

# NATA Refresh: Appraisal for a Sustainable Transport System

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# Summary

1. The Eddington Study and Stern Review prompted the Department to launch a review of the New Approach to Appraisal (NATA) in 2007. This was partly to address issues emerging after ten years of using NATA, and partly to adapt NATA to our new *Delivering a Sustainable Transport System* policy goals – especially the challenges around economic growth and the environmental and social impacts of policies or interventions.
2. We consulted on some specific areas in early 2008, and in the Department's response to the NATA Refresh consultation in July 2008 we summarised the views expressed by respondents. Alongside that document we proposed some new analyses to add to NATA for 2009/10. This report confirms the appraisal guidance that we published in July. Using this new guidance, promoters will be able to: appraise the impacts of cycling and walking; quantify the reliability improvements due to a transport intervention; incorporate the latest forecasts of the drivers of transport demand, and analyse the uncertainty around the drivers.
3. This report then turns to the changes we plan to make to NATA for the financial year that starts in April 2010. This may appear a long time in the future, but we recognised in the NATA consultation that promoters preferred us to give more warning of changes, and to join up changes into one batch, thereby easing the 'change management' around different vintages of guidance. As we move forward, we will ensure that we talk to those developing schemes about any practical implications.
4. Firstly, as part of the routine changes we will periodically make to NATA, we will update our guidance and software to take account of the latest forecasts on growth, population, oil prices and other drivers of transport demand. This will be undertaken during the summer and will take account of the Government's work both on responding to the Committee on Climate Change and incorporating changes in economic conditions over the past year.
5. The fact that many schemes increase fuel consumption and so raise indirect tax revenues is currently treated in appraisal as reducing the cost to Government of a proposal. But in the consultation, it was generally viewed as counter-intuitive that such revenues should improve the benefit to cost

ratio for a proposal, given that differential taxation rates were primarily to encourage public transport use. Chapter 4 covers a change to this metric – the benefit-cost ratio – which we propose to make from 2010/11:

- **New benefit-cost ratio for funding decisions.** Indirect tax will be removed from the Present Value Cost (PVC) calculation and included in the Present Value Benefits (PVB).

6. In addition, the report highlights some specific changes responding to the NATA Refresh consultation, the Department's strategy in *Delivering a Sustainable Transport System* (DaSTS) and the wider cross-Government evidence needs in developing National Planning Statements. Chapter 2 describes how we will change the Appraisal Summary Table (AST) so that it reflects the new transport goals and challenges, especially:

- **Highlighting carbon impacts:** There is a new separate Reduce Carbon Emissions goal in DaSTS. We will release advice in the summer on how to report climate change impacts.
- **Ensuring alignment between local and national goals:** Respondents highlighted that decisions were often made within wider local and regional planning processes, touching areas such as social and distributional impacts, health impacts of transport, housing and economic development.

7. NATA makes considerable use of cost-benefit analysis and, where possible, ascribes monetary valuations to impacts so that they can be compared to costs on Government budgets. The presentation of these monetary impacts raised some concern amongst respondents to the consultation. Chapter 3 describes how we intend to enhance the presentation of these impacts to provide greater transparency about:

- **Indirect taxation impacts:** transport has very different levels of indirect taxation on different modes, and the tax impacts of a proposal are therefore complex. However, when considering the impact that a proposal may have on taxation revenues it should be recognised that changes in taxes are not simply being counted as a benefit in their own right, but reflect changes in economic welfare which need to be captured by any cost benefit analysis process. We will introduce a new table which will demonstrate that these impacts are a transfer between transport users and government, which does not alter the overall worth of a project. This is a presentational change clarifying the double-entry nature of transport related indirect taxes in appraisal.
- **Journey improvements especially time savings:** At present, the journey time savings due to a proposal – often the most important monetised impact – are in just a few rows of the NATA AST. We will split the transport user benefits according to the Department's new transport goals and challenges. We will also provide greater disaggregation of

these impacts as supplementary analyses, providing information on the size of time savings and their spatial and distributional incidence.

8. Chapter 5 looks at the balance between the monetised and other NATA objectives. Some consultation responses suggested that, in assessing value for money, non-monetised impacts might be given insufficient weight. This is an issue about how appraisal results are used in decision making, rather than the NATA appraisal approach in itself. However, it is important that promoters and analysts have a better understanding of this part of the process. The chapter describes how we consider non-monetised impacts and how we perform sensitivity tests on the category of value for money in which a proposal fits. Going forward, the value for money process will be enhanced by:
  - **Introducing a new ‘Very High’ category.** This will cover schemes offering returns greater than four times their costs, helping us to better differentiate and prioritise between the very best schemes.
9. This report announces changes to NATA that the Department will make progress on over the course of the coming year, to become part of definitive guidance in April 2010. Some of the changes address specific issues. The changes in chapters 4 and 5 are relatively straightforward using the existing evidence differently. Other changes present appraisal information in a more informative way. This means that the body of NATA methods and data is to remain largely unchanged. However, we will need to adapt some of the tools and the advice alongside this during 2009. We will issue updated draft guidance in due course.
10. The NATA framework has generally been applied to new capital investment. However, the principles and approaches are equally applicable to any policy intervention, such as revenue spending on smarter choices programme, or a new pricing policy or regulation.
11. One important consideration is ensuring the appraisal is proportionate, so that decisions are robust but do not involve superfluous levels of modelling and analysis. We are therefore currently working on simplified appraisal requirements for major schemes. The focus of this work is to ensure the appraisal effort is proportionate to the size and impacts of schemes or measures. The work is, also, specifically developing a lighter touch process for small schemes, likely to be applied to schemes below £20m. Further, it is considering how the option assessment process can also be systematically covered by appraisal at an early stage in scheme development. This is expected to formalise the process for promoters making the case to do less appraisal work for appraisal aspects that are, for example, unlikely to impinge on the value for money of the scheme, and could also include less onerous analytical procedures.

12. Guidance is expected by summer to appear in consultation on WebTAG, over the year, and then draft guidance before Dec 2009 and full introduction from April 2010. We intend to work with a number of local authorities and other stakeholders to pilot the approach on actual schemes during the year, ahead of issuing the final guidance.



# Chapter 1: Introduction

1. The NATA Refresh was launched in October 2007 with the aim of reviewing the New Approach to Appraisal, the Department for Transport's appraisal framework. The consultation and associated programme of work was started in the light of the recommendations of the Stern Review of the Economics of Climate Change and the Eddington Transport Study into the links between transport and economic growth (Stern, 2006; Eddington 2006). The hope was that by drawing on the experience of people who had used and engaged with the NATA through a consultation process, we would be able to develop the framework in a way that drew on lessons learnt from its past application.
2. NATA is a body of advice, software and data products that the Department for Transport provides to support those developing business cases for Government funding or approval. The analytical tools ensure transport interventions are appraised in a comparable and consistent way and, where standardisation and best practise is possible, NATA seeks to disseminate it to ensure that analysis is robust and undertaken at proportionate cost.
3. The consultation document introduced the five principal themes of the NATA Refresh (DfT, 2007):
  - better capturing the impacts of transport policies and schemes on productivity and competitiveness; particularly agglomeration and labour market effects in cities, journey-time reliability, the distribution of freight, housing and international connectivity;
  - better capturing environmental impacts, particularly valuing carbon emissions, landscape impacts and changes in air quality;
  - better capturing equality issues – social inclusion, regeneration and housing;
  - ensuring greater comparability across modes and between different types of intervention (e.g. taking proper account of the different taxation and financing structures faced by different modes and aligning investment appraisal and regulatory impact assessment); and

- better reflecting uncertainties – both in forecasting and in our understanding of valuations and behaviours – so as to aid robust decision-making.
4. In total we received 101 responses to the consultation from a wide range of stakeholders. The views expressed in the responses have proven invaluable in shaping our programme of work to prepare NATA for the new challenges facing transport policy and planning. A full account of the responses can be found in the Summary of responses document (DfT, 2008) along with our initial indication of the direction of the programme of work.
  5. In planning the NATA Refresh work programme we aimed to:
    - ensure that our appraisal system would closely reflect the goals and challenges faced by our transport system and the wider concerns of government as defined in ‘Towards a Sustainable Transport System’;
    - strive to create a system that would better discriminate between more and less effective options and hence help secure better value from our transport spending; and
    - reduce the overall burden of effort associated with appraisal to ensure that the appraisal and decision-making process would work efficiently for all involved.
  6. We have already made progress towards achieving these aims. The remainder of this chapter will provide an account of the changes that we have made to the governance of the guidance, the new guidance published to date, and our plans to complete the programme of changes over the coming year.

## Governance of the guidance – an orderly release process

7. In their responses to the consultation, many stakeholders drew our attention to problems created by the updating of the guidance to reflect the latest evidence. Changes to modelling and appraisal methodology, or values that are used during the modelling and appraisal process, can lead to the need to repeat analyses and therefore delay the preparation of business cases.
8. We recognise that such changes can be disruptive, and we have therefore introduced a new orderly release process to allow scheme promoters to manage the risks associated with changes to the guidance. Under this process, our appraisal guidance will only change on one day each year – that date in 2009 is April 6th. For the next twelve months, the definitive set of guidance for modelling and appraisal will not change.
9. The orderly release process also allows scheme promoters to familiarise themselves and test forthcoming changes, long in advance of them

becoming part of the definitive set of guidance. In future, all new guidance units will first be issued in the consultation part of WebTAG, the Department's transport analysis guidance website. They will then be moved to an 'in-draft' section of the website at least three months in advance of them becoming definitive. Once a piece of guidance has been given 'in-draft' status it will remain locked to all but the most minor changes.

## Changes to the guidance for April 2009

10. In line with the orderly release process, we are now making some changes to the definitive set of guidance. In July 2008 we announced a number of changes to the guidance, these will become definitive on April 6 2009:
  - **Taking account of carbon emissions:** We have incorporated the latest Department of Energy and Climate Change CO<sub>2</sub> valuations into the NATA guidance and software tools.
  - **New methods to capture the value of more reliable journeys:** We are incorporating draft guidance to capture the impacts upon travel time variability of transport investment; both the Eddington Study and the NATA consultation emphasised the importance of reliability to travellers.
  - **New guidance on appraising cycling and walking schemes:** In accordance with our commitment to the Department of Health's Obesity Strategy, new NATA guidance on appraising the health benefits of increased physical activity will become part of definitive guidance.
  - **Updating forecasts of long-term trends:** We are confirming new data-sets, for use by analysts, that better capture expected long-term trends in a number of key drivers of transport demand:
    - a. new projections of the volume and geographic-distribution of trip-making across the UK that reflect recent changes in population projections from the Office of National Statistics;
    - b. new guidance on forecasting, joining up and updating existing materials and also introducing an approach to handling uncertainty in forecasts;
    - c. new guidance and software based on the latest long-term oil-price forecasts from the Department of Energy and Climate Change; and
    - d. guidance to integrate the latest forecasts of freight traffic, which reflect emerging patterns of global economic development and trade.
11. In addition to these changes, some further updates that were issued in December 2008 will also become definitive on April 6 2009.
  - **Physical fitness:** guidance on the monetisation of impacts on physical fitness;

- **Safety:** the incorporation of guidance previously published in Highways Economics Note 1;
- **Values of time and vehicle operating costs:** reflecting the latest advice from the Department of Energy and Climate Change on fuel prices, Fuel Duty and VAT rate changes; and
- A minor amendment has been made to **Rail Passenger Demand Forecasting Methodology**.

## Further changes to NATA during 2009

12. The rest of this document describes changes that we plan to seek views on during 2009. These changes will constitute the completion of the NATA Refresh. Some of the changes are to the appraisal framework, such as adapting the Appraisal Summary Table in line with the new DaSTS goals and challenges. However, in addition, we intend to release other specific transport analysis guidance units.
13. Alongside this document, we are releasing:
  - **Advice on appraising wider economic impacts.** We have been improving our understanding of how transport improvements support economic growth in agglomerations of economic activity and in accessing productive jobs. We will provide advice on approaches to take this into account in transport appraisal. These have been tested in some schemes.
  - **Appraisal of housing benefits.** The Department has been working with Communities and Local Government to develop techniques for capturing the costs and benefits associated with new housing. We will provide advice primarily focussed on clarifying how a large housing development affects proximate transport links.
14. Further to these draft guidance units, we will release in the summer:
  - **Analysis of packages of schemes.** The Department has existing guidance in this area. However, the experience with the Transport Innovation Fund has suggested some simplifications and prompted a more general refresh.
  - **Tackle climate change goal.** There is a new goal in DaSTS to tackle climate change. We will release advice in the summer on how to appraise climate change impacts.
  - **Supporting proportionate appraisal.** The Department has commissioned work to ensure analytical effort is proportionate to scheme cost. The focus of the project has been on the smallest schemes and we aim to release guidance into WebTAG in the summer.

# Chapter 2: Summarising appraisal results

1. The Appraisal Summary Table (AST) draws together the evidence from economic, environmental and other assessments of the impacts of a proposal. In the same way that one might draw up lists of pros and cons of a course of action when faced with a difficult decision, the AST is used to summarise the evidence for and against a proposal for the decision-maker on one page. As such, it provides a focal point for the decision-making process.
2. Whilst its primary role is to support ministerial decision making, it is often used by other parties as well, e.g. a planning inspector, a local stakeholder, or an official tasked with providing advice on the value for money of a proposition.
3. The responses to the NATA consultation confirmed that stakeholders find the AST a useful tool in the decision making process. While the principle of a summary was supported, there were a number of areas where respondents felt improvements could be made:
  - **Highlighting carbon impacts:** There is a new separate climate change goal in DaSTS. We will release advice in the summer on how to report climate change impacts.
  - **Ensuring alignment between local and national goals:** Respondents highlighted that decisions were often made within wider local and regional planning processes, touching areas such as social and distributional impacts, health impacts of transport, housing and economic development.
  - **Drawing attention to adverse environmental impacts:** Respondents noted the difficulty in providing evidence on adverse and often qualitative impacts on a consistent and comparable basis.
4. This chapter addresses these concerns and proposes specific improvements to the presentation of the AST and analysis underpinning it. The chapter focuses on plans with regard to the first two areas above; the third is explored in Chapter 5.

**Box 2.1. Our proposals on the AST**

In drawing up these proposals to better align results with the Department's new *Delivering a Sustainable Transport System* goals, we have generally found that current appraisal techniques provide many of the required analyses already. We propose:

- Separating and detailing climate change impacts: There is a new separate climate change goal in DaSTS and we will release advice in the summer on how to report these impacts.
- Presenting analyses relevant to the new goals and challenges: We will integrate into a new Appraisal Summary Table a proposal's impact according to the goals in the DaSTS challenges, disaggregating current impacts where appropriate.
- Presenting evidence on the location of impacts: Appraisals can often attribute scheme impacts to particular regions and areas. This information will be used to assess scheme impacts on the DaSTS regional balance, regeneration and housing challenges.

## Appraisal Summary Table: From objectives to goals and challenges

5. Much has changed over the last ten years – our evidence base has grown and we face new challenges – but the principles of sound decision-making remain the same. There is still a need to provide decision makers with a concise but comprehensive summary of the impacts of a course of action, and the Appraisal Summary Table will therefore remain at the heart of the decision-making process.
6. In 1998, when NATA was formulated, great care was invested in ensuring that the Appraisal Summary Table provided a balanced representation of the facts that were pertinent to a decision. The table was designed in such a way as to be comprehensive – capturing all of the impacts – whilst a single-page format was adopted in the hope that it would ease comprehension. The standardised format of the table was adopted to ensure ease of comparison between different options, with all classes of impact assessed in every AST, even if only to show that they were neutral for the intervention in question.
7. There is further preparatory work to be completed before the new AST can be introduced for the appraisal of new proposals. We aim to complete this work over the course of this coming year, with new guidance being released, in accordance with our orderly release principles, before the end of 2009. All appraisals submitted to the Department for Transport for decision after the start of April 2010 will be expected to be summarised according to the new AST structure.

8. The most significant change to the format of the new Appraisal Summary Table is the re-grouping of the NATA objectives and sub-objectives into the Department's new *Delivering a Sustainable Transport Systems* (DaSTS) goals and challenges. To aid understanding of the changes that are being made, the tables at the end of the chapter allow the reader to track from one classification to the other. A first set of changes move existing AST evidence into the appropriate DaSTS challenge:
  - The greenhouse gas sub-objective has been separated from the rest of the environmental impacts and placed in the tackle climate change goal;
  - The health implications of air quality and active travel have moved from the environmental objective to the Safety, Security and Health goal; and
  - Option values and severance are better assessed under the Quality of Life goal.
9. Some of the current NATA objectives need to be either regrouped or disaggregated to inform the new DaSTS goals and challenges:
  - The incorporation of wider economic impacts into the appraisal evidence on how a proposal meets the transport goal of Support Economic Growth;
  - Benefits accruing to business and commuting users have been distinguished as supporting the economy, with other travel time and reliability benefits coming under the Quality of Life goal;
  - Economic regeneration and providing better access to the transport system have been analysed using evidence on their location under the Equality of Opportunity goal;
  - The role that transport infrastructure plays in supporting the delivery of housing is now separately recognised under the Support Economic Growth goal.
10. To aid understanding of the changes that we will be making, Tables 2.1 and 2.2 at the end of this chapter show how NATA objectives relate to the new DaSTS goals and challenges.
11. Some evidence gaps have been identified, such as for the social and distributional impacts falling under the Equality of Opportunity goal. We have published research on our first steps on such analysis alongside this document. The research identifies that eight of the current NATA impacts can be looked at in terms of their social and distributional consequences, including noise and air quality.
12. Over the following pages, each of the new goals is examined in turn to provide a more complete account of the changes that are being made. The following sections also report on progress made towards issuing guidance to support the changes.

## Tackle climate change

13. Averting dangerous levels of climate change presents one of our biggest challenges. It is important that the impact of a proposal's greenhouse gas emissions is registered at appraisal, and that due account is taken of its contribution to meeting our targets to reduce carbon.
14. Ever since it was first developed in 1998, the Appraisal Summary Table has reported the volume of greenhouse gas emissions associated with a proposal. Over time our modelling and appraisal methodologies have improved, and we are now better placed to take account of transport created carbon emissions when making decisions.
15. Monetising the impact of the carbon emissions is important to getting transport decisions right and ensuring that investment decisions reflect our climate change goals and targets. Monetisation sends a clear and consistent signal to decision-makers and scheme-promoters about the weight that should be given to an impact and ensures that due account is taken of the effect.
16. In 2006 we issued guidance which required scheme promoters to apply the then social cost of carbon to the greenhouse gas emissions for reporting in the Appraisal Summary Table (DfT, 2006). In July 2008, we updated that guidance and supporting software to reflect advice on application of the new shadow price of carbon. We will continue to work with our partners across Government to ensure that we are adopting a consistent approach to appraising climate change impacts.
17. The shadow price of carbon is currently under review by the Department of Energy and Climate Change. It is likely that new values will be set once we have a clearer understanding of our trajectory towards meeting our carbon reduction obligations, and budgets have been set for the traded and non-traded sectors. In future, as changes are made to the shadow price of carbon, we will update our guidance and software in line with the orderly release principles that we have established for new guidance, and we will make internal adjustments to valuations if necessary to ensure that decisions take account of the latest evidence.
18. Already, a significant portion of overall carbon dioxide emissions comes under the European Emissions Trading Scheme (ETS) and this is set to increase as trading incorporates aviation. The new AST will need to be more informative about whether carbon emissions fall within ETS or not.
19. The Government will respond to the recommendations of the Climate Change Committee later this year. However, there are some specific areas of analysis that we will develop in the coming months and we will release guidance in the summer. Meeting carbon budgets will require actions to reduce emissions from across transport. We are particularly aware of the



need for modelling advice: ranging from the different emissions characteristics associated with different modes to issues associated with incorporating international and national policies to inform local analysis. The focus of the work will be to support analysis at regional and local level.

## Support economic growth

- 20.** The new 'Support economic growth' section of the table will draw together the impacts that directly affect the economy. The Economy section of the original NATA AST captured all of the direct impacts on the consumers and providers of transport services. This section of the new AST will also capture wider impacts on the economy considering the following impacts:

  - business travellers;
  - commuters;
  - freight operators and transport providers; and
  - will also include the wider impacts on the economy such as through transport's role in supporting agglomerations and providing access to labour markets.
- 21.** Impacts on journey times and the cost of travel will continue to be captured as part of this goal, but will now be augmented by a monetised valuation of reliability improvements, an assessment of productivity impacts, and where appropriate, assessments of an intervention's role in facilitating the construction of new housing or improving network resilience.
- 22.** Unpredictable travel times have a direct efficiency impact on the economy. They cause transport users to either depart early to avoid late arrival, or risk the costs of late arrival in order to avoid the wasted time associated with leaving early. Either way, they have an impact on economic productivity which should be captured in appraisal. In the past we have used a qualitative assessment of reliability improvements but research into the estimation and valuation of these impacts has allowed us to strengthen our guidance by adopting a quantitative approach.
- 23.** Last summer we released new guidance on the quantitative estimation of reliability impacts in the consultation section of WebTAG – this guidance will become part of the definitive set of NATA guidance on April 6<sup>th</sup> 2009. We will continue to conduct research into transport users' perceptions of, and reactions to, unreliability with the aim of further improving the techniques for capturing the value of reliability improvements within the appraisal process.
- 24.** Another area in which we have made significant advances in recent years is in our understanding of how reliable and efficient transport links can support productivity and competitiveness. The Eddington Transport Study (Eddington, 2006) highlighted potential gains from 'agglomeration

economies' where firms and workers benefit from being located close together. Where firms and workers have good access to each other they are likely to benefit from easier access to suppliers, better functioning labour markets, and the sharing of knowledge and expertise. Productivity gains that result from agglomeration may help to support the provision of world class products and services. Improving transport links for workers, businesses, and goods may therefore improve productivity and our international competitiveness.

25. SACTRA (1999) set down the rationale for the appraisal of some wider impacts that might result from direct transport user impacts being amplified through the economy. Some initial estimates of the scale of the impacts were made in the Eddington Transport Study. Since the Eddington Study, the Department has been developing the evidence base and working on the application of this evidence in appraisal. The research and application is now considered sufficiently robust such that WebTAG guidance to allow wider impacts to be appraised more routinely can be released alongside this document. The guidance will be released on WebTAG alongside this document, in a consultative form.
26. We have sought to minimise the additional effort associated with the introduction of the new guidance by producing software to aid the estimation of the Wider Impacts. Our aim, subject to comments we receive in 2009, is to make this guidance definitive in spring 2010.

### Box 2.2. Wider Impacts

Wider Impacts from transport interventions are likely to occur because in practice competition is not perfect in many markets and, as a result, transport user impacts are amplified through the economy. This means that simply measuring the time and money savings to users of a transport scheme would not estimate the full welfare and productivity impact of the scheme. Factoring Wider Impacts into appraisal is important to ensure assessments of transport schemes are made with an understanding of all impacts. The Wider Impacts, to be included in the new WebTAG guidance, are as follows:

- **Agglomeration Impacts:** a transport scheme may affect the accessibility of firms and workers to each other, thereby impacting on the level of ‘agglomeration’ or concentration of activity. There is good evidence that indicates higher agglomeration results in higher productivity.
- **Labour supply impacts:** Transport costs are likely to affect the overall costs and benefits to an individual from working. In deciding whether or not to work, an individual will weigh travel costs against the wage rate of the job. A change in transport costs is therefore likely to affect the incentives of individuals to work and hence the overall level of labour supplied in the economy. The more we can make efficient use of our ‘human resource’ the more output the UK can potentially produce. Higher UK output provides a means to allow for higher UK consumption, therefore impacting on ‘welfare’ or ‘wellbeing’. Labour market impacts from transport are only partly captured by measuring impacts on commuters, which reflect the benefits to them individually in the form of the net pay they receive from working. The Wider Impact which the new webTAG guidance will seek to estimate is the gain to society associated with the additional tax these workers pay.
- **Output change in imperfectly competitive markets:** In most cases, markets are not perfectly competitive. This can lead to lower production and higher prices than would exist in the case of a competitive market, normally to the detriment of consumers and the economy as a whole. A reduction in transport costs allows for an increase in output in the goods or service markets that use transport. This expansion of output delivers a welfare gain as consumers of the goods and services will value any increases in production by more than the cost of the additional units of production. This impact is not measured in user benefits.

The scale of agglomeration impacts is influenced by a scheme's location. To help identify whether an appraisal of the agglomeration impacts is needed the new webTAG guidance will include advice on where agglomeration impacts are likely to be significant, and therefore worth appraising. These areas, where significant impacts are expected, are known as 'Functional Urban Regions' or 'FURs'. We have sought to minimise the additional effort associated with the introduction of the new guidance by producing software to aid the estimation of the Wider Impacts. Our aim, subject to comments received, is to make this guidance definitive in spring 2010.

27. In the Housing Green Paper, the Government outlined plans to deliver three million new homes by 2020 (CLG, 2007). As part of these plans, the Department for Communities and Local Government (CLG) and the Department for Transport (DfT) made a joint commitment to develop a methodology to better capture the economic benefits generated by new housing developments, for inclusion in the New Approach to Appraisal (NATA).
28. The development of new housing can place considerable pressure on transport networks, and in some instances the best combined transport/land-use planning solution involves providing additional infrastructure to accommodate the new demand. Alongside this document we have released new guidance into the consultation section of the WebTAG, which provides a recommended approach for (a) identifying when a housing development is contingent on the provision of new infrastructure, and under these circumstances (b) reporting the impacts arising from the new housing. The new format Appraisal Summary Table will contain a row to capture this information.
29. The final challenge in this goal is resilience, differentiated from reliability as potentially longer and more serious disruptions to transport requiring cross-modal planning. A range of causes of disruption to transport were identified including: the consequences of acts of terrorism, severe weather events or more gradual changes to the transport system as climate changes. We are working with partners across Government to establish a consistent approach to appraising the benefits that accrue from ensuring the resilience of our infrastructure.
30. It is important that planners of transport infrastructure are aware of the need to adapt to future climate change. The UK Climate Information Programme will make new climate change forecasting tools available in late spring 2009, and the Department for Environment, Food and Rural Affairs (Defra) are leading on the production of guidance that will form a supplement to HM Treasury's Green Book. This will advise policy makers on how to take climate change risks into account in appraisal.

## Promote equality of opportunity

- 31.** The Equality of Opportunity goal is ‘to promote greater equality of transport opportunity for all citizens, with the desired outcome of achieving a fairer society’ (DfT, 2008b, p.21). With this goal in mind we have drawn together three classes of impact for inclusion in this part of the Appraisal Summary Table: Accessibility (including wider access to key services, employment and leisure); Regeneration; and Regional balance. The appraisal of all three classes of impact will build upon analyses and data that are already in place as part of the appraisal process. Over the coming year we will issue new guidance to clarify how existing methodologies should be adapted.
- 32.** Respondents to the consultation also drew attention to the importance of reconciling Wider Impacts and regeneration benefits, highlighting that aligning appraisal evidence to local policy priorities would then be facilitated. We are re-examining the current NATA guidance on the estimation of regeneration impacts. Regeneration impacts are attributable to the number of net additional jobs accruing to residents of regeneration areas. The update is considering some specific questions:

  - what should be classed as a regeneration area?
  - what is the size of the net employment impacts?
  - what value should be put on the net additional employment in regeneration areas created by transport schemes?
  - is the current methodology fit for purpose?
- 33.** Regeneration benefits reduce the disparity of the life chances of those living in the most deprived areas and people who live elsewhere. To identify these, relatively small regeneration areas must be defined. The index of multiple deprivation provides one possible basis for defining where regeneration benefits may be most valuable. CLG (2008) described potential approaches to this, and the location of transport user benefits could then be used to identify to what extent benefits accrue to residents of deprived areas.
- 34.** For the regional balance challenge we will draw upon data that is already generated as part of the appraisal of the economic impacts of schemes, to consider the contribution of a scheme to address regional disparities in terms of both levels and growth rates of economic activity. To minimise the additional burden associated with this NATA analysis, we will modify existing appraisal software tools to calculate the proportion of benefits that fall to regions away from the location of the scheme.
- 35.** Some respondents to the consultation felt that accessibility was a broader issue than average journey time, travel costs and other aspects captured by appraisal. We are re-examining the current NATA guidance on accessibility including considering whether it is possible to integrate accessibility

planning processes and techniques in the appraisal of schemes. We plan to update the transport appraisal guidance on accessibility accordingly.

- 36.** The Department's work to incorporate social and distributional impacts into appraisal aims to improve the extent to which proposed schemes are appraised in line with the Equality of Opportunity goal. Identified impacts relevant to this goal include accessibility, affordability, severance and distribution of user benefits. This work is examining how interventions may disproportionately impact potentially vulnerable groups and different social economic groups.

## Improve quality of life and a healthy natural environment

- 37.** The Quality of Life goal is 'to improve quality of life for transport users and non-transport users, including through a healthy natural environment, with the desired outcome of improved well-being for all' (DfT, 2008b, p.43). Transport appraisal guidance on measuring impacts on the natural environment is relatively advanced, particularly in the advice presented in the Highways Agency Design Manual for Roads and Bridges (HA, 2008). The Department expects quantified and monetised noise impacts, and provides environmental capital based assessment techniques for landscape, heritage, water and biodiversity impacts. In fact, one of the advances of the development of NATA ten years ago was the drawing together the evidence of environmental impacts with that emerging from the economic assessment.
- 38.** One auxiliary role that appraisal plays is in informing a public inquiry for a scheme. This role means that a wider set of bodies are involved in the scrutiny of the way in which environmental information is prepared and presented. In some respects the AST may be viewed as providing the funding decision with some insight into the issues that the statutory processes will focus on:
- The evidence on natural/built environment can stall a proposal later in the process and the appraisal evidence is helpful in designing a scheme which can avoid an adverse inspector's report; and
  - While the appraisal evidence is generally highly regarded, it is difficult for individual schemes to consider cumulative impacts on the natural environment.
- 39.** Our environmental evidence base is becoming richer, especially with the work Defra is conducting on noise mapping and ecosystem services. Further, alongside this document, we are releasing our first consideration of the scope for looking at these impacts from a distributional perspective and whether impacts affect the Quality of Life for different social groups or areas.

40. We will continue to develop valuation approaches. With regard to landscape, we are also releasing the results of a second phase of research into assessing whether valuation techniques can be used on specific landscape types and the impacts of transport interventions.
41. In this goal, we will also include the impacts of schemes on the urban environment. NATA includes a sub-objective on townscape. However, there is a need to consider whether this area of our guidance should be improved. There is an increased level of interest in proposals that improve the environment around transport systems and interchanges. The techniques to assess how people value improvements in the 'public realm' are improving and incorporating best practise into appraisal may assist in ensuring comparability of proposals.

## Contribute to better safety, security and health

42. The Safety, Security and Health goal is 'to contribute to better health and longer life-expectancy through reducing risk of death, injury or illness arising from transport, and promoting travel modes that are beneficial to health.' (DfT, 2008b, p. 30). The goal has been developed in the context of a good track record of tackling the safety risks associated with travelling.
43. The Department has rationalised this goal into three separate challenges for the purpose of scheme appraisal. Firstly, the health challenge considers the improvement of health through choosing more active modes and the impacts on health of air quality. The second challenge, on safety, looks at the risk of a fatality or injury either through travel or to those working in the construction and operation of transport systems. On security, the challenges are both due to personal traveller security and the need to reduce the terrorist threat.
44. Transport modelling allows the analyst to determine the traffic induced changes in accidents for proposed road schemes. Similar analysis is available for other modes. On air quality, again, quantitative assessment with the aid of models is relatively advanced. With physical fitness impacts – particularly on cycling and walking schemes – the evidence is being strengthened.
45. A second area explored was the crucial role of regulation and non-capital policies. These were usually multifaceted packages of measures where attribution to different constituent parts was difficult. It was noted that our incorporation of the Impact Assessment within the NATA framework may go some of the way in this area, allowing regulatory proposals to be assessed in a manner consistent with investment decisions. Further, the incorporation of evidence from evaluation into NATA in a more timely way will help. Trials of schemes to improve, say, driver skills, could provide robust indications of the usefulness of measures before they are rolled out.

46. As part of the work on social and distributional impacts we are considering analysis of safety in terms of both the number of accidents and personal security e.g. fear of crime for different social groups and areas. This will provide a more detailed disaggregation of impacts on potentially vulnerable groups and areas to be incorporated within the appraisal process.

## Providing additional evidence: next steps on presentation

47. The AST is primarily a presentational tool, to capture the most important aspects of a proposal. When it was originally designed, the methods to display information were very different. Over time there has been significant changes in information and communication technology and improved visualisation of outputs from transport analysis. For example, simulation of landscape impacts is now more possible, and the use of maps to display the geographical aspects of a proposal is more common.
48. The previous sections also highlighted an increased appetite for the presentation of more detail. The presentation of social and distributional impacts of a scheme requires the disaggregation of existing results, for example identifying potentially vulnerable groups and considering social and distributional impacts for key groups identified. Similarly, we will consider how to present journey time savings in a more disaggregate fashion (see Chapter 3).
49. At present, appraisal information is reported in two layers. On the single-paged AST, the most important aspects are presented in a way that ensures coverage is comprehensive. Alongside the AST, there are a number of other summaries, with information relevant to particular stages in the process. The Public Accounts summary details the effects of a scheme on public finance, the monetised costs and benefits are also summarised in a separate table.



50. Over the coming months we will strive to reach a balance between the changes proposed in this chapter, the space available in the AST and the mix of materials on the AST and those in supporting tables. In doing this, we will look at whether:
- a. a more visual presentation of some of the material is possible;
  - b. linking from the AST to the other summary materials is useful; and
  - c. whether there is a need to develop new supplementary summaries.
51. As far as possible we will modify existing software packages to standardise the approaches, minimising the burden of effort associated with presenting the new summaries. We will also provide new guidance on the preparation of the AST and supporting summaries and release it in accordance with the orderly release process.

**Table 2.1. From NATA objectives to DaSTS goals and challenges**

| NATA objective | NATA subobjective |   | Challenge  | Goal                               |
|----------------|-------------------|---|--|------------------------------------|
| Environment    | Noise             | ▶ | Reduce exposure to noise   | Improve quality of life            |
|                | Local air quality | ▶ | Reduce air quality health costs                                    | Better safety, security and health |
|                | Greenhouse gases  | ▶ | Reduce greenhouse gas emissions                                    | Tackle climate change              |
|                | Landscape         | ▶ | Minimise impact on the natural environment, heritage and landscape | Improve quality of life            |
|                | Townscape         | ▶ | Improve the urban environment                                      | Improve quality of life            |
|                | Heritage          | ▶ | Minimise impact on the natural environment, heritage and landscape | Improve quality of life            |
|                | Biodiversity      | ▶ | Minimise impact on the natural environment, heritage and landscape | Improve quality of life            |
|                | Water environment | ▶ | Minimise impact on the natural environment, heritage and landscape | Improve quality of life            |
|                | Physical fitness  | ▶ | Improve health through physical activity                           | Better safety, security and health |
|                | Journey ambience  | ▶ | Improve experience of travel                                       | Improve quality of life            |

| NATA objective  | NATA subobjective              |   | Challenge   | Goal                               |
|---|--------------------------------|---|---|------------------------------------|
| Safety  | Accidents                      | ▶ | Reduce the risk of death or injury                    | Better safety, security and health |
|   | Security                       | ▶ | Reduce crime  | Better safety, security and health |
| Economy   | Public accounts                | ▶ | Moved to supplementary report                         |                                    |
|   | Regeneration                   | ▶ | Enhance regeneration                                  | Promote equality of opportunity    |
|   | Transport user benefits        | ▶ | Improve connectivity                                  | Support economic growth            |
|   | Transport user benefits        | ▶ | Creating opportunities for social contact and leisure | Improve quality of life            |
|   | Reliability                    | ▶ | Improve reliability                                   | Support economic growth            |
| Creating opportunities for social contact and leisure |                                |   | Improve quality of life                               |                                    |
| Accessibility   | Option values                  | ▶ | Improve experience of travel                          | Improve quality of life            |
|   | Severance                      | ▶ | Creating opportunities for social contact and leisure | Improve quality of life            |
|   | Access to the transport system | ▶ | Improve accessibility                                 | Promote equality of opportunity    |
| Integration   | Transport interchange          | ▶ | Improve experience of travel                          | Improve quality of life            |
|   | Land-use policy                | ▶ | Support the delivery of housing                       | Support economic growth            |
|   | Other government policies      | ▶ | Captured by other goals and challenges                |                                    |

**Table 2.2. From DaSTS goals and challenges back to NATA objectives**

| Goal                            | Challenge  |   | NATA subobjective       | NATA objective                        |
|---------------------------------|--|---|-------------------------|---------------------------------------|
| Tackle climate change           | Reduce carbon emissions  | ◀ | Greenhouse gases        | Environment                           |
| Support economic growth         | Improve reliability  | ◀ | Reliability             | Economy                               |
|                                 | Improve connectivity   | ◀ | Transport user benefits | Economy                               |
|                                 | Support the delivery of housing                                    | ◀ | Land-use policy         | Integration                           |
|                                 | Enhance resilience   | ◀ | New analysis            |                                       |
|                                 | Wider economic impacts   | ◀ | New analysis            |                                       |
| Promote equality of opportunity | Improve accessibility  | ◀ | New analysis            | Accessibility to the Transport System |
|                                 | Enhance regeneration   | ◀ | Regeneration            | Economy                               |
|                                 | Reduce regional imbalance  | ◀ | New analysis            |                                       |
| Improve quality of life         | Reduce exposure to noise   | ◀ | Noise                   | Environment                           |
|                                 | Minimise impact on the natural environment, heritage and landscape | ◀ | Biodiversity            | Environment                           |
|                                 | Minimise impact on the natural environment, heritage and landscape | ◀ | Water environment       | Environment                           |
|                                 | Minimise impact on the natural environment, heritage and landscape | ◀ | Landscape               | Environment                           |
|                                 | Minimise impact on the natural environment, heritage and landscape | ◀ | Heritage                | Environment                           |
|                                 | Improve experience of travel                                       | ◀ | Journey ambience        | Environment                           |
|                                 | Improve experience of travel                                       | ◀ | Option values           | Accessibility                         |
|                                 | Improve experience of travel                                       | ◀ | Transport interchange   | Integration                           |
|                                 | Improve the urban environment                                      | ◀ | Townscape               | Environment                           |
|                                 | Creating opportunities for social contact and leisure              | ◀ | Transport user benefits | Economy                               |
|                                 | Creating opportunities for social contact and leisure              | ◀ | Reliability             | Economy                               |
|                                 | Creating opportunities for social contract and leisure             | ◀ | Severance               | Accessibility                         |

| Goal                               | Challenge                                |   | NATA subobjective | NATA objective |
|------------------------------------|--|---|-------------------|----------------|
| Better safety, security and health | Reduce the risk of death or injury       | ◀ | Accidents         | Safety         |
|                                    | Improve health through physical activity | ◀ | Physical fitness  | Environment    |
|                                    | Reduce air quality health costs          | ◀ | Local air quality | Environment    |
|                                    | Reduce vulnerability to terrorism        | ◀ | New analysis      |                |
|                                    | Reduce crime                             | ◀ | Security          | Safety         |

Note: We have recently completed a consultation on the DaSTS goals and challenges – the precise wording may be changed

# Chapter 3: Analysing the monetised impacts

1. Analysis of monetary impacts within the New Approach to Appraisal (NATA) is well-developed. Many impacts of a transport proposal can be valued and NATA enables proposals to include a detailed account of the monetised costs and benefits.
2. The responses to the NATA consultation reflected this; relatively few issues were raised regarding the framework in which monetary impacts are analysed. However, two types of issues were highlighted: how we could improve the presentation of the results; and areas in which the use of cost-benefit analysis could be improved. This chapter focuses on the first category with chapter 4 turning to the second.
  - **Indirect taxation impacts:** transport has very different levels of indirect taxation on different modes and the tax impacts of a proposal are therefore complex and not understood widely outside the Department;
  - **Switching of modes:** parts of the picture provided by appraisal can appear counter-intuitive and a common concern was whether there was genuine mode comparability; and
  - **Balance between the economy and other NATA objectives:** at present, nearly all of the monetised benefits of a proposal are in one row of the NATA AST. This gives the appearance that NATA is not a true multi-criteria framework.
3. Responding to these issues, we intend to make changes in the way we present the results of cost-benefit analysis. This prefaces the more substantive changes described in the next chapter. We also present more detail about the monetary impacts of mode switch. The account provided by a NATA appraisal fairly reflects the monetised costs and benefits to society and we highlight some specific recent improvements in this area.

**Box 3.1. Our proposals on monetised costs and benefits**

In the analysis of monetised costs and benefits, the focus is primarily to align results better to the Department's new transport goals:

- Indirect taxation impacts: Some part of the consumer and business user benefits are attributable to changes in indirect taxes paid. We currently present these under 'central government funding' because this is where they accrue. We will introduce a new table, which will demonstrate that these benefits are a transfer payment between transport users and government. This is a presentational change clarifying the double entry nature of transport related indirect taxes.
- Journey improvements especially time savings: At present, the journey time savings due to a proposal – often the most important monetised impact – are in a few rows of the NATA AST. We will split the transport user benefits according to the Department's new transport goals and challenges. We will also provide more disaggregations of these impacts as supplementary analyses, such as the size of time savings.

## Background: Role of cost-benefit analysis and the welfare approach

4. Cost-benefit analysis (CBA) is used for assessing the monetary impacts of a proposal. It estimates the change in welfare focussing on those impacts which can be quantified and then valued. In the Green Book, it is defined as:

Analysis which quantifies in monetary terms as many of the costs and benefits of a proposal as feasible, including items for which the market does not provide a satisfactory measure of economic value. (HMT, 2003)

5. In practice, it is generally not possible to attach monetary values to all of the impacts. NATA is a form of multi-criteria analysis (MCA), in that the appraisal summary provides information about all of the impacts of a proposal. This means the cost-benefit analysis is complemented by assessments of impacts that are described qualitatively or that can be quantified, but not monetised.
6. In NATA the monetised impacts include: time and operating costs savings for consumers and business users and for transport providers, valuations of changes in accidents, carbon emissions, levels of noise, journey time reliability, and physical fitness. The costs include those met by government (after any developer contributions). The cost-benefit analysis approach is described in TAG Unit 3.5.4.

- 7.** What distinguishes social cost-benefit analysis from similar financial methods is the aim of calculating change in welfare due to an intervention. Where impacts fall on wider society or where the effects occur outside of a market, a ‘willingness-to-pay’ approach is employed to calculate monetised values. The use of ‘willingness-to-pay’ rather than one which focuses only on real resources was prompted by wider Government practice (Sugden, 1999). This is consistent with the Green Book (HMT, 2003). The principle is to arrive at a monetary measure of the net welfare change for all individuals and actors that is brought about by the project or measure under consideration.
- 8.** During the past decade, we have seen some key developments in this area of appraisal. Some of these have been driven by transport considerations, such as the need to make the analysis more relevant to multimodal transport analysis and the increased importance of private operators alongside public transport bodies. It has also been driven by the wider changes in Government appraisal methods: the Green Book was revised in 2001, integrating willingness-to-pay principles, and the aim to account for as many impacts as possible in monetary terms. This has meant that NATA and its predecessors have extended the range of impacts that are monetised using robust research evidence on values.
- 9.** Table 3.1 indicates the results of a typical cost-benefit analysis for a scheme. Various monetised costs and benefits are analysed. The numbers in this particular summary originate from the documentation of the Department for Transport cost benefit analysis software, TUBA. The calculations in TUBA take the outputs of a transport model and combine them with standard appraisal valuation assumptions to produce an account of the monetised impacts of a proposal.
- 10.** Setting aside, momentarily, consideration of non-monetised impacts (for which, see Chapter 5), overall, for a worthwhile scheme, the positive impacts should be greater than the negative ones so that the net present value is positive. We would generally only expect to fund or approve proposals where this is the case as to do otherwise would be supporting proposals which diminish overall social value.
- 11.** Presenting the cost-benefit analysis in this manner results in some items appearing in more than one line. Many transactions are both a benefit for one actor and a cost to another. For example, the payment of a fare is a cost to the traveller and a revenue to the operator. These transfers of welfare do in some senses ‘cancel out’ but the cost-benefit analysis takes account of all of these impacts in order to identify the distribution of gains and losses.

| Table 3.1. Analysis of monetised costs and benefits from TUBA  |                         |             |
|--|-------------------------|-------------|
| Noise  |                         |             |
| Local Air Quality  |                         |             |
| Greenhouse Gases   | -498                    |             |
| Journey Ambience   |                         |             |
| Accidents  | Not assessed            |             |
| Consumer Users   | 34653                   |             |
| Business Users and Providers   | 76774 – 2335 =<br>74439 |             |
| Reliability  |                         |             |
| Option Values  |                         |             |
|  |                         |             |
| Present Value of Benefits <sup>(see notes)</sup> (PVB)   | 108594                  |             |
|  |                         |             |
| Public Accounts  | 28154                   |             |
|  |                         |             |
| Present Value of Costs <sup>(see notes)</sup> (PVC)  | 28154                   |             |
|  |                         |             |
| Overall Impacts  |                         |             |
| Net Present Value (NPV)  | 80440                   | NPV=PVB-PVC |
| Benefit to Cost Ratio (BCR)  | 3.857                   | BCR=PVB/PVC |
| <p>Note : This table includes costs and benefits which are regularly or occasionally presented in monetised form in transport appraisals, together with some where monetisation is in prospect. There may also be other significant costs and benefits, some of which cannot be presented in monetised form. Where this is the case, the analysis presented above does NOT provide a good measure of value for money and should not be used as the sole basis for decisions.</p> |                         |             |

Source: WebTAG 2.7.1 Transport Appraisal and the new Green Book; Mott MacDonald (2008), p. 54

## Indirect tax impacts

- Respondents to the NATA Refresh consultation expressed concerns about the current treatment of indirect taxation in appraisal. Transport has very different levels of indirect taxation across the modes and the impact of a proposal on overall tax revenue is therefore rather complex. The different rates of taxation are primarily to encourage use of public transport and other more sustainable modes, but because those switching modes to public transport often do so from a more heavily taxed mode, such as the car, accounting for the loss in tax revenue in appraisal may appear to count against such an option.



13. The specific focus of respondents' concerns was firstly that any increase in use of cars and freight vehicles would result in a rise in tax revenues. This would be a positive impact (on government finances) and reported as such in appraisal. It would lower the overall cost to government, strengthening the case for such an intervention. This appears inconsistent with the objectives of the different rates of tax – to give incentives to use public transport.
14. A second set of concerns centre on the way appraisal handles the transactional nature of indirect tax impacts. Respondents commonly saw indirect taxation as being a transfer between users and government. Overall, these would sum to zero and so ought to disappear. This raised questions about whether indirect taxation ought to be appraised at all. The next section explains why the appraisal has to consider tax impacts

### **Accounting for benefits in a common price base**

15. NATA assesses impacts using 'market' values. This is the unit of account in which monetised impacts are appraised. This means that the entries in table 3.1 are in values that would prevail in final goods markets. These prices would include indirect taxes, such as VAT and fuel duty.
16. A common unit of account is necessary to calculate changes in welfare. This is perhaps most stark in comparing the investment costs paid by government when widening a road, with the capital and running costs of the vehicles using the road. Because government is the recipient of VAT and other indirect taxes on its activities, government expenditure may be regarded as free of taxation. So, a sum of money would appear to give it a greater command over goods than the same sum in the hands of the consumer.
17. However, what is actually happening is that the two purchases are occurring at different stages in the economic cycle, with consumers purchasing in a market after indirect taxes are levied, the Government before. In the former, the Government has raised the indirect taxes needed to provide public services, including the provision of transport projects; in the latter it is yet to.
18. We cannot add the two impacts without recognising this aspect. The NATA approach is to value impacts on market prices. To adjust between the two units of account, NATA employs an indirect tax factor, proposed in DoT (1977). This process allows any impact to be added to another.
19. The use of market values means that even where indirect taxes are a transfer between parties, one gaining and one losing, we take a snapshot of the transaction after this has occurred. That means that analysis of monetised impacts will record that the Exchequer has benefited or lost and that the payments made by users are inclusive of any indirect taxes.

20. A key issue to note is that any change in the overall payment of indirect taxes due to a proposal results from a number of transactions which ought to net out in overall impact. Any tax paid to Government has a counter-party – usually the transport user – who has made the payment. So, when a proposal widening a road is appraised, any increased traffic will result in indirect tax revenues to Government. However, transport users will see a commensurate negative impact as their payments of fuel costs will include this tax.
21. We can clarify this in appraisal summaries in a relatively straightforward presentational change. TUBA already provides the amount of the transport user benefits that reflect increased or reduced indirect taxation. Mott McDonald (2008, p. 51) indicates for the scheme detailed above that this amounted to £4.045m. One change we propose is to provide a new table which will detail the user impacts attributable to any changes in indirect tax revenue changes under a sub-heading. This is discussed in more detail in the Annex.

### **Monetised impacts when there is mode switch**

22. Related to issues around indirect taxation, respondents to the NATA Refresh consultation raised specific concerns about how mode switch was handled in appraisal. Where modes have different levels of indirect taxation, proposals that mean that people change mode will impact on the public accounts. Further, fuel duty has been a means to encourage people to travel by modes other than the car, all other things being equal. This incentive should raise the levels of patronage on public transport or encourage people to walk or cycle where possible. However, when a proposal acts to further encourage the traveller to switch away from the motor car, one of the impacts is to reduce the revenues from fuel duty and other relevant taxes.

**BOX 3.2. Appraising what happens when you leave your car behind**

The table below is an example of the potential impacts of moving from a car to cycling or walking. The impacts vary depending on whether you are commuting or travelling for work. The results are calculated using actual appraisal values, where appropriate, and represent estimates of the welfare effects when mode switch occurs.

Overall, these examples show how a case for measures that encourage switching from car to active choices could be made using a cost-benefit analysis. An appraisal would estimate positive monetary impacts of about 7p (the range is 0p to 14p) for each kilometre of commuter travel that switches from motor car to bicycle at average congestions levels. Such a move has some dis-benefits, such as the cycle being slower and so taking more time. But the health and road decongestion impacts counter these. For cycling during the course of work, the higher cost of time combined with the slower speed of cycling means the balance is much more in favour of driving.

**Table 3.2. Comparison of Costs and Benefits for the Decision to Switch from Car to an Active Travel Choice – Pence per kilometre ( p/km )**

| Level of congestion                 | Low                 | Average             | High                |
|-------------------------------------|---------------------|---------------------|---------------------|
| <b>Cycle: Commuter</b>              |                     |                     |                     |
| Travel time costs                   | -34                 | -31                 | -15                 |
| Physical fitness benefits           | 26 to 40            | 26 to 40            | 26 to 40            |
| Congestion reduction benefits       | 0                   | 11                  | 177                 |
| Greenhouse gases reduction benefits | 0.3                 | 0.3                 | 0.4                 |
| Tax revenue loss                    | -4                  | -4                  | -4                  |
| Transport user resource gains       | 4                   | 4                   | 4                   |
| Other costs and benefits            | -8                  | -7                  | -2                  |
| <b>Net Benefits</b>                 | <b>-16 to -2</b>    | <b>0 to 14</b>      | <b>187 to 201</b>   |
| <b>Cycle: In Work</b>               |                     |                     |                     |
| <b>Net Benefits</b>                 | <b>-161 to -148</b> | <b>-172 to -114</b> | <b>130 to 144</b>   |
| <b>Walk: Commuter</b>               |                     |                     |                     |
| <b>Net Benefits</b>                 | <b>-61 to -36</b>   | <b>-45 to -20</b>   | <b>142 to 167</b>   |
| <b>Walk: In Work</b>                |                     |                     |                     |
| <b>Net Benefits</b>                 | <b>-568 to -543</b> | <b>-534 to -510</b> | <b>-393 to -368</b> |

A detailed breakdown is included for cycling during non-work hours. A breakdown is given for three different congestion conditions, low, average and high. The 'congestion reduction benefits' are the time savings experienced by other drivers. Speeds rise for all these travellers, a consequence of one car trip being removed. However, for the individual who changes mode, there are 'travel time costs' as moving from a car to cycling means a slower journey.

'Physical fitness benefits' arise because increased physical activity reduces the likelihood of dying amongst those aged 15 – 64 who cycle. In the table, we have used a range for health benefits, recognising the uncertainty in the proportion of cycling activity that would replace physical activity undertaken without the switch. In the appraisal guidance, there is information on how to calculate the social welfare associated with saving lives, this is converted into a per kilometre basis. This is valued at between 26p/km and 40p/km. We have also taken account of the accident costs of the different modes using comparable information.

The 'greenhouse gases reduction benefits' are due to reduced emissions because of fewer car journeys. Finally, the indirect tax revenues received by governments are included. These are negative due to switching of modes, but are relatively small compared to the travel time costs, physical fitness benefits and decongestion benefits.

23. It is important to note, however, that this is only one of the impacts of switching modes. While, in itself, the move from motor car to bicycle has a negative impact on indirect tax revenues, this partial picture does potentially mislead. In the box, we indicate how mode switching would be accounted for in a comprehensive manner using appraisal advice, including the new Cycling and Walking advice released last year. This is not the appraisal of a particular scheme, but rather illustrates the potential net present value of a single kilometre of a trip switching from car to cycling or walking.
24. Firstly, the negative impact on tax revenues is apparent. Due to the transfer from a car, less fuel is consumed so that tax revenues have been reduced by about 4p. However, what is striking is that in the majority of conditions, the net benefits of switching away from a car are positive. For a commute, taking place in a congested road network (such as at peak hours in our major conurbations), the case for encouraging walking and cycling is very strong in monetary terms. Whether they are positive enough to justify a specific scheme would then be a matter of comparing these welfare benefits with any costs for a specific proposal.
25. Appraisal looks at the impacts of switching mode from the perspective of society. In the table it is possible to see why – despite situations where society at large benefits from walking or cycling – individuals may not want to change from the car. Many of the benefits of changing do not accrue to the person cycling or walking. For example, the largest impact on busy

roads is the removal of cars, which speeds up other road users' travel. This is why it is important that NATA shows decision makers the impact on society's welfare.

## Transport efficiency and a Sustainable Transport System

26. One of the concerns often raised about the presentation of appraisal results is the high proportion of the monetised impacts that are presented in just two lines of the appraisal summary table. The two rows that cover transport economic efficiency of consumers, and business users and transport providers include the journey time savings due to a proposal and the change in money costs, such as due to fares paid.
27. The AST reflects the outputs of the cost-benefit analysis and various other assessments. The last chapter indicated how appraisal summaries can be adapted to present evidence in terms of the new transport goals and challenges. This section provides information on how we propose to use some of the detail in the cost-benefit analysis to say how a proposal's monetised impacts contribute to the goals and challenges of transport.
28. There are three dimensions to the changes proposed in how we present the existing analysis better. Disaggregating transport economic efficiency will be undertaken using:
  - the characteristics of trips that are modelled in the proposal;
  - the distribution of time savings for an intervention; and
  - the location of economic efficiency impacts.

### Using trip characteristics in appraisal evidence

29. Two of the new transport goals – Support Economic Growth and Quality of Life – have challenges which are articulated in terms of the economic efficiency provided by a transport scheme. In improving connectivity, transport proposal promoters are challenged to improve accessibility for people to jobs and to support businesses in economic activity. The 'Improve connectivity' challenge also articulates the needs of hauliers and the logistics industry.
30. Transport modelling is usually undertaken at a disaggregated level, identifying business users from other transport users and separating trips by purpose. These disaggregations are then maintained as the appraisal summaries are generated and can be used to inform the split of benefits between the two goals.

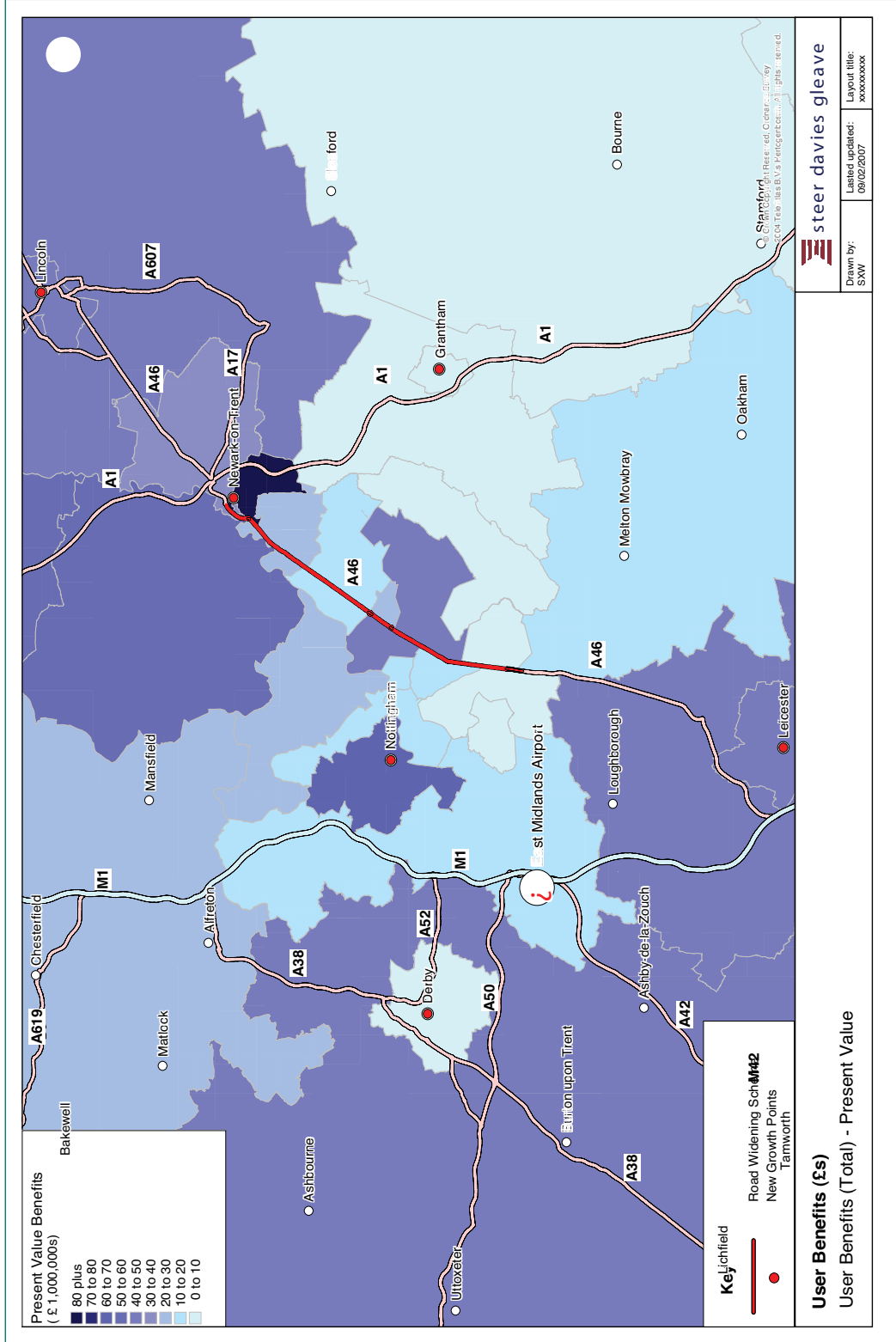
### Analysing the distribution of time savings

31. The extent to which a proposal enhances economic efficiency through the creation of time savings is usually presented in an aggregate manner in appraisal summaries. However, there remains considerable interest in the distribution of these impacts, especially in respect of the size of time savings for individual trips. The Department reviewed the research in this area quite recently and recommended that more detail be presented.
32. During the consultation, respondents were keen that we explored what information could be provided about the composition of time savings and promoters could, using the results already available to them, provide supplementary tables about the distribution. Furthermore, incorporating tools to generate standardised tables about this aspect into the current appraisal software would be possible and we will develop this over the coming months.

### Locating the benefits of a proposal

33. In three of the transport challenges, there is the potential to use the geographical detail underpinning the net present value calculation. We propose to use this analytical capability to provide appraisal information on three of the DaSTS challenges, as follows:
  - **Support delivery of housing:** The proportion of economic efficiency benefits attributable to trips starting or ending in large housing developments which are planned to be built;
  - **Enhance regeneration:** The proportion of economic efficiency benefits attributable to trips starting or ending in 'regional regeneration priority areas' (CLG, 2008);
  - **Reduce regional imbalance:** The proportion of economic efficiency benefits attributable to trips starting or ending in each region.
34. Such an approach has been used previously: figure 3.1 presents analysis for the A46 Newark-Widmerpool road proposal (SDG, 2007). The map shows the present value of benefits of a scheme by where beneficiaries work. The study also maps other measures such as PVB per employed person correcting for the higher concentration of benefits inevitable in the more dense areas of economic activity such as Newark in figure 3.1.

Figure 3.1. Benefits accruing to employed people by where they work



Source: SDG (2007, pg 15)

35. From this information it was possible to determine that about a third of the benefits of the scheme would accrue to those local to or in the immediate vicinity of the intervention. But, it would similarly be possible to highlight what proportion of benefits would be delivered in areas of regeneration. In the new AST, such an estimate would help to inform the challenge of enhancing regeneration
36. In the above figure, we can also identify where boundaries fall, such as those for the regions. This allows the geographic distribution of benefits to be analysed in terms of the proportion falling to different regions. The DaSTS consultation (DfT, 2008a) includes a transport challenge on regional balance, to contribute to the reduction in the gap between economic growth rates for different regions. This challenge also relates to Public Service Agreement 7 (PSA 7) on regional economic performance, as set out in the 2007 Comprehensive Spending Review (HMT, 2007a). Calculating the proportion of benefits accruing to trips starting or ending in each region could help inform the scheme's (or package of scheme's) contribution to PSA 7 and the DaSTS regional balance challenge.
37. The above figure presents benefits by the workplace, which is usually the 'attractor' or, alternatively, the destination of a trip. However, some of the benefits of a transport intervention may be analysed in terms of the production or origin. This is often the residence of the traveller. Similar maps on the change in user benefits due to a proposal would then aggregate by where travellers live. This would be useful in analysing how a proposal contributes to the accessibility of a new housing development.
38. The SDG and similar studies indicate how standard transport modelling outputs can give a richer picture of the geographical distribution of benefits. Over the coming months, the TUBA software package will incorporate this type of analysis so that the methods can be standardised and more routinely produced in an appraisal. At this stage some technical aspects of this development work can be outlined:
- TUBA will use more zonal information: for example, which region a zone is located in or whether it is an area where regeneration benefits will accrue;
  - we anticipate using the commuting, business and freight trip purposes for the regeneration and regional imbalance challenges because these focus more on the business activity facilitated by accessibility improvements; and
  - we anticipate using the commuting and leisure purposes for the supporting delivery of housing challenge, because these purposes are relevant for accessibility improvements when considering housing decisions.
39. We will develop tools to support these analyses over the coming months, releasing a new version of TUBA in summer 2009 for use from April 2010.



## Concluding comments: Proposals for changes

40. This chapter presents some specific improvements to the analysis of monetised costs and benefits that will be incorporated in the Department's guidance and TUBA software primarily to align results better to the Department's new transport goals, but also to bring clarity to the presentation of indirect taxes in the appraisal:
- **Indirect taxation impacts:** Some part of the consumer and business user benefits are attributable to changes in indirect taxes paid. We currently present these under 'central government funding' because this is where they accrue. We will introduce a new table which will demonstrate that these benefits are a transfer payment from transport users to government'. This is a presentational change clarifying the double entry nature of transport related indirect taxes.
  - **Journey improvements especially time savings:** At present, the journey time savings due to a proposal – often the most important monetised impact – are in a few rows of the NATA AST. We will split the transport user benefits according to the Department's new transport goals and challenges. We will also provide more disaggregations of these impacts as supplementary analyses, such as the size of time savings.

# Chapter 4: Prioritising using the benefit-cost ratio

1. The current approach to assessing value for money uses the benefit-cost ratio (BCR), calculated as the benefits to society divided by the overall net costs to Government. The calculation of net costs includes changes to tax revenues that would result from a proposal.
2. Consequently, schemes which result in an increase in indirect tax revenues, such as many road schemes, will have a lower overall cost to Government. This strengthens the case for such an intervention compared to those which reduce indirect tax through the effect on the benefit-cost ratio (BCR). This creates tensions with policy objectives and raises some theoretical concerns over whether this is the most appropriate basis for assessing value for money.
3. Respondents to the consultation raised the treatment of taxation in appraisal in a number of ways:
  - **Priority of schemes raising tax revenues.** It was viewed as counter-intuitive that such a proposal's BCR is higher, given the differential taxation rates were primarily to encourage public transport use.
  - **Mode switch and tackling climate change.** The current prioritisation process also seemed at odds with the desire to reduce fuel use and the consequent emissions of greenhouse gases.
4. The rest of this chapter explains what the benefit-cost ratio is and summarises the work the Department has done to meet the concerns. It explains a change to the benefit-cost ratio that will be confirmed in NATA guidance for 2010.

#### **Box 4.1. Our proposals on the benefit-cost ratio**

While the Department recognises the strong merits of the current approach, it also recognises its weaknesses. Therefore, the Department has considered a range of different approaches to calculating BCRs and assessed their respective strengths and weaknesses. After careful consideration, the Department intends to move to a new metric which aims to retain many of the benefits of the current approach, while reducing its most significant weaknesses.

- New benefit-cost ratio for funding decisions. Indirect tax will be removed from the present value cost (PVC) calculation and included in the present value benefits (PVB).

## Background

5. The Department uses Value for Money (VfM) assessments to help prioritise projects. These assessments are based on benefit-cost ratios (BCRs) which illustrate the amount of benefit a scheme generates per unit cost.
6. A general concern raised in the NATA Refresh consultation was about whether the current approach to assessing BCRs was the most appropriate way of presenting value for money. In particular, concern was expressed about the fact that increases in indirect tax revenues lower the overall cost to Government and thus raise the attractiveness of a particular scheme. This chapter looks at this issue in further detail as well as some of the concerns over the current (NATA) BCR methodology. It also outlines the changes the Department intends to make with respect to the BCR calculation.
7. The chapter begins with a short discussion of the key properties of the BCR and why different classifications of costs and benefits matter. It then moves on to discuss the perceived weaknesses of the current BCR framework and examines alternative frameworks and the new NATA BCR metric.

## The Net Present Value and Benefit-Cost Ratio

8. A transport scheme will have both costs – such as the infrastructure costs of building a new rail line – and benefits – such as the time saved for each traveller using the new line. As many of these costs and benefits are in the future, we discount these impacts into today's values for comparative purposes thus giving us present value benefits (PVB) and present value costs (PVC).
9. In transport appraisal, two important comparisons are made between the benefits and costs. The first comparison is the difference between the

benefits (PVB) and the costs (PVC). This is the net present value (NPV) and it tells us about the overall level of welfare generated by a scheme. A positive NPV indicates the scheme will increase overall welfare.

10. In a world without resource constraints, we would like to recommend all schemes that increase welfare. However, in reality there are limited resources available, and so not all transport projects can be implemented. Therefore, we need some means of comparing competing schemes to ensure we maximise welfare from these limited resources. This might mean implementing one large scheme or several smaller schemes.
11. To assess value for money under resource constraints, we use the ratio of benefits (PVB) to costs (PVC). This is the benefit-cost ratio (BCR) and tells us how much benefit a scheme delivers per £1 of cost. A BCR greater than one tells us there is more than £1 worth of benefits per £1 of cost. The higher the BCR is, the higher the VfM.
12. We care about VfM because we live in a world of finite resources and so we want to maximise the benefits we get from available public money. Schemes can therefore be prioritised on the basis of their VfM which is based on the BCR (although other strategic goals will also affect the prioritisation). Note, we do not prioritise on the basis of the NPV because larger (more expensive) schemes tend to generate the highest NPVs, whereas it may represent better VfM to prioritise lots of smaller (and less expensive) schemes whose cumulative NPV exceeds that of the larger scheme. The BCR allows us to make comparisons between large and small schemes because it tells us the benefit we get for each £1 of cost.

## Defining costs and benefits

13. The difficulty is that in appraisal we have a choice as to what constitutes a benefit and what constitutes a cost. While it is clear that some transport impacts should be classified as costs – such as the infrastructure costs of a scheme to the Government – other impacts are more debateable. For example, if a road scheme increases car traffic and indirect tax revenues to Government – as fuel is taxed significantly above the average rate of indirect tax in the economy – should this enter the NPV and BCR calculations as a positive benefit to the exchequer or a negative cost to the exchequer?
14. While different classifications of costs and benefits do not affect the NPV calculation, they do affect the BCR. For example, consider a hypothetical bus prioritisation scheme which involves the following impacts:

**Table 4.1. An example illustrating impacts for a hypothetical bus scheme**

| <b>Impact</b>             | <b>Quantity</b> |
|---------------------------|-----------------|
| Net benefits to users     | £10m            |
| Net benefits to operators | £5m             |
| Infrastructure costs      | £5m             |
| Change in indirect tax    | (£5m)           |

15. If it is assumed that changes in indirect tax enter the benefits and the only costs are infrastructure costs, the PVB is £10m. This is the £10m of net user benefits plus the £5m of net benefits to operators less the £5m reduction in indirect tax revenues. The PVC is therefore £5m (just the infrastructure costs). The NPV is therefore £5m (£10m – £5m) and the BCR is 2 (£10m/£5m).
16. If the change in indirect tax revenues is considered a cost (and therefore enters the PVC) the PVB becomes £15m. This is the £10m of net user benefits plus the £5m of net benefits to operators. The PVC becomes £10m. This is the £5m infrastructure costs plus the £5m loss in indirect tax revenues. The NPV is therefore unchanged at £5m (£15m – £10m) but the BCR falls to 1.5 (£15m/£10m). Therefore, different classifications of costs and benefits result in different BCRs.
17. The obvious question is, therefore: what is the most appropriate classification of costs and benefits and, therefore, the most appropriate BCR metric? To answer this, it is important to be clear about what prioritising schemes on the basis of their BCR really means. Effectively, prioritising schemes on the basis of their BCR means maximising benefits from a constrained resource (or budget constraint). This constraint is the costs (or PVC).
18. In the above example, maximising VfM subject to a budget constraint which only includes infrastructure costs means using the BCR that excludes indirect tax from the PVC. However, if this budget is affected by changes in indirect tax, it might be best to define the PVC so that it includes indirect tax changes as this would mean maximising VfM from a more realistic budget. This point can be illustrated in the following example which considers three hypothetical schemes A, B and C.

**Table 4.2. An example illustrating impacts for three hypothetical transport schemes**

| Impact              | Schemes |      |      |
|---------------------|---------|------|------|
|                     | A       | B    | C    |
| Net user benefits   | 120     | 400  | 400  |
| Infrastructure cost | 40      | 40   | 40   |
| Indirect tax change | 20      | 20   | (40) |
| NPV                 | 100     | 380  | 320  |
| BCR (1)             | 3.5     | 10.5 | 9    |
| BCR (2)             | 6       | 20   | 5    |

BCR (1) = (Net user benefits + Indirect tax change)/Infrastructure costs

BCR (2) = Net user benefits/(Infrastructure costs – Indirect tax change)

19. A decision maker must choose how to maximise welfare from the money available. Firstly, assume the budget is unaffected by changes in indirect tax revenues and so the only impact affecting the budget is the infrastructure cost of the scheme. If the available budget is 80, to maximise welfare from this, schemes B and C would be chosen thus generating a 700 increase in welfare. The decision maker chooses these schemes because out of the 3 schemes A, B and C, the schemes B and C have the highest BCRs where the budget constraint includes only the infrastructure costs (BCR (1)).
20. However, now suppose the budget is affected by changes in indirect tax revenues. To maximise welfare from this budget, it would define the budget constraint differently so that it includes indirect tax (BCR (2)). With this BCR metric, schemes A and B would be selected increasing welfare by 480. This is because the budget is also affected by indirect tax changes. In this example, it would receive 40 back in indirect tax revenues. The point is that the prioritisation of schemes depends on how the budget constraint is defined. In this example, the different choices were a consequence of maximising welfare from different budget constraints.
21. The key point is that there is no necessarily “right” BCR metric or budget constraint as it will depend on particular circumstances. In the above example, the definition of the budget constraint was either a “narrow” definition of just the infrastructure costs, or a “wider” definition including changes in indirect tax which was assumed to affect the budget constraint. Therefore, determining the most appropriate BCR metric depends on what you deem the most appropriate budget constraint to be.
22. If decisions are to be taken from a “Government-wide” perspective, and where budgets are affected by changes in revenues like indirect tax, it may be sensible to define the budget constraint fairly broadly thus including changes in revenues like indirect tax. However, if decisions are taken more

on a Departmental basis or over a specific resource base, where the budget is unaffected by changes in revenues like indirect tax, it may be better to define the budget constraint more “narrowly” thus excluding changes in indirect tax.

23. The current (NATA) approach defines the budget constraint (or PVC) as net costs to the public sector. It therefore includes changes in all revenue flows to and from Government, including indirect tax revenues. The NATA definition of the budget constraint thus maximises welfare per £1 of net public expenditure, maximising welfare from a whole of Government perspective. There are also useful incentives to developers whose contributions help offset the costs of particular schemes thus lowering the overall cost to the Government.

## Perceived problems with the current approach

24. Although there are a number of advantages of the NATA approach, which takes a government wide view of the resource constraint, there are also a number of weaknesses. In particular, it is questionable whether such an approach maximises welfare from transport spending. In some cases this may attach a disproportionate cost to changes in indirect taxes. It is also not clear that indirect taxes, which are set by the Treasury in light of the overall fiscal and economic situation, will affect costs borne on the transport budget.
25. There have been some other potential weaknesses of the current BCR. It can create tensions with policy objectives. For example, a road scheme which increases CO<sub>2</sub> emissions (and indirect tax revenue) will invariably have a higher BCR than an otherwise identical scheme with lower CO<sub>2</sub> emissions. The current definition can also result in unstable and negative BCRs, particularly when indirect tax revenues or other revenues offset almost all the other costs. Then, small changes in costs or revenues can have large impacts on BCRs.

## Analysing different BCR formulations

26. Given the weaknesses outlined above, some alternative BCR metrics have been analysed and discussed with a range of academics. The starting point to assessing the respective strengths and weaknesses of different BCR metrics is to establish criteria which each metric can be measured against. This includes:
  - Does the constraint reflect the Department’s budget constraint?
  - How theoretically justifiable is the BCR?
  - How does it fit with Department and wider Government priorities?

- Is the BCR useful across a range of transport planning and policy decisions? And by different bodies?
  - Is the BCR stable and well behaved so it can be readily used for prioritisation?
  - How simple is the BCR to use and explain?
- 27.** There is clearly a trade-off between having a BCR metric which is complex but arguably theoretically correct, and a metric which is simple but practical and therefore easier to explain and communicate to stakeholders, as well as use.
- 28.** The critical issue is whether the NATA BCR metric, which defines the constraint (or PVC) as net public expenditure, is the most appropriate constraint. The rationale for the NATA metric is that we should be maximising welfare for each £1 of net Government expenditure.
- 29.** However, a range of alternative metrics have also been assessed. The key alternative metrics include a broad transport budget constraint, a narrow transport budget constraint and a social BCR. The broad transport budget is effectively the same as the NATA metric but does not include changes in indirect tax revenues in the constraint. As well as excluding indirect tax from the budget constraint, the narrow transport constraint also removes changes in revenues from the constraint. The social BCR takes all resource costs to both the public and private sector as the constraint.
- 30.** The rationale for a broad transport budget constraint which moves indirect tax out of the constraint and into the PVB is that we should be looking to maximise VfM subject to a more tightly defined transport budget constraint. Removing indirect tax revenues from the constraint is justified on the grounds that changes in indirect tax accrue to all of Government. This means that any indirect tax revenue increase due to a proposal is a benefit to wider Government, unless there is very strong evidence that it can be used to lower PVC to the transport system. Payments made to reduce the costs, such as developer contributions, would still offset costs.
- 31.** As well as maximising welfare from an arguably more realistic budget, moving to such a metric also has the advantages that it involves no fundamental change to analyses. A further practical advantage of such an approach is the instability to the BCR caused by small changes in indirect tax revenues is greatly reduced.
- 32.** The Department also considered a social BCR metric, placing all resource costs in the constraint. It is therefore relatively simple to understand and it does not need to be tailored to the body making a decision so could be more readily applied by local authorities and other areas of Government. The problems with such an approach are that such a metric will not maximise welfare from the Department's spending as there are lower



incentives to developers and the constraint does not reflect the true Department's budget. There is also a large cost of change with moving to such a metric.

33. However, where no funding is expected and the Department's role is entirely over approving or not the proposal, the social BCR is useful. In these circumstances, there is no cost and determining the most appropriate metric is in part about whether we should be maximising welfare subject to a wide social constraint.
34. Having a constraint which attempts to reflect the true Department budget is problematic as the precise definition of the Department budget is debateable, particularly the treatment of revenues accruing to the Department. Continuing to include revenues in the PVC would retain some of the problems of the NATA approach, and probably favour rail schemes, though the more significant distortions and problems of the sensitivity to wider public finances are avoided.

## Conclusions

35. While acknowledging the strengths and weaknesses of the different metrics, the preferred approach is to retain a broad transport budget given the need to maximise welfare from central Government spending. This is similar to the current NATA metric but removes indirect tax from the PVC. This allows decisions to be taken from a more realistic Department budget (since Department cannot capture indirect tax changes) and avoids the more significant weaknesses of the NATA approach, which tends to place a disproportionate weight on changes in wider public finances. However, this approach would still involve transport revenues, such as rail or local road pricing revenues falling to Government to be deducted from the costs.
36. Narrower definitions of the Department budget, such as simply looking at the direct capital cost to Department could appear a more natural constraint, but this raises other problems. In particular, it would lead to a differential prioritisation of otherwise identical schemes if these were being funded by different parts of Government, which could create perverse incentives. It would also be more difficult for other elements of Government to use this approach and to move to integrated appraisals across different funding streams.
37. The social BCR has many attractions and it is suggested that this metric is adopted as a sensitivity to check the new NATA BCR, particularly where revenues are significant. This metric can also be considered to inform a view of the relative merits of non-spending policies and programmes.
38. It is also recommended that given there is no necessarily "right" answer when assessing each metric, that an increased emphasis on the NPV of a

scheme is given. This would help given an initial indication of the overall net welfare of a scheme.

- 39.** It should be noted that while the move to the new metric does not result in radical changes to how the BCRs are calculated, it does result in different BCRs.
- 40.** Overall, it is not expected that this will have a significant impact on decisions, or on schemes currently in transport programmes. However, it will have an impact on some schemes at the margin tending to benefit public transport schemes and ensures neutrality in how different modes are treated.

# Chapter 5: Assessing Value for Money

1. In this chapter we look at how the Department judges the Value for Money (VfM) offered by a proposal. VfM is an important factor in decision making that helps to prioritise schemes by considering all of the impacts assessed in NATA.
2. The responses to the consultation did not focus on VfM assessment as it lies outside the core NATA guidance. However, there were concerns raised by respondents that are related to the VfM process:
  - **Monetised impacts might be given too much weight.** These concerns were about how we ensure that all factors, both monetised and non-monetised, are given due weight in decision making.
  - **Transparency in use of evidence.** Stakeholders raised concerns about the clarity of the VfM process.
3. This chapter aims to address these concerns by clearly explaining the VfM process; its rationale; and how it contributes to decision making. We describe the approach used which builds on the evidence provided by NATA appraisals. We also outline our proposed change to the current VfM classifications.

## Box 5.1. Our proposals on Value for Money

- **Improving understanding of the Value for Money Process:** A number of concerns in responses to the consultation and from wider feedback were about knowledge of the process. In this chapter we outline the approach used by the Department in more detail than ever before to help improve understanding.
- **Introducing a new Value for Money category, 'Very High', for schemes offering returns greater than four times their costs:** This change will help the Value for Money process continue to influence the quality of the Department's spending. It will allow us to better differentiate and prioritise between the very best schemes.

## The Value for Money Process

4. The Department has published guidance on how appraisal evidence is used to assess the VfM of a proposal (DfT, 2006). This explains how it is important that all the NATA sub-objectives are considered in reaching a view about VfM.
5. The VfM assessment is based upon the concept of a benefit cost ratio (BCR) which looks at returns per unit of spending. However, the VfM assessment is broader than the BCR metric discussed in Chapter 4 as it includes all impacts rather than just those that can be monetised.
6. The VfM of a proposal is only one factor in decision making. A number of respondents to the consultation recognised that the decision over funding or approval was often complex. There are wider factors outside the NATA appraisal that also need to be considered including (but not exclusively limited to): affordability; deliverability; equality and distributional issues; and, public acceptability.
7. The VfM process builds upon the information available in the NATA assessment to help prioritise between schemes. It has three overarching aims:
  - To provide clear and consistent advice to decision makers.
  - To ensure best use of the Department's available funds.
  - To aid scheme promoter's understanding of the likelihood of a scheme being taken forwards on VfM grounds.
8. A NATA assessment of a scheme contains a substantial volume of information, some qualitative, some quantitative but not valued, and some monetised. Combining all this information to reach a conclusion about the overall value of a project can be difficult. One concern raised by respondents was how to weight monetised impacts relative to non-monetised. There is a very real risk that decision makers could be overwhelmed and place too much weight on some familiar types of impact or potentially ignore some impacts all together.
9. The VfM process aims to address this. It pulls together all the information in the NATA assessment to provide decision makers with a view of the quality of a scheme. This quality is ultimately reflected in the VfM category which the scheme is judged to fall in.
10. The process is key to helping the Department prioritise between schemes when making funding choices. All other things being equal, schemes offering higher VfM are more likely to be prioritised. This is consistent with the published Value for Money Guidance Note which explained that the Department would expect to fund very few schemes that did not offer good returns.

## Steps in the Value for Money Process

11. The starting point for any VfM assessment is the Appraisal Summary Table (AST), which includes information on all of the NATA sub-objectives. The AST gives a fair and unbiased overall description of a scheme without giving prominence to any one of the many sub-objectives over another. However, it is only a summary and to fully understand the potential impacts of a scheme, we could need to look at the detailed supporting documentation behind the AST.

### Step 1: The NATA Benefit Cost Ratio

12. The NATA BCR (explained in detail in the previous chapter) allows us to combine all the impacts that can be monetised into a single metric. This important first step allows us to understand the value of a scheme by considering the monetised benefits per unit of spending.
13. The impacts we include in the NATA BCR can be seen in Table 5.1 below. We can confidently use the monetary value associated with these impacts because of the depth of evidence available:
  - the analytical techniques used are well understood and have matured through use over a number of years; and
  - the approach can be generalised across a range of interventions allowing the use of standardised methods (for example one tonne of carbon has the same impact on global warming wherever it is emitted).

**Table 5.1. Levels of evidence available for transport impacts**

| Impacts included in value for money assessment |                          |                                |                        |
|--|--------------------------|--------------------------------|------------------------|
| Qualitative/quantitative assessment            |                          | Monetised values<br>(NATA BCR) |                        |
| Areas for development                          | Some valuation evidence  |                                |                        |
| Townscape                                      | Wider economic benefits* | Risk of death or injury        | Time savings           |
| Water environment                              | Landscape                | Noise                          | Operating costs        |
| Accessibility                                  | Reliability              | Carbon                         | Private sector impacts |
| Social inclusion                               | Air quality              | Physical fitness               | Cost to the Exchequer  |
| Integration                                    | Journey ambience         |                                |                        |
| Biodiversity                                   | Regeneration             |                                |                        |
| Heritage                                       |                          |                                |                        |

\*Reliability and wider economic benefits are monetised in some appraisals.

14. Table 5.1 shows that less than half of the impacts we consider are included in the NATA BCR in a standard appraisal. Though in terms of the overall case for a proposal, these particular impacts may well provide a full enough picture, there is a risk that any assessment we make on the NATA BCR alone would be incomplete.

## Step 2: The Adjusted Benefit Cost Ratio

15. The next step in the VfM process is to reach a view about an “Adjusted BCR”. This step attempts to make the best use of all available evidence to help decision makers understand how non-monetised impacts can be compared with the BCR to reach an overall judgement.
16. This step in the assessment focuses on the impacts listed in the middle column of Table 5.1: for impacts where there is some valuation evidence available. These impacts are not monetised and included in the NATA BCR because the evidence is not as developed as for the monetised impacts.
17. Assessing the value for these impacts is more difficult:
- The evidence base for these particular impacts is developing and there could be a lack of consensus about the correct approach to monetisation or, indeed, if it is possible.
  - A number of the impacts are localised and so even if reliable evidence exists for the value of the impact in one location it does not necessarily hold elsewhere (e.g. the impacts of changes in air quality depend upon the existing air quality in that specific location).
18. Using information in the AST (and supporting appraisal documentation) and any evidence available we try to understand the magnitude of these impacts in comparison to the BCR. This involves trying to place an approximate value on the impacts, where we can.

### **Box 5.2. Considering the impacts on Landscape**

Landscape is one of the impacts where the Department tries to estimate the magnitude of the value that should be placed on any changes.

The NATA framework considers the impacts on the landscape through the environmental capital approach. This approach follows the principle that the overall assessment should be made based on the most adverse assessment ensuring negative impacts are not diluted unless there is a genuine compensatory effect. This NATA approach uses a seven point scale.

The Value for Money assessment adopts a more quantitative approach to allow us to understand the magnitude of the impact in monetary terms. The technique involves assessing the area of land that is judged to be affected within the 'footprint' of the planned scheme and using values per hectare. This includes the area surrounding the scheme as well as the land actually used for construction.

The landscape values currently applied to make monetary estimates in the VfM process are those recommended by the Department for Communities and Local Government (CLG, 2007). The values come from a literature review commissioned by the Office of the Deputy Prime Minister (now DCLG) which consolidated and considered evidence from 47 relevant studies mainly from the UK but also from the US, Europe and Australia. This literature review derived values for a hectare of different types of land. The evidence provided by this study is not considered as robust as the values we place on time-savings or changes in the risk of an accident. However, the evidence is sufficient to provide a magnitude estimate of the landscape costs.

This assessment of landscape inevitably involves some degree of judgement both in terms of the footprint of a scheme and the land type which is impacted upon. The monetary value judged to reflect the landscape impact should be consistent with the qualitative NATA assessment and any deviation from this can help to highlight any issues with the monetary estimate. In order to help ensure consistency of treatment between schemes it is also important to look at previous landscape assessments and compare the monetary estimates.

19. It is not always possible or appropriate to place even approximate values on the impacts. There may be some scheme specific reasons, for example location, that make the application of the existing evidence inappropriate. The local circumstances may differ so substantially from the basis for the monetary estimates that they cannot reasonably be applied.
20. The use of this evidence is important to help ensure decision makers can get some contextual feel for the scale of an impact. This will help to ensure

all impacts are considered and that impacts that are monetised do not receive higher emphasis; using some evidence is better than not using any.

21. When it has been possible to place monetary values on some impacts not normally monetised in NATA it is possible to calculate an adjusted BCR. This is the NATA BCR plus any other impacts that have been monetised and is only presented as a guide to decision makers. This adjusted BCR is less robust than a NATA BCR due to the different evidence used in its estimation, but it does allow a provisional view of the VfM offered by a scheme.

### Step 3: Final VfM Categorisation

22. Even when we have looked at the evidence available to produce an adjusted BCR, there are a number of impacts we have not yet considered. In order to make a final assessment of which VfM category a scheme should be placed in, we need to think about how these impacts could influence the Adjusted BCR.
23. The lack of evidence about the potential monetary values of these remaining impacts makes this the most difficult part of the VfM assessment. There may be a number of reasons why evidence is limited:
  - Quantification of the impacts may be difficult. It could be inherently difficult to quantify some aspects (for example biodiversity) or that estimating impacts accurately could only be done at disproportionate cost.
  - When quantifying impacts placing a value on them can be difficult due to the uniqueness of certain impacts. For example, the impact on a historic monument may have no parallels in past evidence.
24. This part of the assessment requires drawing together the remaining qualitative impacts and then adopting a 'backward induction' approach. This is a process of understanding how sensitive the VfM assessment would be to different magnitudes of negative or positive impacts and then considering whether the remaining impacts are sufficient to alter our provisional VfM assessment.
25. This approach can be most easily be used when considering the remaining sub-objectives on an impact by impact basis.



### **Box 5.3. Considering the impacts on Heritage**

Heritage is one area where there is only limited evidence available on the potential values for any impact. This means that heritage is included in the VfM assessment using a ‘backward induction’ approach.

Consider a hypothetical scheme which has a negative impact on heritage, for example by bringing a road closer to a heritage site. We would need to understand the likelihood that this impact was sufficient to change our provisional assessment. We have already calculated the adjusted BCR and from this we can establish that to change the assessment of the VfM category would require these disbenefits to be valued in excess of £500 million.

The impacts at the heritage site could include increased noise and degradation of local air quality and landscape. We should recognise that these impacts at a heritage site may be valued more highly than elsewhere but need to ensure that we do not double count impacts that are scored elsewhere. The assessment of the heritage impact should reflect only the additional disbenefits which occur.

We could consider the total value of these impacts from the whole scheme to help us understand the heritage impact. For example the total disbenefits of noise; air quality and landscape impacts might be valued in the region of £50 million. We could then consider whether the additional disbenefits associated with the impact on the heritage site are likely to exceed £500 million – ten times this total.

Given the magnitude required to change our provisional VfM assessment we could decide that the evidence available suggests that the heritage impact is unlikely to be valued in excess of £500 million. Therefore, in this case we would not adjust our provisional assessment.

There are occasions where the evidence does support changing our provisional view as well as occasions where it is not possible to reach a robust conclusion. If this is the case the difficulty of reaching a definitive assessment is clearly explained to the decision maker.

26. Understanding the magnitude of the remaining impacts can be more difficult when we try to consider their cumulative impacts. We might reasonably reach the conclusion that a ‘slight beneficial’ assessment of one impact broadly offsets a ‘slight adverse’ assessment elsewhere. This is because we would expect the magnitude of the impacts to be broadly similar.
27. When there are a number of ‘slight’ beneficial or ‘slight’ adverse assessments it can be difficult to understand whether when added together these should alter our provisional assessment. Ultimately, this is a matter of judgement about how many impacts move the VfM assessment up or down and how sensitive the assessment is. Referring to previous assessments helps to ensure consistency in this judgement.

28. It is difficult to compare a 'slight' assessment with a 'moderate' or even 'large' NATA assessment across different impacts. In examples of schemes where there is a variety of assessments, it is necessary to focus our attention on the largest impacts first. These impacts are the most likely to influence our assessment of VfM and may be sufficient to cause us to alter our provisional view in isolation.
29. When we understand the sensitivity of the assessment we can make a judgement about whether the remaining impacts could be sufficient to alter our indicative view. This allows us to reach a final judgement about the VfM of a scheme and therefore the VfM category that a scheme falls in.

#### **Step 4: Presentation of the Value for Money Assessment**

30. The real power of the VfM assessment is in how the information used to make an assessment is presented to senior officials and Ministers. In presenting our assessment it is just as important to explain how the view has been reached as well as the final assessment.
31. This information is presented to senior officials and Ministers as a 'Value for Money Statement'. This VfM statement will normally include:
  - the NATA BCR;
  - the Adjusted BCR;
  - a description of other non-monetised impacts;
  - any key sensitivities of the assessment; and
  - the final VfM categorisation
32. In addition to the VfM statement, submissions requesting a decision to proceed with a scheme should include the Appraisal Summary Table. This means that the VfM statement can help draw decision makers' attention to any significant impacts and refer them to the more detailed assessment in the AST.
33. The VfM statement clearly explains how the final categorisation has been reached and any values that have implicitly been assumed. Ministers may choose to place different weights on the impacts to those used to make the VfM assessment.

## **Value for Money and Statutory Processes**

34. Transport planning has always had to tackle the challenge of weighing up monetised and non-monetised benefits. There are a number of statutory processes that ensure that all impacts, particularly those that cannot easily be monetised, are taken into account.

35. The role of VfM is not to double guess these statutory requirements. For example, evidence about local impacts can be reviewed through a Public Inquiry, and this offers an opportunity to provide detailed expert advice on a particular proposal. This evidence is then conveyed to decision makers through the Inspector's report.
36. The conclusions reached in a Public Inquiry can help inform any VfM assessment by giving insight into local circumstances. Statutory bodies also have a role in helping to assess the impacts, e.g. on scheduled monuments. In return VfM can help promoters understand where additional spending on mitigation measures could be justified to minimise negative impacts.

## Changing the Value for Money Categories

37. The Department currently has four Value for Money categories. Each spending proposal is assessed as offering one of these four different categories based upon the ratio of all the benefits to all the costs. These existing categories are:
  - 'Poor' value for money if a scheme's VfM BCR is less than 1.
  - 'Low' value for money if a scheme's VfM BCR is between 1 and 1.5.
  - 'Medium' value for money if a scheme's VfM BCR is between 1.5 and 2.
  - 'High' value for money if a scheme's VfM BCR is greater than 2.
38. The Department has been reviewing how its spending is split across these different categories as part of its work for Public Service Agreement (PSA) 5 (HMT, 2007b). One of the indicators (Indicator 4) for success in this PSA is the proportion of spending in each category.
39. This work has shown that about 95 per cent of spending approved in the Spending Review 2004 period was classed as offering 'High' VfM. This reflects the excellent returns that spending on transport can offer, as well as the success of the VfM process in helping to ensure poor options are weeded out early in the development process.
40. There are a number of reasons why we would consider making changes to the current VfM categories:
  - The high proportion of schemes currently assessed as 'High' VfM makes it difficult to differentiate within this category. This means that schemes being approved, although 'High' VfM, could be progressed at the cost of schemes offering even higher returns.
  - Changes to the VfM categories could encourage scheme promoters to further improve the value for money of their schemes. Current guidance highlights that schemes offering higher VfM are more likely to progress

stating that the Department should fund ‘most, if not all, high VfM schemes’ (DfT, 2006). We should encourage promoters to achieve the best VfM and not just ‘High’ VfM.

41. We propose to introduce a new VfM category, ‘Very High’, for schemes that have a VfM BCR greater than four. All other categories will remain unchanged:
  - ‘Poor’ value for money if a scheme’s VfM BCR is less than 1.
  - ‘Low’ value for money if a scheme’s VfM BCR is between 1 and 1.5.
  - ‘Medium’ value for money if a scheme’s VfM BCR is between 1.5 and 2.
  - ‘High’ value for money if a scheme’s VfM BCR is between 2 and 4.
  - ‘Very High’ value for money if a scheme’s VfM BCR is greater than 4.
42. We have decided to introduce a new category as a simple and straightforward way of improving differentiation between schemes. The new category also gives promoters with schemes offering very good returns the opportunity to stand out; in line with existing guidance we would expect schemes offering ‘Very High’ VfM to have a higher likelihood of being funded than ‘High’ VfM schemes.
43. This new category will be introduced for schemes offering returns in excess of four times their costs. This reflects splitting ‘High’ VfM schemes approved in SR04 broadly equally between the new ‘Very High’ and ‘High’ categories. It also provides a stretching target for promoters to strive for this very high level of returns.
44. The introduction of the new category will also make more explicit our assessment of non-monetised impacts. Schemes will now have an even higher threshold to achieve to reach the top VfM category. This means that some schemes will now be explicitly assessed as ‘High’ rather than ‘Very High’ reflecting the negative impacts on benefits from non-monetised impacts.
45. We have decided to leave the definitions of existing categories as they currently exist. This has a number of advantages particularly in ensuring consistency for schemes currently in the approvals process. It also ensures that the assessment recognises the good returns offered by investment in transport infrastructure.
46. The direct implications of this change will be limited with some schemes previously assessed as ‘High’ VfM now being assessed as ‘Very High’. However, there may be some wider implications for the assessment of a scheme’s VfM due to the change in BCR metric and the decision not to adjust existing VfM category boundaries.

47. The implications of the change in the BCR metric and how this might impact on a scheme's BCR and ultimately the VfM assessment are discussed in Chapter 4. However, we should note that the intrinsic value of a scheme is not changed by any change in assessment; it is the basis of assessment that has changed slightly.
48. This change in VfM categories will come into effect from April 2009 as part of the Department's internal processes; there will be no additional burden on scheme promoters associated with the change.

## Future Developments for the Value for Money Process

49. The Value for Money process is subject to continuous improvement. We will continue to look for new evidence about the value of the impacts of transport from research in both transport and wider sectors.
50. There will be particular focus on understanding those impacts where very little evidence currently exists and deepening our knowledge of impacts where there is some evidence. This is consistent with the aim of the VfM process to make best use of all available evidence to support decision making in the Department.
51. For specific schemes, we will consider the role for external peer review to challenge the judgements made in the VfM assessment. This would be an exceptional measure to reinforce the internal scrutiny mechanisms used by the Department. It also allows us to call upon a wide range of specialists with expertise in certain areas of impacts to ensure latest evidence was being used and applied appropriately.
52. In the slightly longer term the VfM process will need to evolve to provide support to the Delivering a Sustainable Transport System (DaSTS) process. This will involve tackling assessment in a slightly different way looking at transport strategies and packages of measures. This will require VfM to focus more on helping decision makers understand which schemes offer better Value for Money rather than whether an individual scheme offers VfM or not.
53. The treatment of uncertainty is one area where we will need to consider developing the VfM process to ensure it continues to influence decisions. The current process is good at understanding the uncertainty around the cost estimates (through Quantified Risk Assessment and Optimism Bias) and benefit projections (through sensitivity testing).
54. In order to help prioritisation we need to understand how risk and uncertainty differs or is correlated across the different packages. We will also need to develop our understanding about wider uncertainties (e.g. policy uncertainty and climate change). This will help us understand the value of flexibility that some options can provide compared to others.

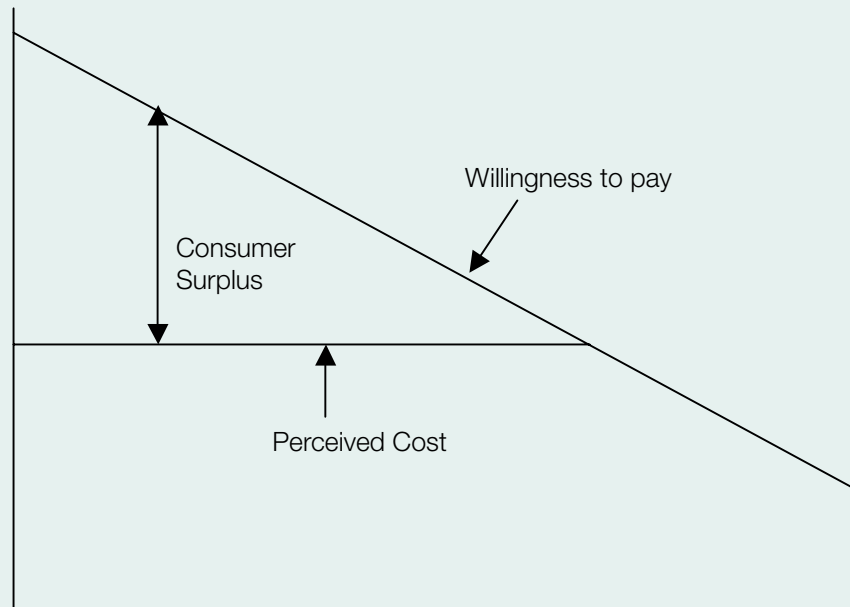
# Annex: The components of transport user benefit

1. The benefit of a trip to the traveller (or his employer) is his willingness to pay for it. Willingness to pay varies from person to person and reflects the individual's assessment of the benefit of a trip. All those travellers making a trip must have a willingness to pay that exceeds the cost of the trip as they perceive it. The amount by which a traveller's willingness to pay exceeds the perceived cost of the trip – his benefit net of the cost he incurs – is his consumer surplus.
2. Appraisal makes considerable use of these economic principles and this annex explores the technical aspects relevant to chapters 3 and 4. In the box, we describe why willingness to pay provides equivalent results to other valuation approaches. We envisage a new supplementary table to be developed over the coming months, to present the appraisal results in a more intuitive manner and this is described below.

## Consumer surplus

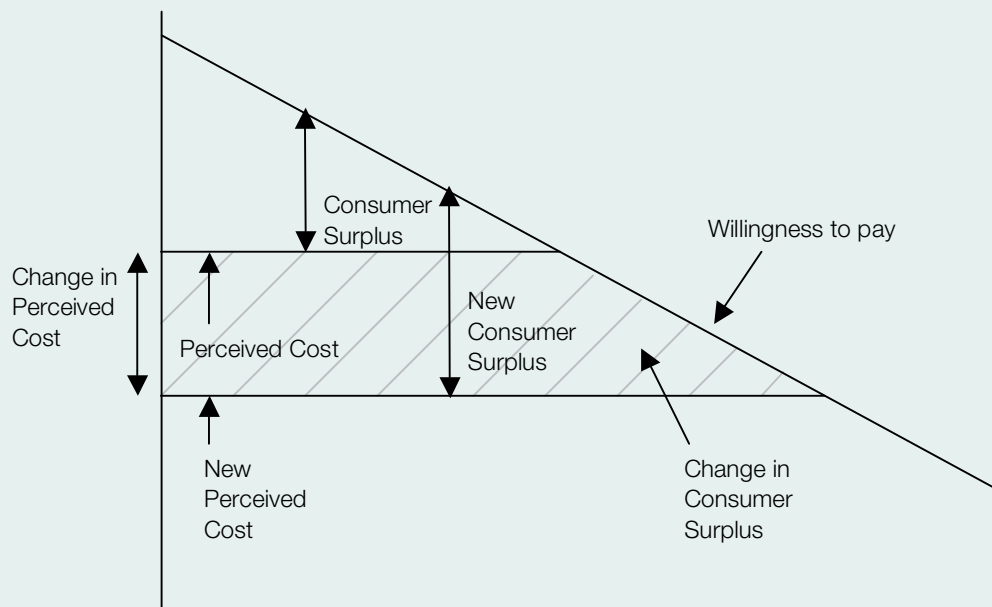
3. Figure A1 illustrates the relationship between willingness to pay, perceived cost and consumer surplus. As Figure A1 shows, consumer surplus varies from person to person and reflects the individual's willingness to pay for a journey. With one exception, there is no relationship between the consumer surplus of those making a journey and the perceived cost of that journey. The exception is the marginal traveller, whose willingness to pay is equal to the perceived cost of the journey.

Figure A1.



- Most transport interventions reduce the perceived cost of travel. Assuming that willingness to pay does not change (a reasonable assumption, since it is a characteristic of the traveller, rather than of the transport system), a reduction in the perceived cost of travel will result in an increase in consumer surplus – see Figure A2. The increase in consumer surplus is a key element of the benefit to transport users of the transport intervention.

Figure A2.



5. The size of the change in consumer surplus is dictated by the size of the change in perceived costs. It is standard practice to split the change in consumer surplus to reflect the contribution to the change in perceived costs of its components – changes in journey times, vehicle operating costs and user charges.
6. However, it is important to recognise that the change in consumer surplus is not the same as the change in perceived costs. This is especially important when change in consumer surplus is attributed to the components of the change in perceived cost. For example, that part of the consumer surplus attributed to user charges is *not* a measure of the change in expenditure on user charges.
7. This can be illustrated by the following example. Consider an intervention that does not affect public transport fares but does lead to increased public transport usage. That part of the consumer surplus attributed to user charges will be zero, but the expenditure on user charges will increase in line with usage.

### **Perceived Costs**

8. Perceived costs can be broken down into three components: resource costs; transfer payments to service providers; and indirect taxes. A transport intervention that results in a change in perceived costs will potentially result in a change in each of these components.
9. For journeys involving the direct consumption of resources, the cost of those resources is incurred by the traveller. However, the net benefit of a trip to society is the benefit of the trip to the traveller (his willingness to pay), less the cost of the resources consumed. Thus, the resource cost element within perceived costs is usually cancelled out. In particular, it does not appear in the two present NATA supplementary tables that present transport user impacts: the Transport Economic Efficiency (TEE) and Public Accounts (PA) tables.
10. Transfer payments and indirect tax are also costs incurred by transport users. They accrue to service providers (transfers) and to government (indirect tax). Thus, any changes in these elements of perceived costs represent benefits to service providers (revenue) and to government (indirect tax revenue). This is the way they are presented in NATA's TEE/PA tables.



### **BOX A1. The equivalence of willingness to pay and other valuation approaches**

This box explains why the Department's current Willingness to Pay (WTP) approach to Cost-Benefit Analysis (CBA), which includes indirect tax, results in the same answer as a Social (or Resource) cost approach which excludes indirect tax. In particular, this section explains why changes in indirect tax represent changes in economic welfare. These changes are in producer welfare and/or consumer surplus. The crucial issue is the proper application of CBA to get to the net resource social welfare change with the advantage of the WTP inclusive of indirect tax being its ability to identify winners and losers.

A concern in the NATA consultation was the apparent inclusion of indirect tax in the appraisal process. In particular, there was a belief that if indirect tax is a transfer between users and the Government, whereby the cost to the payer (the road user) is offset by the benefit to the recipient (the Government), then there was not any need to appraise it at all. This section addresses this issue using a simple example and analyses the potential impacts of a scheme using two different approaches to cost-benefit analysis (CBA).

The first approach analyses social costs and benefits (SCB). This approach seeks to measure only the 'real resource' (or 'social') costs and benefits of a transport scheme. We can define the 'social' cost of production as the marginal cost of the resources used to produce a particular good, while we can define the social benefit of consumption as the marginal valuation by the final consumers of this particular good.

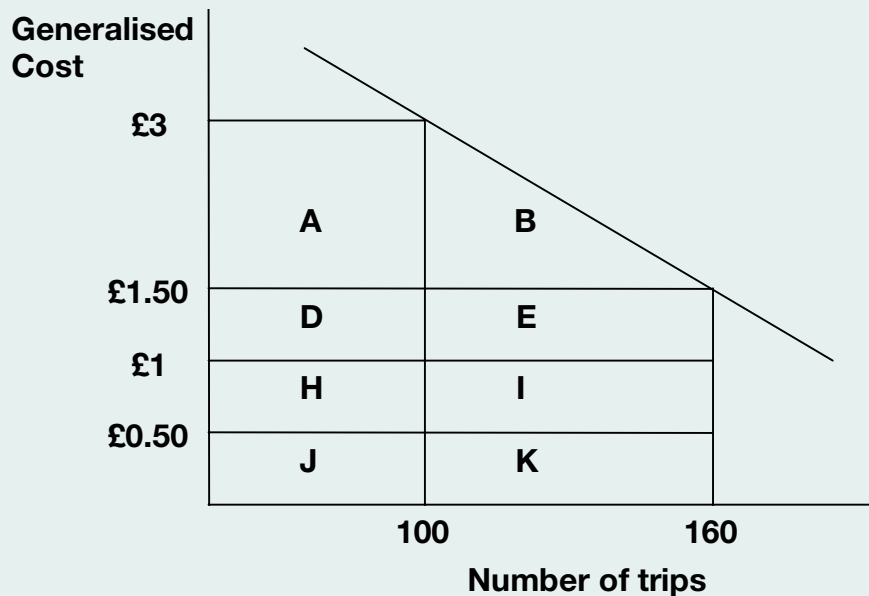
The second approach is 'willingness to pay' (WTP) and this is the approach which the NATA appraisal process is based on. WTP attempts to measure all the gains and losses for each economic interest group separately and then sums these. The WTP therefore allows a better disaggregation of the impacts.

The first point to note about indirect tax is that indirect taxes only have a significant impact on CBA when different goods are taxed at different rates. If all goods were taxed at the same rate (all else being equal), then there would be no change in indirect tax from people shifting from one mode to another.

To illustrate why it is important to include indirect tax in the current approach consider the following example. Assume the generalised cost of travelling by car on a particular road is £3 and 30% of this is made-up of indirect tax which is equal to £1. At this price, assume 100 trips are made.

Now suppose a road improvement scheme reduces the generalised cost of the same trip to £1.50, meaning there is a reduction in indirect tax to £0.50 per trip. The reduction in generalised cost increases the demand for car travel on this road thus increasing the number of trips to 160. We can illustrate this scenario in the diagram below. For simplicity, it is assumed that the only indirect tax in the economy is on car travel and there are no externalities.

**Figure A3.**



The diagram is a simple demand curve showing the number of trips on this particular road at different generalised cost levels. It is downward sloping because it is assumed as the cost of travelling on this road falls, the demand for travel on this road increases. So at a generalised cost of £3, there are 100 trips while at a generalised cost of £1.50, there are 160 trips. Part of the generalised cost is made-up of indirect tax (£1 in the “do minimum” and £0.50 in the “do something”).

In the WTP approach, the reduction in generalised cost means existing road users gain by area A. This is equal to £150 (the £1.50 reduction in cost for each of the 100 trips). There is also an increase in consumer surplus for new travellers who switch to using this road following the reduction in generalised cost. This is equal to area B, which is equal to £45. We assume the ‘rule of a half’ applies e.g. a linear demand curve. This attributes half of the change in costs to the gained trips.

As stated above, the reduction in generalised cost from £3 to £1.50 includes indirect tax. However, the indirect tax levied on the trip does not reflect the consumption of resources. It is simply additional surplus transferred to the community (or Government) as a whole. With the WTP approach, all gains and losses to each group must be summed and therefore changes in indirect taxation need to be accounted for.

For the 100 original trips, there is a reduction in indirect tax equal to area H. This is equal to £50 (the £0.50 reduction in the tax per trip for the 100 trips). However, there is also an increase in indirect tax for the new travellers equal to area K. These travellers were not previously paying any indirect tax (in this example) but are now paying indirect tax on their trip. This is equal to £30 (the £0.50 tax rate for the 60 additional trips).

In summary, there is a £195 increase in consumer surplus (£150 for existing trips and £45 for new trips) and a £20 reduction in indirect tax (a £50 reduction from existing trips and a £30 increase from new trips). This means the NPV of this particular scheme is £175, under a WTP approach.

In the social CBA approach, the 'real resource' cost of using the road in the 'do nothing' is £2 (£3 less the £1 of indirect tax). In the 'do something', the 'real resource' cost falls to £1 (£1.50 less the £0.5 in indirect tax). There is therefore a reduction in the 'real resource' cost of £1 for the 100 original trips which is equal to £100. This is equal to area A (£150) less area H (£50).

For new trips, there is a gross benefit to consumers from the reduction in generalised cost equal to areas B + E + I + K. This is equal to £135 (£45 + £30 + £30 + £30). However, there is also a resource cost for these additional trips equal to areas E + I which is equal to £60 (the £1.50 generalised cost less the £0.5 in indirect tax for the 60 trips). With this approach, the net social benefit (or NPV) is equal to the reduction in real resource costs for existing travellers (£100) plus the reduction in real resource costs for new travellers (£75). The latter being the difference between the gross benefit to the 60 additional trips (£135) and the real resource cost (£60) of making these additional trips. This means the NPV of this scheme under a SCB is equal to £175 (£100 for existing travellers and £75 for new travellers). This is the same result as the WTP approach and therefore demonstrates that the two approaches yield the same NPVs for identical schemes.

The crux of the issue is that in the WTP approach, the area H is considered a loss because there is no offsetting gain to anyone else and area K is considered a social benefit because it has no offsetting gain. In the SCB analysis, area H is a social cost because it enters the CBA as part of a reduction in resource costs while area K is a social benefit because it enters the CBA as part of the valuation of final consumption.

## An alternative style of presentation

11. An alternative style of presentation would be to explicitly show the changes in resource costs, transfer payments and indirect taxes as costs to users and as benefits to service providers and government as appropriate. The following table illustrates how this alternative form of presentation might look:

| <b>Users:</b> | <b>Willingness to pay</b> | <b>- Resources</b> | <b>-Transfers</b> | <b>-Indirect tax</b> | <b>=Consumer surplus</b> |
|---------------|---------------------------|--------------------|-------------------|----------------------|--------------------------|
| Providers:    |                           |                    | +Transfers        |                      | +Transfers               |
| Government:   |                           |                    |                   | +Indirect tax        | +Indirect tax            |
| Society       | Willingness to pay        | -Resources         |                   |                      | =Net benefit             |

12. The first three rows show the impact on one of three economic actors – transport users, service providers and government. The fourth row shows the impact on society, defined as all three economic actors combined. The entries in the fourth row are the sum of the entries for the other three rows.
13. The second column shows the impact on user benefit, while the third, fourth and fifth columns show the components of perceived cost. The final column is the sum of columns two to five. It is readily apparent that the entries in the final column are those that appear in the NATA TEE and PA tables.
14. Empty cells indicate that there is no (net) impact. Thus, as required, transfers and indirect tax have no net impact on the ‘society’ row.

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## Useful links:

### **Department for Transport**

Transport Analysis Guidance:  
<http://www.dft.org.uk/webtag/>

Trip End Modelling Program:  
<http://www.tempro.org.uk>

### **Highways Agency**

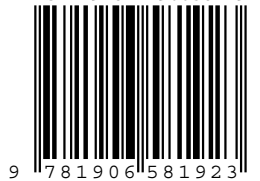
Design Manual for Road and Bridges:  
<http://www.standardsforhighways.co.uk/dmrb/index.htm>

## Other links

Better Regulation Executive Impact Assessment guidance:  
<http://www.cabinetoffice.gov.uk/regulation/ria>

Office for Government Commerce Gateway Process:  
[http://www.ogc.gov.uk/what\\_is\\_ogc\\_gateway\\_review.asp](http://www.ogc.gov.uk/what_is_ogc_gateway_review.asp)

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