



Department
for Transport

Appraisal and Modelling Strategy

TAG update report

May 2021

Department for Transport
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Foreword

In response to a number of significant developments, last year we published a route map for updating our Transport Analysis Guidance (TAG) in uncertain times. This set out a programme of work to gain a better understanding of the issues and manage their combined implications for appraisal. Our aim was to provide a single co-ordinated update to the guidance, to minimise volatility in appraisal results.

This work has considered the challenges and opportunities for our appraisal framework arising from a revised economic outlook, HMT's review of the Green Book, and heightened uncertainty as a result of the COVID-19 pandemic. We have worked closely with our stakeholders to address these. We have also reviewed our approach to capturing long-term impacts of transport investment, consulting on the recommended appraisal period and organising two workshops to gather views.

This report proposes detailed changes to our appraisal guidance. It also welcomes the findings of the Green Book Review and sets out the work we are doing to ensure our appraisal framework supports the delivery of the Government's strategic priorities, notably to grow and level up the economy and to reach net zero emissions by 2050. We look forward to continuing to work with you to ensure that decisions are based on a robust, coherent and informative evidence base.

Amanda Rowlatt, Chief Analyst

A handwritten signature in black ink that reads "Amanda Rowlatt". The signature is written in a cursive, slightly slanted style.

Executive summary

Introduction

1. Over the past 12-18 months there have been a number of changes in the appraisal environment which present both opportunities and challenges for transport scheme appraisal. Considerable uncertainty remains over the future transport market. To address these issues in the round and promote stability in the appraisal framework, we published a route map for updating Transport Analysis Guidance (TAG) during uncertain times¹ last July.
2. The route map set out our plans to undertake a programme of work to gain a better understanding of the issues and manage their combined implications for appraisal. The main issues include:
 - A revised economic outlook with the Office for Budget Responsibility (OBR) forecasting significantly lower long-term growth in productivity and income.
 - Uncertainty around future travel behaviour and needs brought about by COVID-19 and other sources of deep uncertainty.
 - A review of HM Treasury's Green Book, on which DfT's Transport Analysis Guidance is based, to ensure it helps Government take informed decisions in support of levelling up.
 - In light of the UK's Net Zero target by 2050, the need to ensure that impacts on carbon are appropriately assessed and valued and presented with prominence to decision makers.
 - The appropriate timescale to assess the benefits of transport projects and whether the full extent of the value of investments is being captured appropriately.

¹ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/951075/tag-route-map-2020.pdf

3. Stakeholders, including the Joint Analysis Development Panel, have provided valuable input to the route map programme of work through meetings, workshops, a consultation on appraisal periods and two well attended digital engagement events. Our aim has been to implement a consolidated set of changes in a way which is proportionate and balances the risk of disruption to ongoing analytical work and appraisal with the need to have the best available evidence to support decision making.

Wider context

4. In November 2020, HM Treasury published the findings of and response to their review of the Green Book. The findings focus on the need to build stronger strategic cases and being clearer on what constitutes value for money, particularly in the context of transformational investments and ensuring sufficient recognition of place-based impacts. The Green Book Review reiterated that, whilst Benefit Cost Ratios (BCRs) are an important appraisal metric, they need to be considered alongside the wider Value for Money assessment and the other four dimensions of the business case, including the strategic case².
5. DfT welcomes the findings of the Review and its aims to enhance the strategic development and assessment of projects to provide greater clarity around how spending proposals will support the delivery of the Government's strategic priorities, including around carbon and levelling up. As part of our response to the recommendations in the review, we will focus on adapting and strengthening current guidance to clarify the role of the strategic case and its links to evidence in the economic case, setting clearer expectations of the role of place-based impacts and providing further guidance that supports promoters making the case for levelling up and transformational investments.
6. We will also promote the role of the overall value for money assessment and how it is used in decision making, in particular, through emphasising the role of indicative monetised or non-monetised impacts in developing that assessment and presenting alongside wider evidence which demonstrates how they fundamentally support the strategic case. This wider evidence is of significant importance in making a holistic case for investment, alongside the other four dimensions of the business case, supplementing more traditional first-order impacts such as transport user benefits.
7. The recommendations of the Green Book Review are also highly relevant to how we appraise, value and present carbon impacts to decision makers. DfT's Transport Decarbonisation Plan will set out the vital role transport will play in meeting the UK's net zero target. An immediate priority for us is to review and update our appraisal guidance in relation to carbon. This will include updating carbon values, reviewing guidance on estimating and reporting capital (embedded) carbon and considering how best to present carbon impacts to decision makers in the context of their strategic objectives.

² See HMT Business Case Guidance for programmes and projects:
<https://www.gov.uk/government/publications/the-green-book-appraisal-and-evaluation-in-central-government>

Main updates to the appraisal framework

8. The changes we are making to the appraisal framework are described in detail in Chapter 3. Adopting the OBR's latest forecasts of economic growth into guidance will reduce forecasts of future travel demand which underpin appraisal. However, we anticipate that, in line with the Green Book Review, robust business cases will continue to be made for transport proposals which deliver against Government's strategic objectives and which can demonstrate a convincing rationale for intervention.
9. To support the analysis of uncertainty and its presentation to decision makers, we are publishing an Uncertainty Toolkit which provides practitioners with a set of tools and techniques for analysing uncertainty, including a set of scenarios which test the uncertainty around future travel demand and emissions. Recent events have demonstrated the value that the use of scenarios and wider uncertainty analysis can bring. It is too early for us to fully understand the impacts that COVID-19 may have on future travel demand and travel preferences but tools such as scenarios allow us to explore plausible futures and test how well schemes perform in different future states
10. We are also providing scope within TAG for promoters to look beyond 60 years to provide indicative analysis of potential impacts, for inclusion in business cases and value for money statements as sensitivity tests. This reflects the very long-term nature of some transport investments whilst acknowledging the increased uncertainty that comes with a longer time horizon.

Looking ahead

11. Our Appraisal and Modelling Strategy³, published in 2019, sets out a five-year strategy for developing our appraisal and modelling framework. The strategy aims to provide appraisal and modelling tools that are robust, flexible and easy to use, to provide decision makers with as full a view as possible of the impacts of transport investment. We believe the themes in the strategy, which focus on developing evidence to inform investment decisions to make transport better for the user, appraising transformational schemes, making TAG more accessible, developing useful modelling and appraisal tools and reflecting uncertainty over the future of travel are still as relevant as they were two years ago. We will, however, review the priorities in the strategy in light of the Green Book Review, forthcoming Transport Decarbonisation Plan and will hold a stakeholder event in the summer to gather views.

3

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/795924/appraisal-and-modelling-strategy.pdf

1. Progressing the route map

The route map in context

- 1.1 Last year saw some significant national and global events that prompted us to reflect on how transport appraisal may need to adapt in the light of significant change and uncertainty. The publication of the Transport Analysis Guidance (TAG) route map in July 2020 described how we aimed to respond to the challenges and committed to drawing these issues into a programme of work designed to address these changes in a holistic way, providing stability in the appraisal framework during this time.
- 1.2 The route map has allowed us to take stock of the challenges and opportunities arising out of times of change. This report summarises the work we have done to consider the issues and sets out the changes to TAG which we are making (published as forthcoming changes alongside this report). It also provides further context around the changes we are making now and sets out how TAG will evolve over the remaining period of the Appraisal and Modelling Strategy.
- 1.3 During this time, we have held several engagement events to keep stakeholders informed of the progress we have made and to promote a dialogue between the Department and the wider appraisal and modelling industry. We are keen to continue this transparency and engagement concerning the direction of appraisal and modelling development as a major part of our Appraisal and Modelling Strategy. This will be especially important as we collectively aim to provide the best appraisal and advice to decision-makers during continued times of uncertainty.
- 1.4 This report draws together and describes how we have completed our commitments in the July 2020 TAG route map. We have considered several interlinked appraisal issues and developed updates where necessary, releasing them as changes to TAG together. We describe our examination of the issues and provide clarity on the rationale for the updates we are making ahead of their definitive release.

Focus of the route map

- 1.5 Responding to the challenge we set out in the July 2020 route map, we are making several changes to TAG guidance and values to take into account the latest evidence for use in the economic case and value for money assessment of transport business cases.

- 1.6 These updates will provide a more stable basis on which to continue the development and enhancement of guidance in the near future, particularly in the areas we have identified around incorporating the Green Book Review recommendations and enhancing guidance on the assessment of environmental impacts.
- 1.7 This section reintroduces the issues identified in the July 2020 TAG route map. It provides the context and the areas of focus of our considerations for updating appraisal guidance and evidence now and in the future.

A revised long-term economic outlook

- 1.8 As part of the Spring Budget of 2020, the Office for Budget Responsibility (OBR) published a revised economic and fiscal outlook and associated forecasts of the UK economy. Subsequent official publications from the OBR, including the forecasts from the March 3rd 2021 Budget, confirm that the UK economy is predicted to be around 29% smaller in 2070 compared to pre-March 2020 forecasts. This comprises a 23% reduction in projected GDP per capita and an 8% fall in forecast population by 2070, compared to previous forecasts.
- 1.9 The corollary of these forecasts for appraisal is that estimated productivity and income growth is projected to be significantly lower than previously published. Growth and productivity in the future is an important factor in assessing the benefits of transport intervention, both in terms of serving the transport user and in terms of unlocking the economic potential of regions and providing the necessary housing to support future growth.
- 1.10 Our focus in the route map programme has been on investigating the issue chiefly from the viewpoint of appraisal accounting; that is, the way benefits and costs are updated over time in line with economic growth and discounted using the HMT social time preference (discount) rate. This is to ensure that the social welfare calculations in cost benefit analysis remain robust and make use of the most appropriate and up-to-date evidence for transport appraisals. We have examined the relevant issues pertaining to the appropriate use of evidence in updating appraisal values over time across all impacts considered in an appraisal, from values of time to social and environmental impacts such as health and air quality.
- 1.11 Critical to this issue is clarifying how the HMT Green Book guidance should be followed in terms of application of the discount rate. We have conducted a thorough investigation of this issue and collaborated closely with HMT, other government departments and arms-length bodies to provide assurance of a satisfactory resolution. We have also considered the appropriate use of evidence in transport behavioural modelling undertaken as part of most appraisals.
- 1.12 The OBR's revised long term economic outlook suggests there will be less emphasis in the future on investment being justified on the basis of high rates of economic growth. However, changes to the wider appraisal framework, including those set out in the 2020 Green Book, provide clear support for those bringing forward transport proposals which support delivery of Government's strategic objectives, using robust evidence and analysis to make a strong case for investment which considers all

relevant impacts of a scheme and its interactions with wider strategies and programmes.

The Green Book Review

- 1.13 HM Treasury launched the Green Book Review at Budget 2020 with the aim of ensuring that the appraisal framework supported delivery of the Government's levelling up agenda. In November 2020, HM Treasury published the findings and recommendations of the Green Book Review⁴ alongside an updated version of the Green Book – its guidance on appraisal and evaluation in central government.
- 1.14 Among other findings, the Review highlighted that, across government:
- Appraisers often failed to fully engage with the strategic context for spending proposals;
 - There is sometimes an undue focus on benefit-cost ratios (BCRs), in isolation from the strategic objectives of a proposal, with insufficient analysis aimed at illuminating the impacts of interest;
 - Silos across departments can hinder development of proposals in support of place-based strategies.
- 1.15 Changes to the Green Book in response to the Review include stronger guidance on establishing clear objectives for spending proposals from the start and clearer advice on what constitutes value for money, as well as new guidance on appraising transformational impacts and place-based analysis. A number of other steps were recommended alongside changes to the Green Book itself including more support for Green Book users and a new emphasis on the role of business case reviewers as critical gatekeepers.
- 1.16 The Department welcomes the findings of the review and supports its aims to enhance the strategic development and assessment of projects to provide greater clarity around how spending proposals will support the delivery of Government's strategic priorities, including around carbon and levelling up. We also welcome additional guidance in the Green Book on place-based analysis and how and when to perform analysis of transformational interventions. We believe we are well placed to respond to the Review and will build on existing good practice in transport appraisal and the commitments we have made in the Appraisal and Modelling Strategy in taking forward new work.
- 1.17 We describe in this report how we plan to respond to the recommendations of the review. Our proposed response goes beyond changes to TAG to ensure that the recommendations in the Review on strengthening the strategic assessment of projects, and issues around existing practice, incentives and capability are tackled throughout the business case development process. However, changes to guidance will be part of our response and will focus on adapting and strengthening current

⁴ Green Book Review 2020 – Findings and Recommendations:
<https://www.gov.uk/government/publications/final-report-of-the-2020-green-book-review>

guidance to clarify the role of the strategic case and its links to evidence in the economic case, setting clearer expectations on the analysis of place-based impacts and providing further guidance that supports promoters making the case for levelling-up and transformational investments.

- 1.18 We shall also take the opportunity to promote the role of the overall value for money assessment in our guidance and how it is used in decision-making. In particular, emphasising the role of indicative monetised or non-monetised impacts and wider evidence in demonstrating how a proposal meets its strategic objectives, and the importance of that wider evidence in making a holistic case for investment to supplement more traditional first-order impacts, such as transport user benefits.

Ensuring we are assessing the full potential of assets

- 1.19 The Oakervee Review of February 2020 provided several recommendations in considering the appraisal of HS2. In response, we have taken forward work as part of the route map programme to consider the potential for long-term benefits of investment to exist, how they may be measured, and the considerable challenges associated with doing so. This has included holding a formal consultation and two stakeholder workshops to discuss the issues arising.
- 1.20 We have also explored the implications for considering longer-term impacts of investment regarding its role in informing business case analysis, the value for money assessment and ultimately in supporting decision-making. We are providing scope within TAG for promoters to include benefits and costs beyond 60 years as an “indicative monetised” benefit where it is a material consideration, presented within a business case as a sensitivity test and used to inform the overall value for money assessment.

Net Zero and the Transport Decarbonisation Plan

- 1.21 The UK Government is committed to reducing greenhouse gas emissions in line with the 2016 Paris Agreement within the United Nations Framework Convention on Climate Change. In 2019, the UK passed laws to end its contribution to global warming by 2050. The target will require the UK to bring all greenhouse gas emissions to net zero by 2050, compared with the previous target of at least 80% reduction from 1990 levels. This will require additional action to reduce emissions across the whole economy, including transport.
- 1.22 The forthcoming Transport Decarbonisation Plan will set out the vital role transport will play in meeting the UK’s net zero target. We recognise that our appraisal framework plays an important role in ensuring decision makers are provided with robust analysis of the carbon impacts of spending proposals and presented with information which supports them in delivering against the Department’s strategic objective to decarbonise the transport system.
- 1.23 We set out in this report the work we plan to take forward to ensure that our appraisal framework supports the Government in meeting its legal decarbonisation targets. We will take forward our commitment in the Route Map to update the carbon values used

in appraisal once they are available as well as reviewing the guidance to scheme promoters on estimating and reporting capital (embedded) carbon and considering how best to present carbon impacts to decision makers in the context of their strategic objectives. The recommendations of the Green Book review will provide the background against which we will review how we appraise, value and present carbon impacts to decision makers.

The COVID-19 pandemic and wider uncertainty

- 1.24 The COVID-19 pandemic and the measures taken in response have brought about significant shifts in observed travel behaviour over the past year. It is not yet clear how individuals will respond once restrictions on travel and activities are fully lifted and whether the extent to which reductions in travel we have observed during the pandemic will persist in the medium to long-term. The Department continues to monitor trends in travel data and surveys which reflect individual attitudes towards transport and future travel needs, but the uncertainty around how current trends will play out remains significant.
- 1.25 This uncertainty, alongside other sources of deep uncertainty around the future of transport, provides a significant challenge to assessing which investment options may suit future needs and provide the best returns to society. There has been a clear demand from many stakeholders in recent months for advice on the treatment of uncertainty, and guidance around suitable sensitivity testing to account for the potential impact of the pandemic. This has cemented our view that robust analysis of uncertainty should be a vital part of any appraisal, and in particular that scenarios provide a valuable tool in presenting this analysis to decision makers.
- 1.26 Alongside this report we are publishing an Uncertainty Toolkit which provides practitioners with a set of tools and techniques for analysing uncertainty and presenting it to decision makers. This is published as supplementary guidance to TAG and will set out DfT views on a proportionate approach to uncertainty analysis, while emphasising its core role in transport appraisal and modelling.
- 1.27 The Toolkit will introduce a set of common analytical scenarios which reflect major national-level uncertainties impacting on travel demand or emissions. These are released for information at this stage and will be followed up by the release of datasets to support the implementation of the scenarios in models for scheme appraisal. The Toolkit provides guidance on when the Department will expect to see the scenarios used.

Additional considerations

- 1.28 In recent years, there has been a significant effort across government to strengthen the appraisal of environmental impacts by developing and embedding natural capital-based approaches into policy and decision making – underpinned by the rationale that, as summarised by the recently published Dasgupta Review of Biodiversity⁵, "our economies, livelihoods and well-being all depend on our most precious asset:

⁵ <https://www.gov.uk/government/publications/final-report-the-economics-of-biodiversity-the-dasgupta-review>

Nature." The relevant focus within this route map programme has been to build improved foundations in the appraisal framework for incorporating greater use of ecosystem services associated with landscape, whilst bringing the guidance on indicative landscape valuation more in-line with the latest available evidence.

- 1.29 The impact of increased homeworking on productivity is an exciting new area of research. The question coincides with whether transport schemes can be expected to induce productivity gains as large as before by increasing the effective density of cities when face-to-face interaction between workers is reduced due to homeworking. It is unlikely that productivity of workers will reduce per se, however, it is possible that agglomeration benefits from transport will no longer be as significant as before. This is a question that merits further consideration.

2. Supporting the delivery of government's strategic priorities: The Green Book Review

Introduction

2.1 As set out in the 2020 Green Book Review, we recognise the importance of ensuring appraisal practice does not obstruct the delivery of government's priorities. Alongside the detailed changes to our appraisal guidance, this report sets out the work we are doing to ensure our appraisal framework supports the delivery of government's strategic priorities, in particular the objectives to grow and level up the economy and to reach net zero emissions by 2050. This chapter sets out how we are responding to the updated Green Book and the findings and recommendations of the Green Book Review 2020, and planned work to ensure our appraisal guidance supports the government in meeting its legal obligation to meet the 2050 net zero target.

The Green Book Review

2.2 The Treasury announced a review of the Green Book at Budget in March 2020 in response to increasing concern that appraisal was standing in the way of government delivering its key objectives, particularly around levelling up. The Review's findings and recommendations were published in November 2020 alongside the updated Green Book.

2.3 While the Review did not find any evidence that appraisal methodologies were themselves distorting decisions, it recognised that the appraisal process "risks undermining the government's ambition to "level up" poorer regions and to achieve other strategic objectives"⁶.

2.4 In relation to the content of business cases, key findings of the Review were:

- Current appraisal practice does not engage sufficiently with the **strategic context** within which schemes are being developed. This can include

⁶ <https://www.gov.uk/government/publications/final-report-of-the-2020-green-book-review>

consideration of how the proposal contributes to the delivery of government's intended strategic goals such as levelling up or meeting the 2050 net zero target; the specific social and economic features of different places and how the intervention may affect them; or other strategies, programmes or policies which will interact with the intervention. The Review found that the strategic case for many proposals is weak.

- There is an **undue focus on the benefit-cost ratio (BCR)** and effort is put into boosting the BCR at the expense of other analysis which would illuminate the impacts of the scheme and particularly how it contributes to the delivery of its strategic objectives.
- There are particular problems with developing proposals to support a specific place (or places). In particular, it is often unclear when proposals may lead to **transformational change**.
- **Silos between central government departments** exist which act as barriers to generating truly place-based strategies.
- **Robust analysis of place-based impacts** is not carried out or considered in decision making.

2.5 The Review also found a number of issues with the appraisal and decision-making process across government, in particular:

- A lack of transparency around how decisions are taken, with external stakeholders unclear about how business cases are approved.
- A Spending Review process which has been challenged for encouraging an inappropriately heavy focus on the BCR. Stakeholders also identified this as an issue for bidding into departmental funding pots.
- A lack of capacity to engage with the full appraisal process especially the more technical aspects, in both local government and Whitehall.
- Under-investment in rigorous ex-post evaluation means a lack of good evidence on what works to support current policy and programme appraisals.
- Equalities impacts are only considered as an afterthought.

2.6 The recommendations of the Review are wide ranging and include:

- A stronger requirement to establish clear objectives from the outset.
- Stronger and clearer advice on what constitutes value for money.
- New guidance on the appraisal of transformational changes.
- Appropriate emphasis on the analysis of place-based impacts.

- Measures to improve analysis on differential impacts.
- An expert review into the application of the discount rate for environmental impacts.

2.7 The Department welcomes the findings and recommendations of the Green Book Review and has considered how best to respond. This section describes our plan to incorporating the findings into TAG, and how we aim to assist users in applying the Green Book principles in the context of transport appraisal.

Responding to the Review

2.8 We recognise the challenges that scheme promoters may have in developing business cases for schemes which are developed in support of wider government objectives, particularly those with a focus on levelling up left-behind places or decarbonising transport. We have developed a programme of work to support us in embedding the Review's recommendations in practice across the transport industry.

2.9 The recommendations require us to look beyond the detailed appraisal guidance in TAG. While we plan to review TAG to ensure that specific guidance is updated in line with the new Green Book, the change required to embed the recommendations extends to appraisal practice both inside and outside the DfT. We have engaged stakeholders informally during the initial phases of the work programme to begin to understand where obstacles may lie to implementing the recommendations.

2.10 Following this, we plan a programme of work to understand and address these practical issues, of which the first step will be to **commission research** which seeks to understand the extent to which the Review's findings are reflected in the approach to transport appraisal and business case development, and its associated processes. This will focus on interviews with and surveys of key individuals within organisations engaged with business case development to map out the detailed process by which a scheme moves from inception through the phases of business case development to final decision. It will aim to identify where established processes or the incentives faced by individuals in the process may lead to sub-optimal business cases being developed. This will provide an evidence base from which to generate more detailed proposals to address any barriers to change within DfT and across the wider industry.

2.11 A key finding of the Review was that there is insufficient engagement with the strategic context during appraisal. The revised Green Book sets out clear guidance that short-listed options undergoing detailed appraisal in the economic dimension of the business case should already have been assessed to meet strategic objectives. The Green Book mandates the use of the Options Framework Filter in selecting options and the process outlined in Chapter 4 and 5 of the Green Book for moving from longlist to shortlist must be followed⁷. The Review also highlighted the importance of developing a robust, evidence-based strategic case which sets out the

⁷ The Green Book

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/938046/The_Green_Book_2020.pdf

case for change associated with a proposal. We will be publishing an update to DfT's **transport business case guidance** in due course which will provide advice on developing both strategic and economic dimensions of the business case in line with the Green Book changes.

- 2.12 In particular, the revised guidance gives greater clarity on the requirement for the five dimensions of the business case (strategic, economic, management, commercial and financial) to be developed holistically, rather than in silos, and the importance of demonstrating how proposals contribute to wider strategic aims, whether at national, regional or local level. There is a particular emphasis on the requirement for coherence between the strategic and economic cases, with both cases required to draw on the same evidence base, and for claims made about strategic benefits of a proposal to be supported by analysis presented in the economic case.
- 2.13 The strategic dimension of the business case is likely to play a particularly important role where spending proposals are put forward in support of strategic priorities such as growing and levelling up the economy or decarbonisation. It can be harder to make a strong VfM case for schemes in left-behind areas with lower levels of background demand or where a desire to decarbonise local transport options leads to slowing down car travel or reallocating road space.
- 2.14 Where transport schemes have been identified as part of wider strategies to deliver Government's levelling up objectives, this will require promoters to set out a clear narrative about how transport, alongside other complementary interventions, will deliver benefits to local areas and the people who live and work there. Where there is reason to believe that the transport scheme will have impacts on the wider economy this should be supported by an economic narrative presented in the economic case. The theory of change set out in the economic narrative also provides valuable evidence in support of the arguments made in the strategic case. To further support promoters in making the case for schemes that have levelling up objectives, we will be publishing specific supplementary guidance on this objective. This will provide promoters with a framework with which to assess their scheme's impacts in the strategic dimension of the business case.
- 2.15 Decarbonisation is a clear strategic priority for the government and we believe that the Green Book changes will enable spending proposals which are focused on reducing carbon emissions to make a clearer case for investment based on both strategic and economic cases. We are planning to review guidance in TAG on the appraisal of greenhouse gas emissions following the publication of this report. This will focus both on the detailed appraisal methodologies and values as well as how the Green Book changes will support schemes with strategic objectives around decarbonisation.
- 2.16 TAG does not set out a prescribed approach to appraisal and existing guidance includes a number of flexibilities that are relevant in the context of the Green Book. In particular, TAG units on wider economic impacts and social and distributional impacts provide a good basis for promoters looking to consider the wider impacts of their proposals where it is proportionate to do and they are relevant.
- 2.17 A consistent message from our engagement on the Appraisal and Modelling Strategy and the Route Map is that practitioners would welcome more examples of how the

guidance could and should be applied in practice. Alongside this publication we are **publishing a set of case studies** which demonstrate how scheme promoters can use TAG to make the case for schemes where strategic objectives are focused on supporting local economies and addressing differential impacts. In particular, the case studies look at how existing TAG guidance on wider economic impacts (units A2) and social and distributional impacts (units A4) can be used in support of place-based analysis.

- 2.18 We will also **continue with planned work** set out in the Appraisal and Modelling Strategy to fill evidence gaps of particular relevance to delivering the levelling up agenda. We have recently commissioned a research project to develop a set of case studies aimed at understanding how past transport investments have delivered transformational change and the conditions which were in place for that change to materialise. In the longer term we will also take forward research to evaluate potential options for introducing distributional weights in transport appraisal.
- 2.19 As part of our planned programme of work, we will also **review the existing value for money framework** to ensure it provides clear guidance on the assessment and presentation of value for money in line with the updated Green Book and other changes set out in this update report, including to appraisal periods and the treatment of uncertainty in scheme appraisal. We will consider how best to draw out and present analysis relevant to the intended impacts of the scheme alongside the VfM assessment to support robust decision-making which delivers strategic objectives.
- 2.20 Following the publication of this update, we will turn our attention to a more detailed review of relevant TAG units in light of the new Green Book annexes on place-based analysis (Green Book A2) and appraising transformational impacts (Green Book A7)⁸. There is also a link to the work highlighted in the Appraisal and Modelling Strategy to make TAG more accessible and support the application of TAG in practice.

Tackling carbon impacts in appraisal

- 2.21 Decarbonisation is a clear strategic priority for the Government and as stated above we believe that the Green Book changes will enable spending proposals which are focused on reducing carbon emissions to make a clearer case for investment across both the strategic and economic dimensions of the business case.
- 2.22 Recognising the importance of ensuring that our appraisal framework supports the delivery of Government's legal obligations to meet net zero by 2050 and the impetus that will be provided by the publication of the Transport Decarbonisation Plan, we plan to review guidance in TAG on the appraisal of greenhouse gas emissions following the publication of this report.

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https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/938046/The_Green_Book_2020.pdf

2.23 As well as considering the implications of the Green Book Review for the assessment of carbon impacts across the business case, we will also consider the detailed appraisal methodologies and values, with the aim of ensuring that all carbon impacts of transport investment are robustly assessed and presented to decision makers. As set out in the next section of this report, we will incorporate updated carbon values in TAG through the Orderly Release Process (see Annex A) as soon as they become available, encouraging scheme promoters to incorporate these in analysis as soon as is feasible.

3. Developments in appraisal

Introduction

- 3.1 This section describes the changes we are introducing into TAG as part of the route map programme. We describe the rationale for change, the evidence used in drawing together new guidance and data, and a summary of the general expectations around how they should be used in transport appraisals. We also include further information on those areas which will continue to be developed after this publication.
- 3.2 As described in Annex A, the changes published as part of this route map update fall under the TAG Orderly Release Process. The status of these changes are as “forthcoming change notifications”, detailing the changes in guidance and data that will become part of official guidance at the subsequent defined release window. This provides a lead-in time for analysts to see the forthcoming changes and adequately prepare to utilise them at the earliest convenience in preparation for upcoming decision points in their projects and programmes.
- 3.3 We have set the point at which these changes will be formally embedded into TAG as July 2021, at which point it supersedes the guidance previously formalised in November 2019. We will make the necessary updates to each affected TAG Unit and the data book by the end of July and inform TAG users of the formal guidance change⁹. From this point, all transport appraisals should make use of the updated guidance and data. However, users may make use of any “forthcoming change” guidance or data in their business case development at their earliest convenience. This is set out in the TAG proportionate update process, also described in Annex A.

Summary of changes

- 3.4 Table 1 below provides a summary of the development activities completed as part of the TAG route map programme. The following parts of this section provide further detail on the rationale for any changes that we are introducing to TAG and any further development activities that may be necessary.

⁹ To register for notifications of TAG updates and associated stakeholder events, please contact TASM@dft.gov.uk

Issue	Impacts on	Actions
Long-term growth forecasts	Appraisal and modelling	TAG data book updated to March 2021 OBR long-term growth for use in appraisal and annual values for use in modelling.
Green Book Review	Appraisal, potentially modelling	Updates to Transport Business Case guidance to be published subsequent to this update; further review of TAG units planned.
Impacts on appraisal accounting	Appraisal	TAG Unit A1.1 to be updated alongside new OBR forecasts that fixes the growth rate used to uprate appraisal values linked to GDP to the OBR long-term rate.
Appraisal period	Appraisal	TAG Unit A1.1 updated to provide guidance on how analysts may look beyond 60 years to provide indicative analysis of potential impacts, for inclusion in business cases and value for money statements as sensitivity tests. Guidance is expanded to describe what uncertainties need to be taken into account.
Optimism bias	Appraisal	Updated TAG data book with new OB values for use in appraisal at different stages in scheme development. The data set is also expanded in terms of dimensions to allow a more thorough analysis of costs.
Agglomeration elasticities	Appraisal, potentially modelling (SEM) ¹⁰	Further research is mapped out on agglomeration, to be undertaken in 2021, leading to potential guidance changes thereafter.
Uncertainty Toolkit	Appraisal and modelling	Uncertainty toolkit published, allowing a more structured and thorough understanding of uncertainty presented in appraisal. This will continue to be developed through collaboration with stakeholders and TAG users.
Scenarios guidance	Modelling that informs appraisal	Common analytical scenarios as part of a major update to the National Trip End Model (NTEM) data set, and its presentation in TEMPRO, is programmed for Autumn 2021. This will come with updated guidance in TAG Unit M4 on how scenario analysis, particularly using the common analytical scenarios, should be used to support appraisal.
COVID-19 impacts	Modelling that informs appraisal	Common analytical scenarios account for uncertainties brought about by COVID-19. Ahead of publication, sensitivity testing and explicit consideration of the impact of COVID-19 should continue to be reflected in appraisal.
Carbon values	Appraisal	Carbon values will be published in the TAG data book as a forthcoming change notification soon after these values are officially published.
Fleet mix assumptions	Appraisal and modelling	Different fleet mix assumptions will be developed as part of the ongoing enhancements to environmental (carbon) appraisal in support of the Transport Decarbonisation Plan to be published soon after this route map documentation. They will be included in guidance through the common analytical scenarios.

Table 1 Changes to the appraisal framework resulting from the route map programme

¹⁰ SEM are specialist Supplementary Economic Models that may be used to assess wider economic impacts.

Long-term growth forecasts and appraisal accounting

- 3.5 In March 2020, the Office for Budget Responsibility (OBR) issued updated long-term GDP per capita forecasts. These were subsequently confirmed in the July 2020 Fiscal Sustainability Review, which included the short-term GDP impacts of the COVID-19 pandemic, and the subsequent November 2020 and March 2021 publications alongside the Autumn Spending Review and Spring Budget respectively. The long-run steady-state rate of productivity growth was revised downwards from 2% to 1.5%, which due to the effect of compounding accumulates over a typical scheme appraisal period.
- 3.6 Alongside the release of the July 2020 TAG route map, the Department issued a forthcoming change to guidance that included these updated values. We also guided promoters to use these updated values as a mandatory sensitivity test when presenting appraisal results.
- 3.7 The Department has examined this issue in detail as part of the route map programme and has worked closely with its arms-length bodies and across other government departments to reach a consensus on how this should be applied in transport appraisal to ensure analytical integrity, fairness and consistency. This has involved reviewing the current method in TAG of using the OBR GDP forecasts as the preferred evidence source for economic growth assumptions, as well as how this relates to HM Treasury's Green Book guidance, most notably the Social Time Preference Rate (the discount rate).
- 3.8 The result of this work has confirmed the following, which will be implemented in TAG:
- Official OBR GDP forecast data should continue to be the basis for both uprating appraisal benefit streams over time, most notably the values of time, and for demand forecasting.
 - The discount rate in the Green Book remains at 3.5% to year 30 (declining to 3% from year 31 with further declines thereafter), representing the standard rate that should be used across all government appraisals.
 - The TAG GDP per capita growth series applied for uplifting **appraisal** values will be aligned to the fixed nature of the discount rate, and hence be set at OBR's long-term steady-state growth forecast of 1.5% per annum across the appraisal period. For behavioural **modelling**, the OBR annual GDP forecasts should continue to be used as the official source for modelling values.
 - Health impacts – comprising noise, air quality, physical activity impacts and human costs of accidents within TAG – will be discounted using the Green Book 'health' discount rate schedule, starting at 1.5% for years 0-30 and declining thereafter in proportion to the fall in the regular discount rate.
- 3.9 We consider that the OBR forecasts represent the official source of GDP that should be used in appraisal and therefore we must continue to use this as the most robust and relevant evidence in transport appraisal.

- 3.10 HMT have also advised that the discount rate is intended to be stable in nature and accounts for systematic and catastrophe risk aspects of future uncertainty in social time preference, looking across a wide range of evidence surrounding each component of the discount rate, assessed over a long time period. It therefore is not intended to be changed necessarily where official OBR growth forecasts are updated on a more frequent basis.
- 3.11 It is also important to note that the parameters described in establishing the discount rate in the Green Book¹¹ are solely used for that purpose and not intended to be the basis for individual appraisal for the purpose of uprating benefits and costs over time. We have investigated the empirical evidence for the appropriate parameters for these purposes for transport appraisal through engagement across government and through an academic review, published alongside this report¹². Our investigations have concluded that a growth rate of 1.5%, coupled with a value for the elasticity of the marginal utility of consumption with respect to consumption of 1.3, is most in line with the latest evidence. This view on the state of the evidence is also acknowledged in Annex A6 of the Green Book.
- 3.12 The practical implication of this for TAG and transport appraisal is that the latest OBR GDP forecasts will be adopted into TAG. The values provided in the Forthcoming Change document of July 2020 and the corresponding update to the Data Book, both released as part of this route map, have been updated in line with the March 3rd 2021 Budget forecasts. The steady state long run growth rate remains at 1.5%, as it was in previous OBR forecast publications in 2020.
- 3.13 In principle, the economic growth rate used in uprating benefit streams in the appraisal should be anchored to the growth rate used to compute the discount rate. Short-term fluctuations in GDP forecasts, evident in the regular updates to OBR forecasts, are therefore not reflected in a stable discount rate that is not susceptible to routine updates (as noted above). This may cause some positive or negative bias in appraisal results, where such short-term fluctuations in GDP are at present fed into the uprating of appraisal values in earlier appraisal years (before growth reaches its long-term, steady state, rate) but the discount rate remains fixed.
- 3.14 As a corollary, the Department is making a methodological change to TAG to eliminate this issue of shorter-term fluctuations by fixing the GDP per capita growth rate for uprating purposes to the long-term OBR rate across the whole appraisal period, 1.5%.
- 3.15 Furthermore, in line with the current Green Book, TAG will now use the lower 1.5% discount rate for health-related impacts. It should be noted that government, led by HMT, are embarking on a review of the issues pertaining to discounting of environmental and associated impacts, such as utility-based valuations, more generally. This change in TAG represents a reasonable interpretation of the current evidence and the Department will, as always, keep methods in TAG under review.

¹¹ Most notably these are the expected growth rate of future real per capita consumption and the elasticity of the marginal utility of consumption with respect to consumption; see HMT Green Book Annex A6.

¹² Freeman, M and Groom, B (2021): Appraisal accounting think-piece, a think piece for the Department for Transport. <https://www.gov.uk/government/publications/tag-report-on-appraisal-accounting>

- 3.16 The 1.5% discount rate for health-related impacts will apply to accident, air quality, noise and physical activity benefit values in TAG. Adopting this rate is equivalent to assuming these impacts are constant in utility terms. This necessitates minor changes to the TAG data book to reflect the income elasticity of 1.3 for health-related impacts in the historical data series.
- 3.17 These methodological changes improve upon the recommendations from the July 2020 Forthcoming Change document and are included in the updated guidance and values.
- 3.18 As a final note, the use of the OBR growth data for transport modelling applications remains the same as current practice and is unaffected by the change to appraisal accounting methodology. Users should continue to use the annual GDP growth forecasts from the OBR to obtain the most behavioural accuracy in demand modelling. Both data series are provided in the updated TAG data book.

Appraisal period

- 3.19 The Department has undertaken a formal consultation on the length of the appraisal period. This was to explore the theoretical and practical implications of potentially extending the appraisal period beyond the sixty-year period currently recommended in TAG and the HMT Green Book.
- 3.20 There are plausible arguments to look beyond sixty years in the case where an intervention is expected to deliver a significant proportion of benefits beyond this point. TAG and the Green Book are primarily focused on making relative judgements concerning the social returns expected from different investments. However, in some instances it is important to also be able to provide a view on the overall level of returns on an investment, which includes the potential value of assets beyond the standard appraisal period of 60 years. It is reasonable to take a view on these in terms of making judgements about the overall level of return and where that information is material and valuable.
- 3.21 In addition, the design, maintenance and renewals of many new assets are often predicated on keeping them operational indefinitely. It may be reasonable to more fully assess the value of proposed design standards that aim to provide a long-lasting asset (over sixty years) relative to alternatives which incur less cost but with more constrained longevity by design.
- 3.22 The current practice and convention of conducting forecasting and analysis to sixty years is in itself challenging already, but pragmatic, and allows for consistency of appraisal across the transport portfolio and to make relative judgments on value for money. For the majority of scheme decision-making this is fit for purpose, given that measuring the quantum of potential benefits beyond this point, and the associated analytical burden of doing this, is often unlikely to add any material information that will change the view on the relative value of investments and any associated decision.
- 3.23 This view was supported by the significant majority of consultation responses. The main issues raised against simply extending the appraisal period can be put into two

broad categories: the practical difficulties of forecasting or extrapolating out this far; and the realism of such practice in the face of significant uncertainty (i.e. a realistic representation of a do-minimum scenario). Over a long time period, the analyst would need to make some considerable assumptions about the state of future transport supply and demand, and over a period where significant land use or national structural changes are likely. These viewpoints are very much acknowledged and accepted by the Department.

- 3.24 There are also arguments, however, that current appraisal convention does not consider the potential for long-term impacts at all. TAG at present does not explicitly accommodate for the consideration of certain impacts (costs and benefits) that may be accounted for beyond a sixty-year period such as residual asset values. Decision-makers considering potentially long-term transformational investments currently do not have any presentation available to them of potential continuing impacts on social welfare or wider economic impacts after this point, as well as social and environmental impacts such as greenhouse gas emissions.
- 3.25 The Department's view is that where longer-term impacts may be material to an investment decision and appropriately supports the strategic case of a scheme that is explicitly intended to deliver longer-term benefits, analysts should not be precluded from providing this indicative information to decision-makers. This is so long as the life of the asset is designed to last this long with appropriate maintenance and that the associated costs are also included in the analysis. Indeed, this is in-line with the general flexibilities within the TAG framework – that analysis should be provided where it is useful to the decision at hand, so long as it is given alongside an appropriate description of the caveats and uncertainties of the analysis.
- 3.26 The changes stemming from the TAG route map programme, therefore, are a provision of more detailed guidance in TAG unit A1.1 (Cost Benefit Analysis) which is intended to make analysts aware of the challenges associated with long-term modelling and appraisal and how to report the findings in the economic case to support the strategic objectives. This will include more detailed guidance on the expectations associated with extrapolating cost and benefit streams.
- 3.27 Given the expected level of uncertainty and practical challenges with looking past sixty years, the Department expects that in the majority of cases it will be disproportionate to consider costs and benefits beyond this as part of the business case. This is especially the case where such long-term benefits are not explicitly part of the strategic objectives of the scheme and hence where that analysis is immaterial to the decision at hand. The core requirement therefore remains to use a sixty-year appraisal period when presenting the core appraisal outputs.
- 3.28 Where a longer appraisal period is thought to be needed, this must be agreed with the approving authority of the scheme and the Department should be consulted in the first instance. Further analysis beyond that point, including clear evidence and articulation of the treatment of uncertainty in the future and through the use of modelling and extrapolation, will act as supplementary evidence in the form of an indicatively monetised impact. This evidence can inform the overall value for money assessment of the scheme and consideration of alignment against strategic objectives.

- 3.29 It should also be emphasised that if longer-term value is included for a business case, while it may give a more accurate picture of absolute, standalone value-for-money of an option, it does not allow judgements to be made about relative value-for-money compared to other options/schemes where a shorter appraisal period has been used. Where such comparisons are relevant for a decision, a common maximum appraisal period of sixty years must still be used.
- 3.30 More detailed guidance is provided on the considerations of uncertainty when extending the analysis into a far distant future and hence a far more uncertain basis. This will include general expectations on the use of scenarios, presentations of uncertainty ranges and how the analysis should be reported as indicative information that is intended to support the appraisal, whilst retaining the core appraisal elements to the standard sixty-year timeframe. Links are made to the Uncertainty Toolkit also provided as part of this route map update.

Optimism bias

- 3.31 Optimism bias is the systematic tendency for scheme promoters to be overly optimistic about the estimated scheme costs and delivery times, which results in the need for appraisal to include an optimism-bias adjusted cost estimate.
- 3.32 Currently, TAG includes estimates for optimism bias uplift figures, which are added to the Quantified Risk Assessment (QRA) mean. QRA mean is the weighted average cost estimate across the range of risks included in the QRA (and their implications on costs) and their associated probabilities. DfT contracted Oxford Global Projects (OGP) to produce up-to-date optimism bias uplift figures for a greater number of project types. Updates to TAG Unit A1.2 and A5.3 implement these new uplift figures, which are now applied to the base cost. The new uplift figures are, in general, similar to the previous estimations for earlier business case stages but are significantly higher for the full business case stage. This is in part since the new uplift figures are now intended to be added to the base cost, which will as a rule be lower than the QRA mean, and the fact that the evidence base of the new values has been significantly strengthened, based on a reference class forecasting (RCF) from thousands of past projects.
- 3.33 Even though it is no longer necessary for the QRA to be calculated for optimism bias adjustments, this does not take away the need for QRA analysis. The comparison of QRA figures which are calculated via a bottom-up approach, and the optimism-bias adjusted cost which follows a top-down RCF approach, can provide valuable insights to a scheme's expected costs. RCF is likely to be more informative in earlier stages of the project where cost estimates are less mature, while QRA may be more informative in later stages. Therefore, carrying out RCF and QRA in conjunction is advised to inform the approach to risk management of a project. A significant divergence between cost estimates obtained using QRA and those derived from applying the new optimism bias uplifts to base cost may indicate project risks have been misunderstood.
- 3.34 The Department has also provided additional guidance for rail schemes. Given that the optimism bias uplift values were produced for the HMT stages SOBC/OBC/FBC,

we have recommended that the SOBC rate applies at GRIP1-2, the OBC at GRIP 3-4 and the FBC rate at GRIP5¹³.

- 3.35 In addition to updating the optimism bias uplift figures, the Department is also providing some guidance on the treatment of inflation for cost estimates. The optimism bias uplift figures are calculated on the assumption that they will be applied to the real-term base cost estimates, and so produce real-term cost overruns. However, should scheme promoters only be able to produce estimates that include inflation, we have provided guidance for two different approaches to identify the optimism bias uplift required for nominal estimates. Alternative approaches may be used but justification is required as to why this approach was chosen and its effectiveness in identifying the optimism uplift required for estimates including inflation.
- 3.36 The first approach applies the RCF logic to the historical divergence between construction specific and general inflation. The “pmean” (i.e. the p-value for which the corresponding uplift value is most accurate for the greatest number of schemes) from this reference class, corresponds to a 2.1% uplift on annual GDP deflator inflation, will be used to estimate costs in the core scenario appraisal.
- 3.37 The second approach uses historic data on real-term cost overruns and nominal cost overruns in past, completed UK projects. The pmean from this reference class is 4.3% uplift on total cost.

The Uncertainty Toolkit and Scenarios

- 3.38 The Uncertainty Toolkit is TAG Supplementary Guidance setting out recommended techniques for developing uncertainty analysis in the context of modelling for scheme appraisals. The Uncertainty Toolkit represents a significant step forward in discussing uncertainty in TAG, bringing together an overview of the treatment of uncertainty already covered in the guidance and filling a gap where there is limited guidance on how to conduct national scenario tests proportionately and consistently. Our intention is that this is not the final say and the toolkit will potentially evolve over time when tested in the field, particularly with reference to aspects that are at this stage provided for information such as the common analytical scenarios¹⁴.
- 3.39 The aim of the Uncertainty Toolkit is to provide those concerned with transport analysis with practical advice on the analysis and presentation of uncertainty. The toolkit considers techniques for exploring uncertainty as part of transport modelling and appraisal with a particular focus on the use of scenarios for uncertainty around future travel demand. The toolkit provides guidance on the Department’s view of when it is appropriate to use different tools and techniques for analysing uncertainty and provides guidance on considerations around proportionality.

¹³ SOBC = Strategic Outline Business Case, OBC = Outline Business Case, FBC = Full Business Case, GRIP = [stages in] Governance for Rail Investment Projects.

¹⁴ Feedback on this first version of the Toolkit is welcome through tasm@dft.gov.uk.

3.40 The Toolkit defines a set of principles for the treatment of uncertainty in transport modelling and appraisal:

- The treatment of uncertainty is a core part of any transport analysis and is needed to inform robust decision making.
- Analysis should not focus exclusively on the core scenario and uncertainty analysis and consideration of wider ‘what if’ scenarios should be undertaken as standard.
- Proportionate techniques for defining, measuring and reducing uncertainty should be used.
- Uncertainty should be considered holistically across the strategic and economic cases and throughout the planning process.

3.41 The common analytical scenarios introduced in the Toolkit and described in its annex cover key national level uncertainties. These bring a consistent approach to testing uncertainty across modes. They are not intended to reflect all possible future outcomes but are designed to test a subset of key uncertainties, namely: high and low economic and population growth, regional growth, behaviour, technology and fleet decarbonisation. These will be published alongside the core NTEM update in TEMPro¹⁵ later in 2021 and will therefore share common assumptions to the core.

3.42 Further work is being done to confirm the detailed assumptions for the common analytical scenarios. The range of uncertainties captured will also inform decision making in light of DfT’s strategic objectives around levelling up and decarbonisation. TAG Unit M4 will be updated following the publication of the common analytical scenarios in TEMPro. Alignment will be achieved between the common analytical scenarios and the existing High and Low Demand scenarios in TAG unit M4.

3.43 In the interim period before common analytical scenario publication we expect schemes as a minimum to continue to use existing scenario formulation from TAG Unit M4 and look to using proportionate uncertainty analysis techniques to fully understand uncertainty, including that relating to the impact of COVID-19. Schemes submitting business cases directly to DfT are invited to engage directly with scheme sponsors to agree a suitable approach. In the specific case of decarbonisation in the interim period before publication, if a scheme promoter wishes to test the uncertainty associated with a faster uptake of Zero Emission Vehicles (ZEVs) within scheme appraisal, a sensitivity test using RTF18 scenario 7 could be considered. Scheme promoters can approach the Department for advice on the underpinning assumptions to support such a sensitivity test.

3.44 Recent events have demonstrated the value that the use of scenarios and wider uncertainty analysis can bring. It is too early for us to fully understand the impacts that COVID-19 may have on future travel demand and travel preferences but tools such as scenarios allow us to explore plausible futures and test how well schemes

¹⁵ TEMPro is the National Trip End Model Presentation Program, which is free software provided by the Department to access national trip end model data (of travel demand). It is available here: <https://www.gov.uk/government/publications/tempro-downloads>

perform in different future states. The behaviour and low economy scenarios described in the Toolkit will both help to provide a balanced exploration of possible impacts.

- 3.45 The Uncertainty Toolkit strengthens the expectation that sensitivity testing is presented more prominently in business cases as standard. This sensitivity testing should include commentary around the potential impacts of COVID-19 and its impact on demand assumptions. Similarly, standard sensitivity testing around appraisal values provides resilience against potential changes in those values as a business case is developed.
- 3.46 We intend to continue to engage with the Joint Analysis Development Panel and our delivery partners following publication of the first version of the Uncertainty Toolkit.

Carbon values and fleet mix assumptions

- 3.47 As previously described, the Department is committed to playing its part in meeting the Government's 2050 net zero target for greenhouse gas emissions. In order to fulfil these objectives, the appraisal framework will need to adapt to ensure the value of investments with the central aim of decarbonisation are fairly considered and are able to be prioritised. We have described our ambitions here in section 2.
- 3.48 We reported in the July 2020 Route Map document that TAG will continue to be updated in-line with official carbon values produced by the Department for Business, Energy and Industrial Strategy (BEIS). Also in July we issued a forthcoming change notification to allow TAG users to accommodate interim BEIS guidance in transport appraisal, advising analysts to illustrate the potential impact of placing a higher value on greenhouse gas emissions by reporting a high carbon values sensitivity test using the latest published carbon values from supplementary Green Book guidance¹⁶.
- 3.49 We shall update TAG as soon as possible after BEIS have released the next official set of carbon values. TAG users should continue to use the existing high carbon values series for sensitivity testing until the values are updated, in accordance with the July 2020 forthcoming change notice. We shall communicate the expectations of use of the new values further when they are published.
- 3.50 The Department will update the vehicle mix forecasts to be used in appraisal within the TAG Data Book in line with the forthcoming change issued in July 2020. The new forecasts are based on updated modelling assumptions reflecting the introduction of new tighter CO₂ emissions standards for cars, vans and HGVs to be implemented in 2025 and 2030, new sales figures showing a further decline in sales of diesel cars compared to 2018, and updated consumer choice modelling of the take-up for ultra-low emissions vehicles. The combined effect of these changes has resulted in updated electric vehicle and fuel efficiency forecasts.

¹⁶ <https://www.gov.uk/government/publications/tag-forthcoming-changes-to-carbon-values>

Landscape values

- 3.51 The physical and cultural characteristics of the land provide a range of benefits to society, and transport interventions may impact upon these benefits positively or negatively. The Department currently provides supplementary Value for Money guidance for monetising the value of different broad categories of landscape¹⁷. Therefore, it is only appropriate that landscape impacts are fully considered within the appraisal process. Currently, the Department allows for the assessment of landscape through guidance in TAG Unit A3 on how to undertake a qualitative approach to assessing landscape impacts - using the environmental capital approach - as well as supplementary Value for Money guidance that can be used to provide an indicative monetised estimate of scheme impacts on different broad categories of landscape.
- 3.52 The methodology for monetising landscape impacts is based on a set of values drawn originally from a 2001 meta-analysis of willingness-to-pay studies. In 2018, the Department commissioned an expert-led review of the existing methodology and underlying values¹⁸. This recommended two principal changes to the guidance which have been taken forward:
- Revisions to landscape values reflecting necessary updates to key parameters underpinning the values such as income and population growth. These revisions are required to bring the values in line with both the latest available outturn data, forecasts, as well as ONS/Defra natural capital accounting principles.
 - Adding provision for the valuation of landscape ecosystem services¹⁹. By valuing constituent ecosystem services, future appraisal of landscape impacts can better account for the differing impacts of transport schemes upon the services provided by landscape, and measure impacts in the best available physical units. In identifying the timing and distribution of impacts, the approach can also help to inform mitigation options. Incorporating ecosystem services into appraisal is also in line with the recommendations on embedding a natural capital approach in the 2018 Green Book.

Agglomeration

- 3.53 In 2019, DfT commissioned a study to review the methodology used to calculate productivity benefits and to explore the potential for updating the agglomeration elasticity values found in our guidance. To estimate a new set of elasticity values, the

¹⁷ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/918480/value-for-money-supplementary-guidance-on-landscape.pdf

¹⁸ Temple, Eftic and TRL, Valuation of Landscape Impacts of Transport Interventions & Mitigations Using an Ecosystem Services Approach, January 2019: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/942839/valuation_of_landscape_impacts_of_transport_interventions-document.pdf

¹⁹ Ecosystem services are the benefits provided by ecosystems that contribute to making human life both possible and worth living. (UK National Ecosystem Assessment definition, <http://uknea.unep-wcmc.org/EcosystemAssessmentConcepts/EcosystemServices/tabid/103/Default.aspx>)

project consultants used an innovative spatial econometrics approach that includes spill-over effects from a transport shock over time and across space. The new elasticity estimates are outside the range found in literature although not directly comparable to those obtained through more traditional econometric approaches.

- 3.54 The agglomeration project has made it evident that certain challenges exist in the estimation of agglomeration elasticities, including for example a lack of robust data to underpin the econometric work. The study departed from previous agglomeration studies in that it adopted a more exploratory estimation approach compared to the micro-founded method the existing TAG elasticities are based on. Important work was done to improve our understanding of sectoral groupings and how different sectors link together in the economy.
- 3.55 The Department has decided not to incorporate the results of the research in the guidance due to its exploratory nature and some outstanding questions about the elasticity values generated. In addition, the impact of the COVID-19 pandemic on travel and working patterns has increased the uncertainty about how transport will impact on agglomeration over the long-term. While the long-term impact of the pandemic on agglomeration is yet to become clear, given the shift towards homeworking, making a significant change to elasticities at this point in time would be hard to justify.
- 3.56 To better understand the potential impact of COVID-19 on agglomeration, the Department has commissioned a separate scoping study to identify the main research areas regarding the impact of homeworking as well as to review the theoretical underpinnings of agglomeration mechanisms.
- 3.57 The scoping study, together with any lessons that can be learned from the agglomeration study and existing previous empirical work, will inform a work programme related to agglomeration for the coming years. We envisage this programme will include theoretical as well as empirical pieces, including gathering of robust datasets and new empirical work on homeworking and its productivity impacts – a currently under-researched area. Specifically, it will be important to gather data that shows how workers will split their time between home and the office in the future.

4. Continued development through the Appraisal and Modelling Strategy

The Appraisal and Modelling Strategy

- 4.1 We published the Appraisal and Modelling Strategy in April 2019 after extensive consultation with our stakeholders on the most appropriate areas of focus for development of the appraisal and modelling evidence base over a five-year period. The route map has addressed some of the topics originally identified in the strategy but also included emerging issues requiring a consolidated response to events starting in early 2020.
- 4.2 As we describe in this report, our emphasis in 2021 will be to continue to prioritise many of the issues in the route map, folding them into our Appraisal and Modelling Strategy plans. This will particularly focus on taking forward necessary updates to appraisal methodology through the response to the Green Book Review, to support the decarbonisation agenda and levelling-up and to support better reflection of uncertainty across the industry. This will include prioritising a greater understanding of the longer-term impacts of COVID-19.
- 4.3 Whilst this has expanded the scope of the strategy in some of these areas, this builds on the original foundations laid out in the strategy, particularly addressing the themes of capturing the range of impacts relevant for transport policy, appraising transformational schemes and housing, and reflecting uncertainty over the future of travel.
- 4.4 Two years into the strategy we are, as ever, keen to continue to engage with our stakeholders to ensure that its key themes remain relevant and robust as we continue developing modelling and appraisal methods over the next few years. This is an opportune moment to take stock of priorities in the strategy which include:
- Developing the social and environmental evidence base to provide more robust valuation of place-based impacts and through increasing the emphasis on ecosystem services in line with HMT Green Book supplementary guidance and to support decarbonisation.

- Improving the accessibility of TAG as a product and emphasising how it may be used flexibly and proportionately to analyse the most material and important aspects for any decision. This will include clarifying how TAG should be interpreted and used as a set of good-practice guidelines and a holistic framework across a wide array of impacts to inform value for money advice. In line with the recommendations of the Green Book Review, it is also a chance to step back and review the practices and incentives around the application of appraisal and TAG and where change may be necessary to promote high quality analysis to provide as rich a picture as possible for decision-making, whilst ensuring proportionality.
- Building up the evidence base and appraisal methods of transformational investment and the provision of housing. We will continue to develop wider impacts appraisal and evaluation capability, running in parallel with developments focusing on the Green Book Review to support the development of stronger evidence-based strategic cases.
- Continue to develop insightful and practical approaches to representing uncertainty, including the provision of common analytical scenarios and strengthening the evidence around the impacts of COVID-19.
- Placing a renewed emphasis on the modelling aspects of TAG, reviewing and addressing areas of methods and evidence for application in schemes, whilst also developing analytical methods at a national level to support policy development. We shall also place a greater and more explicit focus on supporting industry in developing techniques outside of the direct remit laid out in TAG. This will concern different modelling types and use of data, and supporting innovation by collaborating with industry, particularly where there are concerns over the use of different model types in appraisal applications or for use in spatial planning more broadly.

Engagement and consultation

- 4.5 We plan to hold a stakeholder event in the summer around the time where the changes from these updates are formalised into TAG. This will allow the opportunity to share views on the issues covered in this report and hear about future appraisal developments.
- 4.6 We are also excited at the prospect of seeking your views on the highest-priority development areas in appraisal and modelling methods. Approaching the halfway point of the Appraisal and Modelling Strategy, this represents an opportune moment to take stock on the themes and priorities within it and refocus on the most relevant priorities over the next two and a half years. The stakeholder event will provide the opportunity for you to provide your thoughts. We will also continue to work closely with the Joint Analysis Development Panel, whose insights and challenge form a central component of our external engagement.
- 4.7 It also remains our intention to hold training events on transport appraisal practice in general and the Department's expectations around how TAG should be interpreted and used. This will also allow us to gather feedback on the experience of using TAG

and perceptions on its use from practitioners, which we may feed into the theme of making TAG more accessible. We are considering options on how to take these forward, including general foundation courses, more detailed sessions on particular areas of interest, and bespoke events for new professionals working on appraisals or transport models used in appraisals. We would welcome your views to assist our planning of these potential events; please contact us at TASM@dft.gov.uk.

Annex A: Change management processes in TAG

The Orderly Release Process

- A.1 In order to keep the evidence base for transport analysis up to date, we occasionally need to refresh the values in the guidance to reflect more recent changes, trends and research. The Orderly Release Process²⁰ is the change management process in TAG. It provides advance notice of changes to guidance to allow more certainty of the timetable for changes and early sight of forthcoming revisions. This allows scheme promoters and sponsors to plan the work required to implement the changes.
- A.2 The Orderly Release Process also affords some stability to analysis and appraisals in an environment where multiple changes in the evidence base may occur or be foreseen to have the prospect of occurring in relatively quick succession. This can be particularly pertinent to longer term projects or programmes and emphasises the benefit of producing thorough uncertainty analysis to explore the impact of potential evidence base changes and how sensitive proposals are to them.

The Proportionate Update Process

- 4.8 While sound planning of business case development, assisted by the Orderly Release Process, can minimise the cost, resource, and time needed to ensure a business case remains in step with latest evidence, it is nonetheless reasonable for project sponsors to decide what updates to business cases it is proportionate to make when TAG, or other guidance / evidence changes.
- 4.9 The Department expects that such decisions should be made on a scheme by scheme basis and be based on balancing the need to ensure decisions are based on up-to-date evidence with the need to support decision makers in delivering their programme. This should involve reasonably balancing (a) the greater time, cost, and/or resource needed to deliver programmes, with (b) the quality of the analysis

²⁰ <https://www.gov.uk/government/publications/change-management-in-webtag-the-orderly-release-process>

submitted to assist the decision required, including its robustness against potential challenge from all sources.

4.10 The Proportionate Update Process²¹ described in TAG provides advice on how to judge whether it is proportionate to update existing analytical work and recommends seeking support from the scheme sponsor when making that judgment.

²¹ <https://www.gov.uk/government/publications/webtag-tag-proportionate-update-process>

Annex B: Consultation response on appraisal periods

Summary

- B.1 As part of our proposal in the July 2020 TAG route map to reflect and incorporate evidence into appraisal of the long-term, we announced our plans to launch a consultation on the length of the appraisal period used in TAG. Given the Government's ambition to invest heavily in a number of major transport projects over the coming years and decades, it is crucial that we have the right investment appraisal framework in place to help inform value for money decision making. In addition, it is also important that our guidance works for the stakeholders who use it, so any changes must be proportionate in terms of the benefits they bring in versus the practicality of these changes.
- B.2 In December 2020 we launched a consultation to collect views on the recommended appraisal period for transport appraisal. This included running two workshops and collecting written responses which will be published on GOV.UK where permission is granted by respondents. Both the consultation responses and the workshops had good engagement from a variety of stakeholders. We have taken on board this feedback in developing updates to our appraisal guidance at this time.
- B.3 The Department's current guidance is to use a 60-year appraisal period from scheme opening for assets with an indefinite lifespan, and that appropriate maintenance and renewal costs to ensure they remain operational are counted in the appraisal. A shorter period may be used for assets with a shorter lifespan – only in such cases should a residual value, in general, be included according to current guidance. However, where a scheme involves large capital expenditure towards the end of the 60-year appraisal, residual value may be considered on a case-by-case basis subject to contacting the Department for advice. The primary motivation for capping appraisals at 60 years regardless of asset life is to provide a consistent basis for comparisons between options and schemes. The consultation document²² highlighted some possible approaches that would help better reflect a scheme's long-

²² <https://www.gov.uk/government/consultations/appraisal-periods-consultation>

term impacts in the appraisal framework, including extending the appraisal period, market-based valuation and scrap value.

- B.4 Overall, the response from stakeholders was sceptical regarding the proposal to extend the appraisal period. While many stakeholders supported the idea of considering long term benefits in principal, there was a near consensus that producing credible appraisal estimates post 60 years is extremely challenging. A smaller number of stakeholders directly stated they disagreed with a longer appraisal period. Respondents did, however, suggest various qualitative and quantitative approaches for considering long term benefits including consideration in the strategic case, non-monetised/scoring system assessment of option values, greater use of scenarios and sensitivity tests, social or market residual value and indicatively monetised long-term benefits. The remainder of this section summarises the key themes discussed in the consultation, the Department's response to the key issues raised and the rationale underpinning the definitive set of guidance changes.

Key Themes

Long-term Uncertainty

- B.5 The most common concern raised by stakeholders was regarding the long-term uncertainty that is inevitable when looking further into the future. Some suggested that a priority should be to deal with uncertainty using sensitivity analysis and scenarios over sixty years rather than extending the uncertainty further. Others commented that if a scheme needed benefits beyond sixty years to make the case then it may not be the best option. Policy, technology, and travel demand uncertainty were noted as key uncertainties by stakeholders. Particularly travel demand where assumptions on the drivers of demand growth and the stability of parameters into the distant future are difficult to estimate.
- B.6 As a result of this feedback we are implementing that schemes with a long asset life are able to undertake a sensitivity test where benefits and costs are extrapolated beyond sixty years. This will be included in the indicative monetised category for Value for Money (VfM) assessment only, and not the initial or adjusted BCRs in recognition of the very high level of uncertainty associated with these longer-term benefits as identified in the consultation. Schemes will need to contact the Department prior to undertaking the sensitivity test, each being considered on a case-by-case basis as to whether undertaking the test is appropriate and beneficial for decision-making.
- B.7 The Department fully recognises the additional uncertainty that would come with an extended appraisal period, as raised by stakeholders. Therefore, we have adopted a measured approach for using a longer appraisal period, to be implemented only when it is appropriate for the scheme and supported by the strategic case. The sixty-year appraisal framework will still form the core scenario to account for the fact that the results from a longer time horizon will be far more uncertain.

Supply-side and modelling

- B.8 Another key theme from the consultation involved concerns on the supply side and model convergence. Over the longer time horizon introduced by the extended appraisal period, modelling becomes increasingly challenging. Many stakeholders raised the point that simple extrapolation of costs and benefits further into the future does not aid decision makers, therefore additional modelling would be needed. However, given there are potential issues with model convergence even in a typical forecast horizon of 20 years, this presents many challenges.
- B.9 Therefore, for the potentially limited number of cases that would consider using an extended appraisal period as a sensitivity test, we would expect further modelled year tests to be conducted to demonstrate that the expected profile of the magnitude of impacts is supportive of the approach taken to extrapolation. For example, if the magnitude of impacts is declining over time (e.g. due to capacity limits), a flat-line extrapolation would not be appropriate. In addition, we are requiring that scheme promoters undertake sensitivity tests around future travel demand. We would expect those projects with a compelling strategic rationale for including post sixty-year benefits to also be applying the full range of Common Analytical Scenarios (CAS), once they become formally part of TAG. We have also provided guidance for scheme promoters in the interim before CAS become part of TAG.

Environment

- B.10 Another key theme that was consistently raised by stakeholders within the consultation was environmental impacts. The main view was that from an environmental point of view, it is already difficult to assess carbon emissions into the future. Stakeholders raised concerns from their own experience that greenhouse gas emission rates and values present additional uncertainty risk or are simply not available far into the future.
- B.11 Given that this is an incredibly important area, and transport interventions could include irreversible change to the natural environment, it is essential that the Department carefully considers the implications any changes in the appraisal framework may have on the environmental assessment. Therefore, we are advising that, should scheme promoters need to undertake this additional sensitivity test, they apply more rigorous uncertainty analysis with the use of scenarios to better understand the long-term impacts of the scheme. Uncertainty analysis of travel demand scenarios will also necessarily extend to environmental appraisal, i.e. giving a range of greenhouse gas impacts across the scenarios.
- B.12 We are also strengthening our environmental analysis within the current appraisal framework, which will be included in the benefits and costs extrapolated beyond sixty years. In particular, this Route Map delivers a change to TAG that updates to the values and methodology of examining landscape impacts through further Ecosystem Services. We shall publish updates to the values of carbon in TAG after BEIS have prepared and released the official data.

Residual Value

B.13 It was clear from the consultation feedback that the main concern from stakeholders was the level of uncertainty and modelling challenges that would come with a longer appraisal period. Therefore, it is appropriate that the Department continues to explore the use of residual values in the appraisal framework as an additional tool for presenting long-term impacts and to provide decision-makers with further sensitivity tests. As a future workstream we intend to look into a variety of residual value approaches and its potential in real-options analysis

Conclusion

B.14 This conclusion of the consultation on the appraisal period represents a critical milestone in the development of the Department's framework for appraising the impacts of transport investment. The guidance allows for scheme promoters to represent the potential long-term impacts of an investment, whilst acknowledging the increased uncertainty that comes with a longer time horizon.