Consultation Response
January 2021

Appraisal and Modelling Strategy: Appraisal Periods Consultation

Department for Transport
Our ref: 240119E1

steer

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1 Introduction

1.1 This is Steer's response to the Department for Transport's *Appraisal and Modelling Strategy: Appraisal Periods Consultation*.

1.2 This is an important consultation and one which we welcome and are pleased to respond to. We would like to acknowledge and note our appreciation of the approach that the Department has adopted to engagement with practitioners during the consultation period: we were pleased to take part in the on-line workshop that the Department held in December 2020. We found this workshop a helpful way of confirming our understanding of the position set out in the Department's consultation document, as well as allowing us to develop our thinking having heard from academics and from other practitioners working in the field.

1.3 Our response to this consultation has been informed by our broad range of experience developing and undertaking appraisals, developing business cases and acting as independent technical evaluators. This experience includes:

- Working with sub-national transport bodies developing their strategies and business cases for 'transformational' transport interventions
- Leading the development of five case business cases for capital and policy interventions for all modes, and particularly for rail and urban public transport
- Developing and defending business case evidence in the role of expert witness at public inquiries and other hearings
- Acting as Independent Transport Evaluator for Local Enterprise Partnerships to support the application of their respective Assurance Frameworks
- On behalf of the Department and MHCLG (for the Housing Infrastructure Fund), reviewing modelling and appraisal of schemes seeking Government funding
- International experience developing and applying appraisal frameworks in jurisdictions with similar decision-making frameworks to the UK

1.4 This experience gives us a wide perspective of how the Department's guidance is applied in practice and its strengths and weaknesses. While the response has been informed by the work we have undertaken for many public sector clients, what we say here is our view. Where we cite examples, nothing we say here should be construed as representing any others' views.

Publication

1.5 Standard Department practice is to publish consultation responses alongside its analysis of the responses it receives. We confirm we are content for this document to be published by the Department should it wish to do so.

2 Overall Approach

1 Do you think there is a case for including long-term benefits, beyond the existing 60-year appraisal period? What do you think are the main challenges associated with this?

2.1 The long-term costs and benefits of a transport investment should be considered when decision makers come to a view on its value for money. However, we do not believe that extending the appraisal period beyond the current 60 years is the way to do this. More than this, we believe that alternatives to extending the monetised appraisal period beyond 60 years would be strongly preferable. We take this view for a number of reasons, which we set out below and elaborate throughout our response. Later, in our response to Question 10, we set how we believe longer term impacts should be considered when coming to a view on value for money.

Inherent Forecasting Uncertainty

2.2 We can only forecast so far into the future before the forecast uncertainty is so great that there can be little confidence in the numbers that models produce. TAG asks for two forecast years and very few models look more than 20 years after scheme opening, regardless of the life of the asset being appraised. While some models look further than this, confidence in such forecasts is inherently lower than forecasts for earlier years. Scenario testing is put forward as a way to consider such uncertainties, but over long timescales the upper and lower bounds of plausible forecasts may become so wide that the range of BCR outcomes spans a number of value for money categories.

Reliance on Extrapolation

2.3 Extending the appraisal period does nothing to address lower confidence in later forecast years, rather it simply extrapolates the inherent forecasting uncertainty over a longer timeframe. Furthermore, the longer the appraisal period the greater the proportion of the Present Value of Benefits which is simply an extrapolation from the last forecast year. The longer the appraisal period, the greater the importance of assumptions on the growth of population, GDP, values of time and the like. More often than not these are generic and are neither specific to the intervention in question nor its context. Such assumptions are themselves inherently uncertain and therefore longer the appraisal period, less certainty there is in the PVB, regardless of our confidence with our forecasting models.

Compounding (Multiplicative) Effects

2.4 The assumptions used to extrapolate benefits interact and have multiplicative effects. Errors compound over time. The need to introduce devices (for example demand caps) to moderate the growth of benefits, revenue surpluses or costs should be taken as a signal that the appraisal period is too long and they are being extrapolated too far.

The Profile and Scale of Costs

2.5 While much effort is put into estimating implementation costs (noting that these are also important when considering affordability), relatively little effort can be put into assessing the scale and periodicity of on-going maintenance and renewal costs. The longer the appraisal period the more important the assumptions made on these become (even with discounting). However, in many cases the basis for these assumptions is often no more than notional. Substantially, this is because forecasting maintenance, renewal and operating costs a long time into the future is difficult to do with any degree of confidence and there are considerable uncertainties around the impacts of new technologies, changes to operating practices and future expectations on how services are provided, which could be due to regulatory changes, or could be changes that are commercially driven.

Value for Money Thresholds

2.6 In our view, the value for money thresholds that are used to assess whether schemes are poor, low, medium, high or very high value for money should be a function of the applied discount rates *and* appraisal periods. If appraisal periods were to be extended, this should also require a rebasing of the value for money thresholds. This is for three reasons:

- Any commonly accepted assessment of value for money should consider not only the return on the investment, but also how long it takes for this return to accrue
- Related to this, to avoid 'grade inflation' where the portfolio of projects becomes better value for money simply because of a procedural change
- The inherent uncertainty with the benefits and costs after year 60 needs to be taken into account

2.7 Put simply, the starting point should be that a BCR of 2.0 over 60 years is better value for money than a BCR of 2.0 over 100 years.

2.8 Applying these principles means we find it difficult to see any reasons why a scheme that is adjudged (say) poor value for money when appraised over 60 years will not be adjudged poor value for money when assessed over 100 years, regardless of the BCR when assessed over the longer time period.

Changing Technology, Operations and Competition

2.9 Even when running on historical alignments, the railway that is operating today is unrecognisable from that 100 years ago. Motor vehicles might run along roads that were built in the 1920s or earlier, but they too operate in a way which is incomparable to the way that motor vehicles operated in the Twenties. However, our appraisals assume that the infrastructure being appraised delivers the same outputs in the final appraisal year as it does in the final forecast year. It also assumes that the competitive position is also largely unchanged, for example a generalised minute's advantage of rail over road has the same impact in the last forecast year and the final appraisal year. Both these positions are implausible, but with a 60-year appraisal have a limited impact on the assessed PVBs and PVCs. Extending the appraisal period places greater weight on an implausible position.

Stakeholder Perception and Credibility

2.10 Within the transport planning profession there is a tacit acceptance of appraising schemes over 60 years. It is 17 years since we moved from a 30 year to 60-year appraisal period and many have not known anything different: this is just the way things are done, it is what TAG

says. Nonetheless, many of the criticisms we make of the proposal to appraise over longer periods are to a degree also applicable to 60-year appraisals. Claims that the appraisal captures the actual social value of an intervention over the 60-year period are, we believe, overstated. However, we recognise that a 60-year appraisal period and the assumptions that are made to support this create a framework for appraising the relative performance of projects on a comparable basis and that this, along with established benchmarks, facilitate decision making. By creating a set of rules that are applied to all scheme, the way we use cost benefit analysis is in effect a social construct to support decision making. In this regard it is very helpful, albeit something which to be used and interpreted with care to avoid decision making becoming reductive.

2.11 In contrast to the transport planning profession, amongst stakeholders there is scepticism about the merits of 60-year appraisals. Seeking to undermine confidence in the appraisal is a first line of attack to opponents of an intervention, for example at a public inquiry or when lobbying a local transport authority committee. Because of forecasting uncertainty and the way costs and benefits are extrapolated, arguments that the appraisal captures full social value have little traction. Longer appraisal periods will mean that greater proportions of PVBs are extrapolations beyond the last forecast year and more of the BCR is explained by the assumptions made to make the extrapolations. Our view is that appraising over a longer period will undermine confidence in appraisal, not increase it.

Summary

2.12 As the consultation document says, “it is hard to conceive a plausible state of the world in 30 or 60 years, let alone 100 or more”. We agree. However, we draw a different conclusion from the Department and in our view, rather than try to overcome these difficulties and develop an appraisal framework that looks so far into the future, the difficulties of doing so are insurmountable. We go as far to suggest that extending the appraisal period beyond 60 years will undermine confidence in monetised appraisal and hence value for money assessments and decision making that flows from these, not improve it.

2.13 The appraisal period does not have to be extended to allow the long life of certain assets to be considered when coming to a view on value for money. We suggest that the Department should focus its efforts on increasing confidence in the appraisal system that we have currently and work with decision makers to help them interpret the benefit cost ratios that are produced to allow a broad-based assessment of value for money.

3 Alternative Approaches for Reflecting Long Term Value

Market-based residual value approaches

2 In light of our assessment of alternative approaches, are there other methods we may not have considered? In particular, should we be focusing on the wide range of possible social, economic and environmental impacts over the longer term, which are unlikely to be fully captured in a market-based valuation?

3.1 We recognise that certain assets (or components of some assets) have lives in excess of 60 years. This can lead to benefits and costs beyond the standard 60-year appraisal period considered in TAG. To inform decision-making, it is therefore appropriate to attempt to capture these benefits and costs as part of the value for money assessment.

3.2 The Department's assessment present three potential options to capture this longer life:

i. through a longer appraisal period, which is the subject of the present consultation
ii. through marked-based valuations aimed at calculating a financial cash flow and/or residual value of the asset
iii. through scrap value reflecting the value of selling the asset after 60 years

3.3 The Department considers options (ii) and (iii) as inadequate given that they do not reflect the social value of the asset from a welfare perspective. We agree that these approaches do not fully capture social value.

3.4 However, extending the appraisal period beyond 60 years is also fraught with significant challenges, as we describe in this document. Under the heading "strategic case or non-monetised impacts" page 30 of the consultation document suggests considering longer term impacts as part of the strategic case, presenting a useful approach to reflect longer asset lives into the decision-making framework.

3.5 We consider that this would be in line with the emphasis placed in the Treasury's November 2020 review of the Green Book for stronger strategic cases which demonstrate alignment between the scheme's benefits and policy priorities, including those benefits which have longer term impact.

3.6 This approach should be considered as a minimum. The question is whether more can be done to reflect the longer-term benefits and costs of a scheme.

3.7 A potential approach would be to calculate some type of *social* residual value for the asset at the end of the 60-year appraisal period (that is reflecting the longer-term welfare benefits of the asset). Residual value approaches have the benefit of being straightforward to implement, conceptually simple and easy for stakeholders to understand. It is true that they do not explicitly capture the benefits that using the asset will have after the appraisal period, but they also do not presuppose the costs that will have to be incurred to realise these benefits, which

is one of the most significant causes of uncertainty in extending the appraisal period beyond 60 years.

3.8 Such an approach to developing a social residual value would be to:

- Identify which assets have a life longer than 60 years. This would be limited to a number of assets, for example for a railway these would be earthworks or tunnels, but not trackwork or rolling stock, which have shorter lives
- Value the cost saved for not having to build an equivalent asset in 60 years, but rather doing so at the end of the life of the asset (for example in 100 years). This value could be the opportunity cost of not having to invest in renewing the asset in 60 years, but rather in 100 years, and using the funds at year 60 in an alternative investment which could generate social value. The consultation document mentions on page 10 that "the Green Book also recommends that an asset's residual value or liability at the end of the appraisal period should be included to reflect its opportunity cost"
- The value of this cost could be taken as a benefit at the end of the appraisal period

3.9 There is, however, a limitation to this approach. It assumes that in 60 years an equivalent asset would need to be built. Nevertheless, as pointed out in Paragraph 2.9, technology and the way assets are used are likely to change significantly in 60 years, with some assets becoming obsolete. This means that this approach might need to be limited to a clearly specified subset of assets, for instance, those which create a new transport right of way or induce a 'true' transformation[1] in mobility patterns.

[1] Following the approach in the Green Book Review, these would be mobility patterns that are irreversible. This would suggest mobility patterns associated with new land uses that are expected to have a longevity greater than the appraisal period

4 Modelling and Appraisal Challenges

Treatment of uncertainty

3 What do you consider to be the key sources of uncertainty associated with appraising benefits over a longer timeframe?

4.1 As we have previously explained within this response, our view is that it is the reliance on extrapolation of future forecast year benefits which particularly brings additional uncertainty. In both the illustrations we cite below, this uncertainty will already exist within a 60-year appraisal – however extending the appraisal timeframe would increase the proportion of benefits from uncertain years such that what might now be only 'uncomfortable' will reach a point where it becomes 'unacceptable'.

Going Beyond Marginal Extrapolation of Final Forecast Year

4.2 Currently TAG recommends the application of demand/market growth beyond the final forecast year. The implicit assumption of this approach is that the benefits modelled in that year continue to apply and can be scaled in this way. Naturally, there are limits to the validity of this assumption; where capacity is constrained (congestion on highways or crowding on public transport) the benefit per passenger will of course change as the market grows. This represents the majority of cases in which transport appraisal is applied.

4.3 Market growth beyond the final forecast year should therefore not be applied in the absence of consideration of the possible impact of capacity constraint. Should natural market growth be moderated to reflect suppression of demand? Or for public transport, should additional costs be included (in do-minimum and do-something) to represent the provision of additional capacity. Both are questions which should have been considered in developing demand forecasts in any case, but thinking needs to extend beyond the final forecast year.

4.4 Even where an appropriate approach to market growth/capacity constraint has been implemented, the effects of changing values of time (VOTs) must be considered. The TAG Databook shows VOTs increasing in real terms (c. 2%) up to 2100 (and presumably beyond). Extrapolation beyond the final forecast year within the appraisal takes account of the benefit of this real growth, but ignores the behavioural response. As VOTs grow, traveller choices change – the likelihood that travellers will choose a quicker but more expensive option increases. The internal consistency of the appraisal is compromised.

Changing Use

4.5 While the consultation document refers to a railway network which is inherited from the Victorian era, only part of the original Victorian network remains operational. That there are sections which have not maintained their originally intended use must also be considered. For example, the sections of railway which have been variously mothballed, converted to other

use (busway/cycleway), built over, or otherwise lost. It is not just the Victorian railway that this applies to. Take for example the 1953 Woodhead Tunnel, which was closed to railway traffic in 1981 just 28 years after its completion, but now is part of the National Grid being used by high tension electricity cables connecting sources of power generation east of the Pennines with sources of consumption on the west. A considerable amount of the UK canal network has also had a long life, but mostly not delivering its originally intended use or benefits.

4.6 A contrary example can also be based on the UK's highway network; various of the structures carrying or spanning the M25 have had to be rebuilt as part of projects to increase capacity to accommodate higher levels of growth than forecast. Although elements of these structures had long design lives, in reality many of them had gone by thirty years.

4.7 The underlying point is that just because elements of infrastructure have design lives of 100 years plus, this provides limited justification for assuming the originally intended benefits will still be delivered. We are living through an age of an unprecedented pace in change, particularly in terms of technology and the increasing impacts of global warming. Placing any weight on benefits which are beyond what we can reasonably anticipate is not justifiable.

Summary

4.8 Our experience of transport appraisal suggests that, within a 60-year appraisal, the final of two forecast years has approximately double the influence of the first. In addition to the extrapolation of years after that forecast year, the process of interpolation between first and final forecast year further influences the NPV and BCR. Extending the appraisal period gives further weight to the second (generally less certain) forecast year and to the even more uncertain extrapolation of it.

4.9 A prime focus of TAG is achieving the highest level of consistency between schemes, for example in the use of TUBA to construct a monetised appraisal from forecast years. A further challenge about extended appraisal periods is the shift in balance of the appraisal to choices the analyst makes about the future market, away from mechanised consistency.

4.10 In summary, as described above, many aspects of monetised appraisal beyond the final forecast year are uncertain and therefore there is considerable uncertainty in all extrapolated benefits. While this has become accepted by the industry for 60-year appraisal (although bringing challenges) we do not consider that the increased uncertainty from extending the standard appraisal beyond 60 years would provide results which can be considered robust enough to form the basis of an investment decision.

4 To what extent do you believe that limiting the appraisal period to a set timeframe is an appropriate way of handling uncertainty? Are there other approaches which might better balance uncertainty with the potential longer-term benefits of investment?

4.11 We do not believe that setting a single timeframe for all appraisals is an appropriate way to handle uncertainty, although as we set out later we do believe there is merit in having a set of standard appraisal periods that can be used as a starting point should there be a case for a bespoke appraisal period. Requiring projects with predominantly short-lived outputs/outcomes to extend the appraisal, for example by repeating (uncommitted and uncertain) investment cyclically up to the set timeframe would be perverse. We believe (see Paragraph 4.15) that it would be inconsistent to unknowingly compare BCRs appraised over different timescales. Later in this document we put forward proposals to make clear to

decision makers what the appraisal period is, as well as set out the BCR performance over different time periods (see Table 5.1 and Table 5.2).

Differential Impacts by Project

5 To what extent do you think that current practice in relation to appraisal periods materially biases against particular schemes or options? What do you consider the source of this bias to be?

4.12 We see no biases relating to the value for money assessment of long-life projects which have asset lives greater than the standard 60-year appraisal period. However, we do see potential difficulties with the approach to appraising shorter life projects and we suggest that this should be an area for the Department's attention.

4.13 At present we consider that there is a degree of confusion about what TAG says and what TAG allows in relation to appraisal periods that are shorter than 60 years. Our experience is that guidance is applied in different ways in different places. We illustrate this below with a case study of the approach to appraising cycling infrastructure.

4.14 While we have no evidence that the way guidance is currently applied results in biases for or against any particular type of scheme, we think that this is potentially important at a programme level. For example, if we cast our mind back to the Eddington Transport Study, the available evidence on the BCR performance of different types of schemes was used to draw conclusions on the relative benefits of different types and scales of interventions. Taken together, decisions made by disparate accountable bodies on how to apply what TAG says on appraisal periods has the potential to influence future policy decisions.

4.15 We also note that we are not convinced that it is legitimate to directly compare the BCR of a scheme appraised over (say) 20 years with one appraised over 60 years. The value for money of a scheme that has a BCR of 2 when appraised over 20 years is not the same as the value for money of an alternative scheme which also has a BCR of 2 when appraised over 60 years. This is simply because the former scheme has a faster return on investment, which to us seems a material consideration when coming to a view on value for money. When BCRs are quoted for schemes appraised over shorter periods, we suggest that this is made clear. This can be done by amending standard reporting (for example the AST and AMCB table) to quote the BCR *and* the appraisal period, as well as amending the guidance on coming to a view on value for money to ask appraisers to explicitly consider the appraisal period. In our response to Question 10 we set out further proposals for how BCRs can be better presented to aid decision making.

4.16 Our suggestion would be there to be a limited number of standard appraisal periods to be used, although we recognise on a case-by-case basis there may be a need for bespoke periods. For example, MHCLG guidance limits appraisal periods to 10, 30 or 60 years. Such an approach would allow meaningful comparison of short, medium and longer life interventions but would also need guidance on how to deal with social residual values. We have covered this point in our response to Question 2.

Appraising Cycling: A Case Study

4.17 As the Department is well aware, in TAG Unit A1.1 the default scheme appraisal period is 60 years from opening date. It is recognised in TAG, however, that this period may not be appropriate for all schemes. There are two principal reasons why a reduced appraisal period may be appropriate:

1. It is considered, or there is established evidence, that the benefits of the scheme would not persist over a 60-year appraisal period
2. The life of the asset is less than the default appraisal period

4.18 The approach taken for appraising cycling scheme is an example where such a reduced appraisal period tends to be adopted. A 20-year appraisal period is the usual approach However, the-20-year appraisal period is not part of TAG *per se*. In TAG 5.1 *Active Mode Appraisal* at Paragraph 3.1.2 it says:

"Most walking and cycling schemes will have finite project lives and/or significant uncertainty around the longevity of impact (particularly for demand management schemes) so that the sixty year appraisal period recommended for large-scale infrastructure projects might not be applicable. […] Where longer appraisal periods are used it is vital that all maintenance and renewal costs during the appraisal period are included in cost estimates."

4.19 The TAG unit goes on to ask the key question, which is how long will benefits really last before reinvestment is required. However, this question is not answered. TAG Unit A4.1 *Social Impact Appraisal*, which covers journey quality benefits is also silent on how long benefits may last and the appraisal period.

4.20 The 20-year period for walking and cycling infrastructure is quoted in the *Active Mode Appraisal Toolkit User Guide*, where in Paragraph 3.16 it says:

"Although large-scale infrastructure schemes for other modes typically assume a 60-year appraisal period, this is generally not recommended for active modes interventions as they are more likely to have more finite project lives and increased uncertainty around the longevity of their impacts. Therefore, most appraisals of cycling and walking infrastructure schemes assume an appraisal period of 20 years."

4.21 Neither AMAT nor TAG Unit A5.1 offer an explanation of why, other than through degradation of the asset over time, benefits may reduce. In the same paragraph it goes on to say:

*"However, some infrastructure schemes **may** be justified in adopting a longer appraisal period (up to a maximum of 60 years), for example if they are considered to have a comparable design life to major road and rail capacity improvements. This is not expected to apply to most active mode interventions. Any appraisal assuming a longer appraisal period must also provide an accompanying justification." [emphasis added]*

4.22 We have looked at historical DfT publications to find the source of the 20-year assumption and cannot:

- DfT's March 2015 document *Investing in Cycling and Walking: The Economic Case for Action* says 20 years should be applied, but no justification is given for this[2]
- The 20-year assumption is likely to pre-date 2015, but we can't locate its source. However, in its August 2014 document *Value for Money Assessment for Cycling Grants*, DfT adopts a 30-year appraisal period for cycling schemes[3]
- While the original October 2013 version of TAG Unit A5.1 has a worked example appraisal using a 20-year period,[4] it does not specify an appraisal period *per se*. This example does not form part of the current (2020) TAG issue

[2] Paragraph 3.29

[3] Paragraph 2.26

[4] Paragraph B.4.2

4.23 We also note that some promoters adopt a longer appraisal period to assess their cycling interventions. For example, at Paragraph 6.3 of the Leeds City Region November 2019 Transforming Cities Fund Strategic Outline Business Case[5] it states:

"Following discussions with DfT during the co-development period it was decided to assess cycling and walking schemes over 30 years. This is longer than the 20-year appraisal period normally used for such schemes, but recognises that the cycling and walking infrastructure provided will be provided to a high standard to match with existing CityConnect infrastructure."

4.24 With regard to the appraisal of cycling interventions, we would like to draw the Department's attention to the following:

- While a 20-year appraisal period is often used for cycling schemes, this time period does not appear in TAG. The AMAT user manual is not guidance
- We cannot find the historical precedent for adopting a 20-year appraisal period, or a justification of why it is more appropriate than any other appraisal period
- With the Department's agreement, some promoters have adopted longer appraisal periods. While we do not question that these promoters are looking to implement high quality schemes that will deliver benefits over time, it is not clear that their proposals are materially better than similar schemes elsewhere appraised by others over a shorter time period
- LTN 1/20 is seeking to better the design and implementation of cycling facilities. There is a reasonable question whether the conventional practice of using a 20-year appraisal period matches the Government's ambition for the standard of new cycle schemes as set out in its 2020 guidance

4.25 All in all, we believe there is a strong case for reviewing the Department's guidance on the appropriate period for appraising cycling schemes and issuing new and definitive guidance on the matter.

Inter-generational Effects

6 Do you think there is a case for reflecting potential inter-generational effects in appraisal?

4.26 We believe there is a case for including inter-generational effects in appraisal.

4.27 We are persuaded by the arguments put forward by Jonathan Aldred[6] in his recent book *Licence to be Bad. How Economics Corrupted Us*.[7] What Aldred reminds us is that as well as costs to the economy, climate change is a threat to life. It can lead to premature death due to a multitude of reasons, some of which are more direct than others. David Wallace-Wells sets these out at length in *The Uninhabitable Earth*.[8] The scale of the impact on life increases with greater warming. Reducing the scale of global warming reduces the number of people who will die because of it.

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[5] **https://www.westyorks-ca.gov.uk/media/3372/lcr-tcf-sobc-final.pdf**

[6] Jonathan Aldred is Fellow and Director of Studies in Economics at Emmanuel College and Lecturer in the Department of Land Economy, University of Cambridge

[7] See pages 205-211 in Aldred J (2019) *Licence to be Bad. How Economics Corrupted Us*, Allen Lane, London

[8] Wallace-Wells D (2019) *The Uninhabitable Earth A Story of the Future*, Allen Lane, London

4.28 The Ramsey Equation implies that lives in the future are worth less than now. This is discrimination against future generations. As stated by Aldred, Frank Ramsey himself called this position "ethically indefensible". The way to avoid this ethically indefensible position is not to apply the pure time preference element (δ) of discount rate when there are intergenerational impacts that affect life. The Green Book already allows a 1.5% discount rate to be applied when there are health impacts so this lower discount rate could be adopted for carbon emissions immediately and in advance of a more thorough review of the what the appropriate discount rate should be. (This argument also applies to how the value of accidents avoided is discounted.)

4.29 The Ramsey Equation also assumes that future impacts on the economy are worth less in the future than they are now, but this assumes that in the future we all continue to get more wealthy in the way that we do now. It ignores that the potential for climate change to be so disruptive that it changes the ways economies function. As Nick Stern notes "what we do now on climate change will transform the circumstances *and income* of future generations and this will determine discount rates"[9] [emphasis added]. In the specific case of climate change, this is an argument against applying the second part (μg) of Ramsey Equation.

4.30 We also note that the impacts of climate change are not just intergenerational, they are extraterritorial. The consequences of UK emissions are not just felt in the UK. While not unique,[10] this adds a further complexity to thinking about discount rates. With extraterritorial impacts, thinking about the UK's marginal utility of consumption is too narrow a perspective.

4.31 We welcome the Treasury's announcement that it will lead an expert external review of the application of the discount rate and that this will be concluded in 2021.[11] Given that transport contributes around a third of the UK's greenhouse gas emissions and that there is a pressing need to accelerate the decarbonisation of the transport sector, the outcomes of this review will be important for future appraisal of transport interventions.

4.32 When it comes to appraising the intergenerational impacts of climate change, we suggest that the Ramsey Equation is potentially part of the problem, rather than the solution. Simply adjusting its inputs is unlikely to produce an outcome that will materially adjust the value for money assessments of either emitting interventions (that is make their BCRs materially worse) or of interventions that lead to worthwhile reductions in greenhouse gases (that is make their BCR materially better). When it comes to climate change, we may need a different way of thinking about how to set discount rates.

4.33 Finally, the UK's commitment to net zero emissions by 2050 is enshrined in legislation. To us, this commitment raises a number of other important issues:

- 2050 is less than 30 years away. The case for reflecting inter-generational effects should be independent of whether or not the appraisal period is extended beyond 60 years
- Assuming that the 2050 target is met (and given legislation, it seems difficult for the Government to adopt any alternative assumptions), when thinking about appraisal the consequence of the 2050 target are that:

[9] Page 81, Stern N (2009) *A Blueprint for a Safer Planet*, Bodley Head, London

[10] Impacts of acid rain on Scandinavian forests and CFCs on the ozone layer are other examples

[11] Para 3.17 HM Treasury (2020) *Green Book Review 2020: Findings and Response*, CP331

- Near term reductions in greenhouse gas emissions should be valued highly as these will have an impact over a longer period
- As we get closer to 2050 and meeting the target the marginal value of a tonne of CO_2e should decline[12]
- After 2050 and assuming the target is met, then the marginal value of removing a tonne of CO_2e should be zero as there is no public policy imperative to further reduce greenhouse gas emissions. Conversely, the marginal cost of increasing CO_2e should be high[13]

4.34 When it comes to thinking about the discount rate applied to greenhouse gas emissions this cannot be done independently from the values that are applied over time. Near term reductions in greenhouse gas emissions can be valued more highly by increasing the price, lowering the discount rate applied, or a combination of both these actions.

4.35 Finally, we note that this approach all assumes that there is trajectory to net zero that can be met through the usual course of policy and programme development. In this the costs and benefits of alternative policies and programmes are considered and the most economic, efficient and effective options are chosen such that net zero is achieved. Such policies and programmes might be outside transport (for example taxation/carbon pricing), but they can affect the relative value for money of alternative transport investments.

4.36 At present the implied approach of Government is that it may be acceptable for a particular intervention to lead to a net increase in carbon as long as the whole programme supports a net decrease. However, this requires an explicit consideration of carbon impacts programme-wide, as well as scheme-by-scheme. Furthermore, should it become clear that the net zero would not be met then it may be necessary to move to a cost effectiveness approach (as for air quality in Clean Air Zones) where the price of carbon is not a consideration, only the reaching of net zero with the lowest social cost.

Appraisal Accounting

7 Do you have any further thoughts on the interaction between the discount rate and the approach to uplifting appraisal values which we should consider in the event that appraisal periods are extended?

4.37 As the consultation document notes “with a shorter appraisal period of 60 years, the issue of the relationship between the appraisal value growth rate and the declining discount rate is less material, however it grows in significance as the appraisal period is progressively extended”. To us, this is a principal reason why the appraisal period should not be extended.

[12] Because (for example) moving from a position of emissions being 25% greater than 1990 levels to one of emissions being 20% greater has a bigger impact on the course of climate change than moving from a position where emissions are 5% greater than 1990 levels to net zero. Climate change effects are not linear

[13] Of course, a future Parliament may legislate for a net negative target or Government may adopt this voluntarily. But, until that happens, once net zero has been achieved there is no additional public policy benefit from further reductions in greenhouse gas emissions and because of this there is no reason for public money to be spent to secure such reductions. In contrast, once net zero has been reached any increase in CO_2e would appear to be a material disbenefit. These could be offset by carbon sinks with the cost of the sink being explicitly integral to the overall cost of the intervention

4.38 While no doubt parameters for appraisal value growth rates and discount rates can be derived that ensures that over time the net discount factor becomes asymptotic to zero, this can be no more than a mathematical artifice. Given the inherent uncertainties about the nature and scale of the future economy, the further we look ahead the lower the confidence we should have in the parameters, but as the consultation document notes, the further we look ahead the greater the importance of these parameters on the results of the appraisal. Looking further ahead makes the results of the appraisal inherently uncertain. We do not think that adopting an approach that makes appraisal outputs more uncertain is helpful to decision makers, or will help with the goal of increasing acceptance and confidence in appraisal outcomes with stakeholders.

Profiling Other Appraisal Impacts over the Long-term

8 Are there any further considerations we have omitted with regards to profiling relevant cost or benefit streams over a longer appraisal period, including environmental, social and wider economy impacts?

4.39 We return to our substantive point that for appraisal to support decision making, there needs to be confidence with its outputs and how they have been derived. Raising the question of how we profile environmental, social and wider economy impacts over a longer appraisal period simply highlights further examples of the difficulties in doing so in a way that decision makers and stakeholders will find plausible.

4.40 Take environmental impacts as an example. When thinking about noise or air quality impacts associated with (say) a new road, it is not just the volume of future traffic that is important. To extend the appraisal period we also need to be able to profile the average noise and pollution emitting characteristics of motor vehicles more than 60 years beyond the road's opening date. Furthermore, we also need to have a view on the public's tolerance of noise and air quality. Historical precedence suggests that it is plausible that that their future valuation of reductions in noise or improvements in air quality are very different to those experienced today. Furthermore, legal standards change over time, for example on what is considered acceptable air quality.

4.41 There is already uncertainty with appraising noise or air quality impacts over 60 years, but this is accepted for most schemes as the monetised noise and air quality impacts more often than not do not have a material impact on the assessment of value for money. Extending the appraisal period will only increase uncertainty. We do not see how this can be done in a way that engenders confidence with decision makers and stakeholders.

4.42 When it comes to Level 3 impacts, these are not currently included within the BCR reflecting the uncertainty in the methods that are used to assess them and that for some, there is no accepted approach to express them in a welfare framework that allows them to be added to Level 1 and Level 2 impacts. Even if the second of these obstacles can be overcome, uncertainty will remain and will only increase over a longer time period.

4.43 Looking at GVA and job impacts, Level 3 impacts are claimed when an intervention results in a change in the scale and distribution of population and employment. Setting aside issues of whether such changes are net to the national economy or to a local area, the changes are with respect to the way that the economy is expected to work in the model forecast years. This already inherently has a set of potentially contestable assumptions, which include that the economy functions in the forecast years in the same way as it does in the base year and specifically that how the economy responds to changes in transport generalised costs over

time in the same way as it does now. Given the overwhelming influence of disruptive exogenous factors such as technology change, it is questionable whether these assumptions hold over 60 years, let alone 100.

Other Appraisal Period Issues

9 How should we determine the appropriate appraisal period for a programme or package of schemes, with potentially different opening dates? Should this differ from the approach taken for a standalone project?

4.44 Two issues are raised in this question:

i. which appraisal period should be used for a programme of projects or packages of a scheme
ii. which appraisal period should be used when assessing the case for delaying or accelerating the opening year of a scheme

Appraisal Period for a Programme of Projects

4.45 TAG guidance indicates that benefits of a scheme should be taken for the length of the appraisal period from the first year these benefits can be realised. Therefore, *prima facie* it would appear appropriate that the benefits of each of the projects of a programme/packages start to be accrued when each project becomes operational. This would lead to overlapping 60-year appraisal periods.

4.46 This is the approach described in Figure 7 of the consultation document and is the most in line with the current TAG principles of consistency and comparability of appraisals. There is, however, a nuance to this approach. Where there exist programme-wide benefits which can only be delivered in full once the entire programme is operational, to us these should only be claimed from the introduction of the last project of the programme, and then for the appraisal period (60 years). Therefore, each of the overlapping projects/packages should only comprise the benefits associated to its standalone implementation.

4.47 There is also a question of programme divisibility and proportionality of analysis. For a programme implemented over no more than a few years (say, 3 or 4 years) and funded as a single programme, we advocate a pragmatic approach:

- At early stages of programme development (for example pre-SOBC or SOBC) a proportionate approach would be to look at the programme as whole. In this case, the appraisal period would start once the full programme is in place. This would mean early benefits from initial phases may not be fully captured in the appraisal but given all the other uncertainties with costs and benefits in an early stage appraisal, this is likely to be an acceptable simplification with no detrimental impact on decision making
- In later stages of programme development (for example OBC and beyond), if the programme is substantial in geographic scope with individual elements having localised impacts, or is made up of disparate scheme that have a range of outputs and outcomes, we would expect business cases to be produced either for different programme elements or sub-programmes. Any programme-wide business case is likely to contain a number of increment/decrement tests that demonstrate that the preferred programme is the optimum way forward. Either approach gives the analytical basis for a more disaggregated profiling of costs and benefits, but rather than develop detailed guidance we would suggest that the Department limits itself to setting out general principles and allowing promoters to develop an approach that supports decision making for their particular programme

4.48 For longer term programmes, it would seem sensible to divide the programme into phases with each phase being the do-minimum for the appraisal of subsequent phases. For example, say a city was looking to promote a three-phase rapid transit network. A pragmatic and proportionate approach would be for early business cases (SOBC or earlier) to consider the network as a whole with benefits accruing from when the full network is operational and then later business cases to look at each phase as an incremental addition to earlier phases.

4.49 Should a promoter have a programme that it is looking to implement over a long time frame, then an approach of splitting the programme into phases and treating each phase as a do-something addition to a do-minimum made up of earlier phases would be a pragmatic way forward.

Delaying or Accelerating the Scheme's Opening Year

4.50 The case for delaying or accelerating the opening year of a scheme is typically considered by promoters as an alternative scenario to the proposed opening year of the scheme. As stated in the consultation document, under current guidance delaying or accelerating the opening date of a scheme results in shifting the entire appraisal period forwards or backwards in time, with the impact generally being limited to a handful of years more or less of discounting/real growth. This would not be expected to materially affect the assessment of value for money.

4.51 In its consultation document the Department says that "in reality delaying a project (for example) is likely to lead to fewer years of benefits being delivered". If the start date of a project is delayed and there is no change to its implementation period, we do not see why this should be the case. While the appraisal period would start at a later date, it would be the same length as if the project were implemented earlier. There would be no change to the period over which benefits are assessed. In such circumstances, we do not see the merit in the suggestion of keeping the end date of the appraisal fixed.

4.52 There can, however, be other consequences of delaying a project which should be identified and considered within a business case, which can have a material impact even with a shift to the start of the appraisal period. These include:

- Delays in decision making causing projects to incur real capital cost inflation that affects both the BCR and project affordability, as well as resulting in promoters to carry the cost of having to re-work business cases and supporting analysis
- A change to the strategic purpose of a project. For example, say a road scheme is put forward with a strategic goal to release land for housing development. If the road is delayed, the local housing need may have to be met by developing sites elsewhere meaning the road is either no longer needed, or it is mis-specified
- The opportunity for cost savings and/or a reduced implementation period and/or minimising disruption during construction is lost. This could be because the ability to combine scheme construction programme with another scheme is lost
- Real additional costs are incurred. An example could be when delay means implementation alongside other schemes, which increases complexity and therefore costs
- If the scheme is part of a wider programme, scheme dependencies mean that that overall case for the programme is weakened as is the case for inter-related dependent schemes

4.53 Each of the scenarios above may require different cost and/or benefit inputs to the appraisal rather than a simple time-shift of the cost and benefit streams.

5 Supporting Decision Making

10 How can we best ensure that decision makers understand the potential value of longer-term assets and the risks, uncertainties and limitations of the analysis in relation to long-term benefits?

5.1 We agree with the Department that decision makers should understand the potential value of longer terms assets when coming to a view on preferred options and on funding decisions. We do not, however, believe that extending the appraisal period is the way to give the understanding that is needed.

5.2 In its *Green Book Review 2020: Findings and Response*,[14] the Treasury notes that:

"While the BCR is a useful metric for capturing quantifiable costs and benefits, there is a tendency to place an inappropriate emphasis on it, in a way that frames value for money as an absolute concept: a proposal with a BCR above a certain arbitrary threshold is seen as offering good value for money, whereas a proposal that falls below that threshold offers poor value for money. Considerable time and effort is expended to 'boost' the BCR that would have been better spent developing and testing the other elements of the business case including its strategic coherence, risk management and the implications of significant unquantifiable factors."

5.3 We understand why focussing on a BCR can be attractive to decision makers. BCRs can be ranked to identify 'better' and 'worse' performing options. Thresholds can be applied to categorise the societal returns that an option delivers. However, BCRs can be treated as having a precision that in reality cannot be supported. The focus on the BCR has the danger of being reductive with analysts and decision makers being incurious about the sources of costs and benefits, and the confidence that should be placed upon these. In general, we agree with what we take to be the theme of Treasury's assessment, which is that over-focussing on the BCR can lead to poorer not better decision making.

5.4 To us, extending the appraisal period is against the spirit of what the Treasury is arguing for in its Green Book Review, which is that more time and effort is expended explaining the strengths, weaknesses and limitation of the appraisal framework to decision makers, and equipping them to weigh up the monetised, quantified and unquantified impacts of an intervention when coming to a decision. Inevitably, this will increase the demands upon their time and some decisions may become more challenging and more judgemental. However, ultimately decision makers are answerable to the electorate for the decisions that they make and it is important that they are equipped to explain the trade-offs that have been made rather than being able to falling back on a technocratic argument and relying on a BCR.

[14] **https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/937700/Green_Book_Review_final_report_241120v2.pdf**

Differential Impacts on Value for Money

5.5 In its consultation document the Department says, "lengthening the appraisal period is likely to improve the value for money assessment of most transport projects". We do not agree with this assertion. A longer appraisal periods will more often than not increase the benefit cost ratio, but as the Department points out in its *Value for Money Framework*[15] the BCR is the starting point for assessing value for money, not the end point. We do not agree for the two principal reasons set out below:

5.6 First, the assessment of value for money should not be independent of appraisal period. It is not just the benefits per pound spent that are of interest. Any commonly accepted assessment of value for money should consider not only the return on the investment, but also how long it takes for this return to accrue. Setting aside any consideration of forecasting uncertainty or risk and for the purpose of this example taking BCR to be the sole determinant of value for money, let's assume that Intervention A is appraised over 30 years and has a BCR of 2.0. Because the returns on investment happen sooner, this is better value for money than Intervention B that also has a BCR of 2.0 but appraised over 60 years. It follows that Intervention C appraised over 100 years and which also has a BCR of 2.0 is not as good value for money as either Intervention A or Intervention B.

5.7 Extending the appraisal period also requires adjustment to the BCR benchmarks that determine the initial value for money assessment.

5.8 Second, an assessment of risk and uncertainty is integral to the assessment of value for money. As the Department sets out in its *Value for Money Framework*, consideration of risk and uncertainty is the third of three elements that need to be considered when coming to a view on value for money.

5.9 As the Department's consultation document says, "there is significant additional uncertainty in appraisal results when a longer appraisal period is used". Going back to our three hypothetical interventions, consideration of risk alone would mean that Intervention A is better value for money than Intervention B which is better value for money than Intervention C, even though all three interventions have the same BCR. This is simply because Intervention A returns benefits sooner than B or C and there is inherently less risk associated with benefits returned over a shorter time frame.[16]

5.10 Increasing the appraisal period is more than likely to increase the BCR. Let's suppose that when appraised over 60 years our Intervention C had a BCR of 1.7 putting it in the 'medium' value for money category. Because of the inherent risks and uncertainties with the extended appraisal period, a BCR of over 2.0 over 100 years should not be seen as sufficient to move this value for money assessment to 'good'.

5.11 Perhaps more pertinently, the inherent risks and uncertainties with longer appraisal periods should not mean that an intervention that has a poor BCR (that is BCR <1.0) when appraised over 60 years should necessarily be considered a low value for money intervention when appraised over 100 years, even in the BCR is greater than 1.0.

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[15] **https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/918479/value-for-money-framework.pdf**

[16] If Interventions A, B and C are radically different and return different types of benefit this may not hold. But for the purpose of this example, treat Interventions A, B and C as if they returned similar benefits assessed using similar techniques

5.12 The consultation document identifies that, all else being equal, a longer appraisal period is likely to favour schemes that generate net revenue. Local public transport schemes and national rail schemes fall into this category, as would any road pricing or user charging proposals. In our view, revenue forecasting is the most uncertain element of the benefit stream. Taking a national rail scheme as an example, in the scheme opening year we should have the highest confidence in the outputs that the scheme will deliver, that is things such as station-to-station journey times, service frequency and the like (although there remains a degree of uncertainty whether the timetable operated will be that assumed in the appraisal). However, yield per passenger is inherently more uncertain. This is for four principal reasons:

- First, with peak and off-peak fares, advanced purchase tickets, single, return and season products and user-specific discounts (young people, older people, etc) rail fares are complex. There are many different ticket products available between any pair of stations. Any method to calculate revenue has inherent uncertainty, even with segmentation of demand
- Second, the revenue in the opening year is dependent on decisions that will be undertaken between scheme approval and scheme opening that are independent of the scheme under consideration, for example the Government's annual decision on the average rate of increase in ticket prices, or a decision to introduce (or withdraw) a product from the ticketing mix
- Third, yields and revenues will be a function of commercial decisions taken by the holder of revenue risk taken after the appraisal is concluded. These can happen both before operation starts and during operation
- Fourth, yields and revenues can be affected by pricing and/or service provision decisions for other modes not considered at the time of the appraisal

5.13 The uncertainty with revenue projections used for economic assessment is the reason why such projections are not used in financial forecasting. Usual practice is that holders of revenue risk will develop revenue models that while often informed by the demand forecasting that underpins the economic case, are independent of it.

5.14 Even before we consider forecasting uncertainty, we therefore start from a position where opening year yield is more uncertain than opening year journey times. This means that revenue is inherently more uncertain than user benefits. The further beyond the second forecast year that revenue is extrapolated, the more uncertain the projection. Experience also tells us that because the way that revenue surplus is taken off capital costs in the denominator of the BCR fraction, small changes in demand and hence revenue can lead to large changes in BCR. To us, this suggests that extreme caution should be applied should an extended appraisal period lead to a materially different BCR for a revenue generating scheme.

Representing Uncertainty

5.15 We welcome the Department's work to develop its 'uncertainty toolkit' and look forward to the outcome of this work. We also welcome the moves to greater use of future year scenarios within modelling and appraisal practice.

5.16 We suggest that there are two principal ways that the ways BCRs are reported can be developed to illustrate uncertainty over the appraisal period. Both of these suggestions are made independent of any consideration of the length of the appraisal period.

BCRs over Different Periods

5.17 We suggest that BCRs be reported using either the first or both of the approaches illustrated in the tables below.

Table 5.1: Reporting BCRs – Option 1

	After 10 years	After 30 years	After 60 years
BCR			

Table 5.2: Reporting BCRs – Option 2

	BCR 1.0	BCR 1.5	BCR 2.0
Years			

5.18 Option 1 has three benefits:

- If decision makers choose, greater weight can be placed on early year BCRs, which as the Department recognises in its consultation document are inherently more certain
- It allows decision makers to understand when benefits occur and if they choose, to place greater weight on interventions that have an early impact
- It allows schemes with different appraisal periods to be properly compared (with N/A being inserted in the table for years beyond the scheme's appraisal period)

5.19 Option 2 is a variation on the 'switching values' approach in the consultation document. It makes explicit the payback period to reach pre-defined value for money thresholds. For many schemes higher thresholds will not be reached. Option 2 also allow this to be made explicit to decision makers. (As an aside, we note that the Department's suggestion to consider switching values around the length of appraisal period to reach a given value for money threshold is an implicit acceptance that how long it takes to get a return on investment is integral to the assessment of value for money.)

5.20 Both Options 1 and 2 could easily be accommodated within appraisals and their adoption would place no additional analytical burden upon scheme promoters.

Strategic Case or Non-monetised Benefits

5.21 As said several times in this response, we agree with the Department that decision makers should understand the potential value of longer terms assets when coming to a view on preferred options and on funding decisions, but we don't think that extending the appraisal period is the way to do this.

Strategic Case

5.22 As a minimum, if promoters believe that that their scheme will lead to benefits after the appraisal period, then this should form part of the strategic dimension of the business case. Similarly, if promoters believe that the need for intervention can only be met by implementing a scheme that continues to return benefits after the standard appraisal period, then this too should be part of the strategic case. Either way, if long-term impacts do not form part of the strategic case, then there is no basis to consider them when coming to a view on value for money.

5.23 Our suggestion is that promoters be asked to state explicitly what will become of the intervention after the appraisal period. As well as setting out potential future benefits, this statement should also set out the nature of any future costs and liabilities. We're not suggesting that these need to be monetised, rather that their nature needs to be set out. This could include making good as an alternative to on-going maintenance and renewal.

5.24 There will need to be realism about what these future benefits and costs could be. For example, it would be unrealistic to say that a new railway will operate the service assumed in the appraisal after the appraisal period. Rather, the construction of a new railway gives future generations the option to continue operating a service, provided that they also continue to invest in the maintenance and up-keep of the line, as well as periodically enhance it. For instance, the consultation document correctly says that in part the West Coast Main Line operates on alignments built in the 1840s. The service that operates today, however, is unrecognisable from that in Victorian times and is facilitated by major enhancements that have operated since – most recently West Coast Route Modernisation completed over the ten years to 2008, electrification in the late 1960s and early 1970s and many other station, infrastructure and rolling stock enhancements, as well as on-going day-to-day maintenance and periodic asset renewal.

5.25 If the Department is to explicitly ask promoters to state what will become of the intervention after the appraisal period and the nature of the potential benefits and costs that this will incur, then it will need to produce guidance on how this should be done.

Residual Value

5.26 We find the proposition to include an assessment of impacts beyond the appraisal period within the set of qualitative impacts attractive. The use of a seven-point scale would offer consistency with the approach to assessing other non-monetised impacts. However, using "residual value" concatenates the assessment of costs and benefits and this is not the approach adopted for any other impact. Our suggestion is that "residual value" is split into two categories: "residual benefits" and "residual costs". As well as potentially benefitting future generations, long-life assets also impose costs upon them (for example maintenance and renewals) which should be included. This should be made clear.

Value for Money Guidance

5.27 Taken together, our response to Question 10 implies a need for the Department to revisit its *Value for Money Framework* to set out its advice on how the costs and benefits of long-life assets should be considered coming to a view on value for money.

6 Potential Ways Forward

11 What are your thoughts on our proposed criteria for identifying the preferred approach?

6.1 In its consultation document the Department identifies six criteria to help assess alternative options for capturing long-term benefits (and we suggest, long-term costs as well). We agree that these criteria will be helpful. However, we suggest that there is an additional criterion, which is “stakeholder credibility and plausibility”.

6.2 Already we find scepticism amongst stakeholders there about the merits of 60-year appraisals. Extending the appraisal period will increase the proportion of the overall PVB and PVC that are extrapolations from the last forecast year. Once explained to decision makers, stakeholders and the public, it has to be questionable whether a situation where a greater share of the starting point for a value for money assessment is based on extrapolation beyond what is generally accepted as the limits of a forecastable time horizon would be seen as a methodological improvement.

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