Department for Transport

Appraisal period

Consultation responses

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Introduction

In December 2020 DfT launched a consultation on how best to reflect the long-term costs and benefits of transport projects in appraisal and seeking feedback on the main challenges of assessing costs and benefits over a longer time frame than the current 60-year period. This document contains unedited responses to the consultation where permission has been given to publish. It contains the vast majority of responses and is for the most part representative of the views expressed. We are publishing the responses in the interests of openness and transparency, and it should be noted that they do not necessarily reflect the views or policy of DfT. The Department's response to the consultation can be found in Annex B of the TAG Update Report.

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West Yorkshire combined authority

WSP

Air Quality Team, AECOM

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?

The 60-year appraisal period is already longer than the design life of most aspects of infrastructure (as set out in Figure 3 in the consultation document). Only tunnels have a longer design life. Examples given in the consultation document of infrastructure assets that are still in use after 60 years or more include the M1. Whilst this road is still being used 60 years after its initial construction, the road has been developed and upgraded in many places many times since the original construction. Any benefits applied to the construction of the road (for example) beyond a certain point would need a way to account for the investment, maintenance and development costs over that extended period. A simple maintenance cost (e.g. replacing the road surface) would seem insufficient to capture the true cost of that piece of infrastructure remaining in use to bring out the identified benefits.

The main challenges in assessing long-term benefits beyond the current 60-year appraisal period lie largely in determining appropriate scenarios for assessment/modelling and then appropriate methods for scaling or interpolating between and beyond those points for example for air quality and greenhouse gases. For example, a linear extrapolation would bias the results to the latest model year.

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

There are a number of sources of uncertainty associated with both the traffic modelling that underpins the appraisals and specific aspects or inputs from the more specific appraisal topics (e.g. environment). The further into the future projections are undertaken for, the greater the level of uncertainty associated with those projections.

Emission rates used in air quality assessments only project as far as 2030, so there is already a large amount of uncertainty in any predictions beyond that point. Increasing this beyond 60 years would only increase that uncertainty level even more. From an air quality perspective, the key areas of uncertainty, particularly in establishing suitable emission rates to use in assessments, would be:

- Uncertainty in fleet growth and turnover over time

- Adoption of new technology
- Developments in technology not currently anticipated

Also, within the air quality and greenhouse gas assessments is the damage cost associated with these emissions and how that changes over time.

In carrying out the air quality appraisals the other key input is the traffic data and over time there are a number of uncertainties associated with the development of future traffic numbers:

- Growth in traffic flows over time
- Composition of the vehicle fleet
- Additional schemes/developments that would affect future baseline (do minimum) flows
- Potential for change in use of schemes as new technology is developed

4. To what extent do you believe that limiting the appraisal period to a set timeframe is an appropriate way of handling uncertainty?

Limiting the appraisal period to a set timeframe does seem like an appropriate way to manage uncertainty. For example, constraining the length of the appraisal period to a “core” scenario of a specific length, then a further sensitivity test could be carried out over a longer appraisal period to recognise the greater uncertainty of longer-term projections.

Dr David Metz

Honorary professor, Centre for Transport Studies, University College London, in a personal capacity.

This submission addresses the overall approach (Q1).

The standard approach to the appraisal of transport investments is based on the estimation of user benefits, mainly the saving of travel time. Clearly, uncertainty increases as more distant future benefits are considered. Factors that would need to be taken into account in estimating future demand include:

Population growth. The Total Fertility Rate (the average number of children born to a woman over her lifetime) for the UK is 1.89, below the level of 2.1 needed for a stable population, and the lowest on record. Many developed countries have lower rates: Germany 1.45, Italy 1.44, Japan 1.41. So, we may experience future population decline, although decisions on immigration would affect the outcome.

The relationship between income growth and travel demand. The average distance travelled by all surface modes has not increased this century (NTS data), suggesting an uncoupling of the relationship between GDP growth, income and travel demand. There is evidence for the saturation of demand for daily travel.

More generally, it is impossible to validate the performance of models far into the future. Lack of validation contributes to optimism bias in modelling generally. Models are complex and opaque, with the value of many parameters to be chosen based on expert judgement, such that outcomes can often reflect the preconceptions of those who commission the modelling. The Green Book and TAG provide uplift factors for costs to allow for optimism, but there is no equivalent for benefits.

There is evidence for optimism bias in demand estimation, particularly when competitive bidding is involved, as for rail franchises in the UK and toll road concessions in Australia. Some winning bids have been too optimistic in projecting future revenues, such that rail franchisees have withdrawn, and toll road investors disappointed and consultants successfully sued.

Given all the uncertainties, extension of the appraisal period beyond the current duration would be unwise. The possibilities of benefits beyond 60 years might be regarded as a bonus that could increase confidence in an investment that offers an acceptable BCR within that period, as well as to counter optimism bias in demand estimation.

I imagine the interest in extending the appraisal period arises from the HS2 Business Case, where extending to 100 years generates a small increase to the BCR that is otherwise in a low value for money category. Notwithstanding the arguments above, there could be a case for extending the appraisal period for HS2 on account of the expected changes in land use.

There has always been an inconsistency in supposing time savings to be the main user benefit of transport investment, given that average travel time as measured in the NTS has hardly changed over almost fifty years, despite huge investment justified by the saving of travel time. The explanation is that time savings are short run. In the long run users take advantage of faster travel to travel further, to gain more access to people, places, opportunities and choices. Increased access leads to changes in land use and in the built environment that are mainly long term.

Accordingly, it could be appropriate to appraise the long-term benefits of transport investment as part of consideration of its long-term impact on the wider built environment. In the case of HS2, this would involve assessing the prospects for business and residential property development at locations whose access is enhanced by the new rail route. That is not to say that changes in land use would continue over a long period. They may well take place fairly quickly, both before and after the rail route opens, although there would be long-term benefits from the improvements to real estate. There are many uncertainties about such developments, both planning and commercial, but these uncertainties are directly relevant to policy objectives and therefore worth addressing, unlike the uncertainties about long run travel time savings.

The underlying question concerns the nature of the long run economic benefits of transport investment. While an extensive methodology has been developed based on time savings as the main part of generalised costs, time and money are importantly different. Time acts as an independent influence on travel behaviour. The long run impact of investment is to increase access within a time constraint. Such increased access is the benefit to users and results in changes to the use and value of land made more accessible.[1]

In conclusion, if appraisal focuses on time savings to users, then extension of the appraisal period is not justified. If, however, the focus is on increasing access to the built environment, then a longer timeframe might be warranted.

4 January 2021

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[1] For a full discussion see D. Metz, Time Constraints and Travel Behaviour, *Transportation Planning and Technology*, 44, 2021, available online.

Geoff Smith

FCILT, Technical director at Jacobs, responding in a personal capacity

Overall Approach

Q 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?

Response:

There is a clear case for changing the appraisal rules to account for some of the largest infrastructure schemes in the UK such as HS2 which will produce a new transport corridor which will be available for the long term. Equally many of our major motorways were built in the 1960's and 70's and look like they will have valuable life beyond 60 years – although many are effectively being rebuilt as smart motorways at present suggesting that the land purchase, earthworks and tunnels are the long term assets and the capacity was used up so the initial journey time savings were getting eroded.

There are a number of challenges associated with changing the 60 year appraisal period;

- Comparison between projects – once we change the basic rules it will be more difficult to compare projects, such as, HS2 vs Transpennine upgrade vs smart motorways vs smaller schemes.
- If we allow longer appraisals it opens the question – when / how do we decide on the end point? Will we end up with a myriad of appraisal periods?
- How do we produce realistic forecast model years to avoid extreme extrapolation of benefits?
- How realistic are forecast benefits over long appraisal periods without taking account of the economic cycles (economic downturns/ crashes) and impact on transport demand / benefits?
- How do we realistically foresee the long-term future to make longer appraisal periods realistic? There may have been a resurgence in rail demand in the last 20 years or so but there was a substantial decline in use for several decades after the second world war. Many railways have existed for over 100 years but many more were shut

well before that! How do we value their second life as walk/cycle ways? A TV series on abandoned infrastructure highlights that not all projects have a long life.

Market-based residual value approaches

Q 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?

Response:

Current guidance allows for a residual value of the assets of the infrastructure to be included within the cost benefit analysis although heavily discounted at the end of the appraisal period. Consideration should be given to revising the discounting of the residual value to make this more valuable than currently allowed. The advantage of this approach is it is based on the estimated costs which are less subject to error than the very long-term modelling assumptions for benefits (economic, environmental or social).

You favour extrapolation of opex and benefits but this approach is faced with more uncertainty which could be fundamental such as technology change, behavioural change, economic restructuring. It is difficult to forecast input assumptions such as GDP, fuel costs, population and employment over the longer term. Also, model parameters and appraisal values may change (elasticities, mode choice, value of time, health, agglomeration).

Further, economic appraisal rules have increased the technical complexity of producing business cases within my career, resulting in higher costs for scheme promotors and I wonder how many worthy projects are not brought forward as the local authorities are unable to afford the technical development work. I would strongly recommend that the extension of appraisal periods is brought in for only the largest transformational projects and not for smaller projects other than residual value.

Treatment of uncertainty

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

Response:

I have outlined in response to the previous questions some key aspects of uncertainty including economic cycles, technology, economic restructuring, model input parameters. We could add to that – wars, environmental catastrophes, political upheaval and pandemics. Our only way of looking at the potential uncertainties over the long-term is to look back to 1921 and the changes in-between. Then the world was reliant on railway systems and most people did not have personal travel other than walking. Cities (outside London) were constrained in size based on haw far people could walk to work. There was no telephones or televisions, who could have forecast the mobile phone or mass ownership of cars back then? We did not have the NHS. There wasn't the service industry of today and most people were employed in manufacturing or food production. There was

also no TAG / PDFH or cost benefit analysis or demand modelling which was only made possible by the invention of computers.

My vision for the future would be further advancement in computing power and speed so that we could analyse the highway network in real time and use machine learning from previous days, weeks, years, conditions so that signals would be optimised and messaging more reliable. This could have wide ranging impacts – potentially more personal travel as capacity would be optimised – or it could link to the widely talked about Mobility as a Service (MaaS) which would arrange my best option – be that modal, temporal or not to travel and use Teams/ Skype. That would change the demands limiting the 'benefits' of capacity investment.

Q 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?

Response:

Alternatives to setting the appraisal period are to use modelling of demand and capacity to determine the realistic period of benefits and to use scenarios to test uncertainties. I understand this is being advocated by the DfT. Capacity analysis should already be part of the appraisal checks by practitioners. For rail – the train services have a finite capacity so there should be a demand cap at least. For roads, in my experience modelling further highway demand growth in a further forecast year would tend to reduce the benefits (if the model converges with the levels of congestion throughout!). Capacity analysis and additional forecast years should be part of any consideration of extending the appraisal period.

The appraisal period should be limited to the asset life. For urban realm schemes we use 15 to 20 years for the appraisal. I think walk and cycle schemes should also use shorter appraisal periods. Bus priority schemes should be tested with 5 year appraisal period – as many bus lanes have been removed by incoming politicians in several cities in the UK.

Differential impacts by project al

Q 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?

Response:

Yes, rail due to the structure of the rail industry rail appraisals have high ongoing costs (particularly due to rolling stock leasing) and, so long as there remains capacity, the appraisal could be extended on the same basis and would lead to higher benefit cost ratios. For roads the further forecast years would limit the benefits – change the shape of the curve before extrapolation and lower the benefit cost ratio.

Inter-generational effects

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

Response:

Yes, where there is a key loss to environmental assets. This should be looked at early in the option selection and design process as it could have a material impact on the route chosen.

Also, would the intergenerational effect of the value of the new asset be considered in the same way. The value of transformational connectivity could materially affect commuting patterns, house purchase decisions based on the permanence of the solution.

Appraisal accounting

Q 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?

Response:

It seems illogical to me to lower the discount rate over time. Over longer periods of time unknown/ unforeseen changes are more likely to happen and we would value the promise of the return at a lower rate (extending the argument of would you prefer me to give you £5 back tomorrow as a better option than giving you £5 next year). We can use the discount rate to account for some of the uncertainty in longer appraisal periods.

Profiling other appraisal impacts over the long-term

Q 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?

Response:

We would expect the TAG databook to provide appropriate information for longer appraisal periods. I would expect that to be a challenge for DfT.

Other appraisal period issues

Q 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?

Response:

I have been discussing exactly this with DfT Rail on a business case under consideration and we considered the best approach was to assess each option over 60 years of operation (delaying the investment by 5 years in 3 options). For a package each benefit stream should be appraised over 60 years from when it starts.

It is a good test of a scheme to examine a scenario of delaying the investment!

There seems to be a strong case for setting a maximum appraisal period of 100 years.

Supporting decision making

Q 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?

Response:

I think the issue of the scheme assets, their expected life and the expected life of the benefits stream should be presented to decision makers and I support the presentation of the benefits in the bands you suggest. Making decision makers appreciate the longevity of the project options will support the Green Book change to emphasise ‘cost effectiveness’. It will be interesting to see how this would play out for highway schemes and for bus / tram / rail schemes.

Potential ways forward

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

Response:

I support the potential ways forward and criteria suggested, except for the assumption that the way forward is to ‘reflect the full range of social costs and benefits’. I would recommend further analysis of the residual value approach and options to increase the value in the appraisal instead of adding complexity.

I hope that this response is helpful and thank you for the opportunity to contribute to the development of future appraisal guidance.

Please note that this is a personal response and does not necessarily reflect the views of the company I work for, but I have drawn from my experience of appraisal over 36 years within several organisations I have worked for including local government.

Response to DfT's Appraisal Periods Consultation

January 2021

Introduction

Highways England is pleased to respond to DfT's Appraisal Periods Consultation. Our response contains two sections:

1. Response to each consultation question. While some of our responses draw on the expert advice note, the views in this section are Highways England's.
2. An expert advice note prepared by Peter Mackie and Richard Batley of the Institute for Transport Studies. This note sets out the broad context in which the transport appraisal periods debate should be seen and discusses the theoretical and practical issues connected to making any such change.

Highways England's Responses to the Consultation Questions

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?

Highways England supports the proposal to include long term scheme impacts beyond the existing 60-year appraisal period. We are keen to work with DfT to help ensure that the methods strike the right balance between the desire to capture long-term impacts, practical implementation challenges and the greater uncertainty associated with estimating long-term benefits.

Case for including long-term scheme impacts

The consultation document explains that much of the transport infrastructure we use today is more than 60 years old and will continue to be in use for many years to come. There are some exceptions but many rail assets were constructed in the Victorian age and much of our motorway network is approaching 60 years old with no expectation that they will cease to be used.

In this context it is clear that many – though not all – transport schemes will have delivered benefits and incurred costs beyond 60 years. The same is likely to be true for future schemes and it seems appropriate to try to capture these impacts in scheme appraisals.

In principle the appraisal period should cover the expected economic life of the scheme.[2] If that time period is greater than 60 years, the appraisal period for that investment should be longer than 60 years.

However, there are difficulties in putting this into practice. Without perfect foresight it is not possible to say with certainty what the economic life of an asset is, whether it will be terminated by technical or economic obsolescence, and when that will be.

[2] Note that this is distinct from the asset's design life: assets can be renewed at the end of their design life and continue to deliver benefits. The economic life is the period over which the scheme is expected to deliver benefits to society.

Looking back in history, it would have been impossible to predict at the time of opening that the West Coast Main Line would continue to be operational for more than a 150 years whereas the Great Central Main Line would have closed less than 70 years after opening. This lack of perfect foresight combined with a desire to ensure comparability between appraisals for different transport schemes this means that we will need to select a standard appraisal period.

Any standard appraisal period will be too short for some schemes, approximately correct for other schemes and too long for still other schemes. We won't always know *ex ante* which specific schemes will fall into which category, but in aggregate we may have a view about the minimum period over which the majority of schemes will continue to deliver benefits. Historically, this seems to be longer than 60 years and sometimes more than 100 years. So, in hindsight it would have been appropriate to use a longer appraisal period for some historical schemes.

Ideally, the length of a standard appraisal period would be selected in light of strong evaluation evidence of the period over which a wide range of different transport schemes have delivered benefits. We are not aware of any such evidence but would encourage DfT to review its own archives to see if such evidence is available. Once a judgment has been reached on the appropriate appraisal period based on historical evidence, the next question is whether the same appraisal period will be appropriate for future schemes.

Overall, we think it likely that most future schemes will have the potential to deliver benefits for more than 60 years on the assumption that there are sufficient investments in maintenance and renewal over that time period. On this basis we think that capturing the long-term impacts of schemes is the right thing to do in principle.

Main challenges

We see a number of challenges with attempting to capture the long-term impacts of schemes, particularly where the approach to doing so is to estimate long-term social benefits and costs. We note that some of the practical challenges might be reduced if a market-based residual value approach were implemented although this would give a poor indication of the long-term social value of the asset. Our response to question 2 discusses this issue in more detail.

In this section we focus on the challenges associated with estimating benefit streams beyond year 60. These include the difficulties of forecasting travel demand two generations into the future and the fact that with a longer appraisal period, a much greater proportion of total benefits will be outside the modelled periods and so subject to much greater uncertainty.

The main difficulty is that if benefits are only measured at, say, year 1 and year 20, that leaves the bulk of the appraisal period depending on extrapolation of the benefits stream far outside the conditions in the modelled years. This is, of course, already a problem with a 60-year life. So far, the solution has been to impose some form of demand cap at some point (e.g. the design year or horizon year) and to assume that traffic conditions either remain stable thereafter or grow only in line with population

growth. However, relying on such an assumption for over half the discounted benefits could adversely affect the robustness of the cost benefit analysis.

As part of its proposal to extend the appraisal period DfT should consider in detail how to extrapolate benefits beyond the final modelled year, including both demand growth and the growth in appraisal values. Various approaches are available. The consultation document notes three possible approaches for growing appraisal values (zero growth, assumed population growth or assumed traffic growth); other approaches may be available too

The demand cap approach can have different effects on different schemes. This was discussed extensively in the long-term benefits report (Arup/ITS, 2016)[3]. Consider an inter-urban scheme which will have enough capacity to last a very long time. Capping traffic growth at a certain year for the rest of the appraisal period would probably understates 'true' benefits over the rest of the appraisal period. But now consider road capacity schemes in congested areas, in peak periods such parts of the network will be at minimum speed in the do-minimum and will probably be close to capacity in the do-something by the design year. Capping traffic may actually increase benefits relative to what would happen in the appraisal without capping. So the issues about demonstrating the relative value for money performance of different parts of the roads programme would intensify.

It is also worth reflecting that despite this additional uncertainty, in the presence of a demand cap extending the appraisal period will not have any impact on the choice of preferred solution for a scheme. For a given scheme, a longer appraisal period will have the effect of increasing the sum of discounted benefits and costs for each option and would have any significant impact on the relativities between scheme options.

Another challenge is that future travel modes and behaviours may look rather different to historical trends, and the further into the future we seek to appraise scheme benefits the more likely it is that today's expectations will be significantly different to the future reality. A particularly important point here is that life expiry may occur not for reasons of technical obsolescence but for reasons of market obsolescence. So, for example, if road travel is partially supplanted by telecoms or hyperloops, or if the efficiency of road travel is revolutionised by technology, or if there is large scale behavioural change, then some capacity may become redundant before the end of its technical life. If we look back to the economic and technical conditions of the transport market in the interwar period and compare that with today, that gives us an indication of the task of predicting the market at the turn of the next century.

Overall, there will be a great deal of uncertainty to be factored into the assessment, a point which we discuss further in our responses to questions 3 and 4.

That being said, we are confident that an approach can be found which strikes the right balance between the desire to capture long-term impacts, practical

[3] Arup/ITS Leeds (2016) 'Research into Appraisal of Long Term Benefits of Transport Schemes'

implementation challenges and the greater uncertainty associated with estimating long-term benefits. We would be pleased to assist DfT should it be helpful.

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?

We consider that the Green Book approach of calculating market-based residual values at the end of the appraisal period is theoretically correct where the asset has reached the end of its economic life and will not deliver social benefits beyond the end of the appraisal period.

In principle, a different approach is required where – as per the current TAG approach – the formal appraisal period is set not on the basis of expected economic life of the individual investment but rather to ensure comparability between different transport investment proposals. In this case the expected economic life will typically be longer that the specified appraisal period and the asset will continue to deliver social benefits well beyond the end of the appraisal period assuming, of course, that the asset's continued operation is ensured by an appropriate maintenance and renewal regime.

In this context Highways England can see clearly the merits in DfT's proposal to adopt an approach that is based in some form on consideration of the full flow of social costs and benefits that may accrue after 60 years. However, we can also see some challenges stemming from both uncertainty and the limitations of today's economic modelling / appraisal to provide a reasonable estimate of social impacts in two or three generations' time.

We note DfT's statement in the consultation document that *"while we welcome views on alternative approaches, for appraising the value of schemes beyond 60 years it is unlikely we will adopt an approach that is not based in some form on consideration of the full flow of social costs and benefits that may accrue after 60 years"*. However, given the substantial uncertainty associated with estimating long-term benefits (see discussion below) we think it would be worth DfT considering the extent to which adopting a residual value approach would strike a reasonable balance between the desire to reflect long-term scheme impacts and the risk of introducing so much uncertainty to the estimates that they are of limited help to decisionmakers relative to the more robust estimates of short term impacts.

Highways England does not have a firm view on the most appropriate method of estimating the residual value were such an approach to be adopted. However, we are optimistic that a pragmatic way forward could be found.

In the remainder of our response we focus our feedback on the pros and cons of a longer appraisal period, such that we can respond fully to the questions raised in the consultation document. Notwithstanding this, we think that the pros and cons of a

residual value approach deserve further exploration before a final decision is taken.

Treatment of uncertainty

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

Two dimensions of uncertainty are particularly important in the context of extending the appraisal period:

a) the precision of models – in terms of both inputs and outputs – may impact upon the robustness of appraisal results

b) modelling and appraisal would be conducted over longer timeframes within an increasingly uncertain world

Linked to these overarching dimensions of uncertainty are more specific considerations around demand-side and supply-side uncertainty. The consultation document provides a good overview of these.

Highways England agrees that key drivers of demand-side uncertainty include:

- exogenous input assumptions such as gross domestic product, fuel costs, population and employment
- modelling parameters which are used to convert these exogenous drivers into impacts on travel demand, such as demand elasticities and mode choice parameters
- appraisal values, such as forecast values of time, health impacts and agglomeration elasticities.

In addition to these we note that there is also substantial uncertainty around future technologies – including potential new transport modes – and behavioural changes which may have substantial impacts on transport demand and potential obsolescence of investments.

There is also the potential for future unexpected shocks to have substantial and longlasting impacts: the recent shock due to the Covid-19 pandemic illustrates that short-term impacts of a shock can be unequal across transport modes although the longterm effects are yet to be seen. Either way, the potential for unexpected future shocks and the greater likelihood that a shock occurs within a longer appraisal period adds to the weight of uncertainty.

On the supply-side, Highways England agrees that it is hard to conceive a plausible state of the world in 100 years' time where no further non-committed projects are brought forward to meet growing demand. It will be important for DfT to consider how best to specify the Do Minimum in the context of a longer appraisal period.

Of course, many of these sources of uncertainty also apply to a 60-year appraisal period. But there's no doubt that any estimated benefits and costs between years 61 and 100 will be significantly more uncertain than those for earlier years. If the

appraisal period is to be extended it is essential that uncertainty is treated appropriately and proportionately in appraisal.

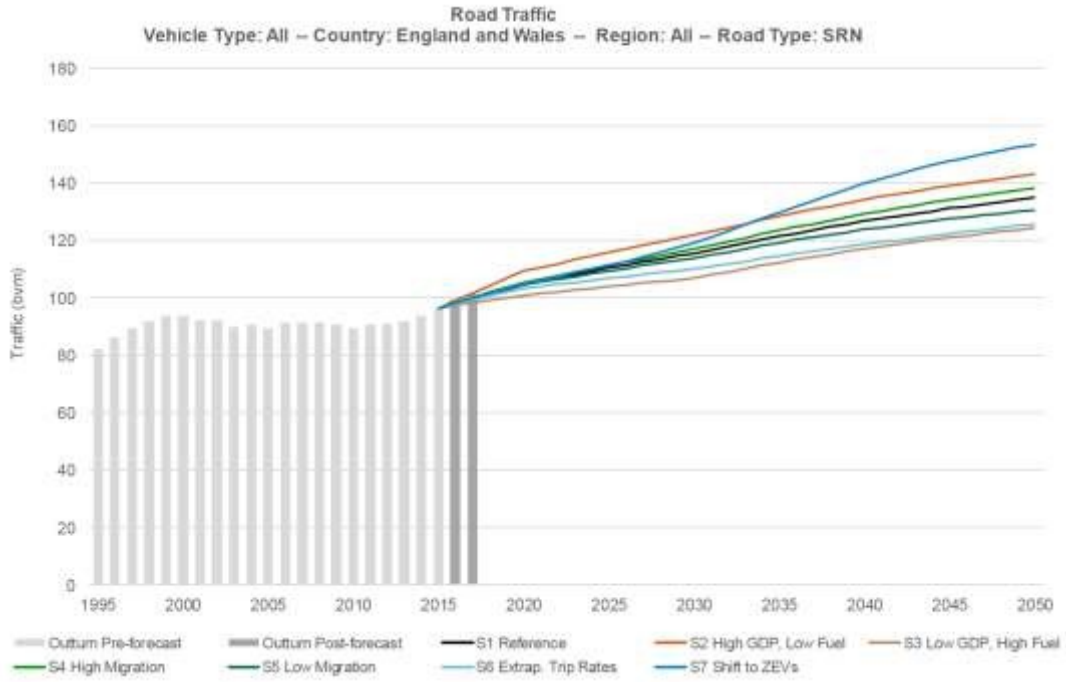
4 To what extent do you believe that limiting the appraisal period to a set timeframe is an appropriate way of handling uncertainty? Are there other approaches which might better balance uncertainty with the potential longer-term benefits of investment?

Highways England notes that this consultation does not seek views on how we handle uncertainty in modelling, appraisal and decision making in general and so we restrict our comments to how best to handle uncertainty in the context of a longer appraisal period.

Limiting the appraisal period to a set timeframe is one appropriate way of handling uncertainty but the effectiveness of this approach depends on both the time period chosen and a number of outside factors. However, it should not be the only method through which uncertainty is handled and must be used in conjunction with other approaches.

There is little doubt that short-term forecasts of GDP, population growth, transport demand etc. are less uncertain than are long-term forecasts. The concept of increasing uncertainty over time is recognised and illustrated through the use of fan charts by many organisations including the Bank of England and the Office of Budgetary Responsibility. DfT's road traffic forecasts also recognise that uncertainty increases the further into the future we look, as illustrated in the below figure.

Figure 1: Vehicle miles for England & Wales on the SRN



Source: Department for Transport, 'Road Traffic Forecasts 2018

All else being equal, limiting the length of the appraisal period will limit the amount of uncertainty in an appraisal. And so any proposal to extend the appraisal period must consider how it will handle the greater uncertainty that this will lead to.

There are a number of different possible approaches to handling uncertainty in the context of a longer appraisal period. The Uncertainty Toolkit will provide new ways of handling uncertainty and we hope that these will help to address the additional uncertainty deriving from a longer appraisal period. But we cannot comment further on this until the Toolkit is available.

In the context of a longer appraisal period we consider that it will be more important than ever to properly illustrate the sources of uncertainty and to demonstrate how different assumptions of the future affect appraisal outcomes. It will be important to place increased focus on scenario and sensitivity analyses and to make the range of possible costs and benefits easy for decisionmakers to understand. Uncertainty fans can be an effective way of doing this.

There is also a question about how – in the context of greater uncertainty – appraisal practitioners should convert the range of possible outcomes illustrated through uncertainty fans into certainty equivalents. For example, there is the need to consider whether the uncertainty fans are symmetrical around some central scenario or whether, in practice, the downside relative to the central case is greater than the upside. If that were to be the case, then it would be wrong to use the central scenario as the best measure of the (mean) expected value.

Asset life and maintenance

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?

This question only partially links to the discussion in the consultation document. We first provide our views on the specific proposal set out in the consultation document and then address the broader question.

The consultation document sets out the possibility that appraisal periods could be tied to the design life of an asset. Highways England sees little merit in such an approach and questions the practicalities of implementing it.

Highways England's schemes typically involve investment in a wide range of different assets including road surface, structures, vehicle restraint systems, drainage, technology and geotechnics. Each of these assets has a different design life, ranging from a few years for technology assets to more than 100 years for structures assets. It should also be noted that some assets are formed of hundreds of different elements which themselves have different design lives.

Would the approach floated in the consultation document imply that a different appraisal period should be used for each asset? We think that would be the wrong approach. Indeed, the benefits of our schemes do not derive from investment in individual assets but from the combined investment in all assets that are part of the

scheme. For example, investing in a vehicle restraint system would deliver no benefit to road users if there was no road surface for them to drive on and no bridge over the river. Similarly, we cannot attribute the overall benefits of our scheme to individual assets. From our perspective, it is not correct in theory to try to tie appraisal periods to the life of individual assets and would be problematic to introduce in practice.

Instead of using a different appraisal period for each asset, perhaps the idea is that the appraisal period for a scheme should be based on the life of either the shortest-lived or longest-lived asset which forms part of the scheme. The former approach would be problematic as the shortest-lived asset may be just a few years and a substantial portion of benefits would be missed. The latter approach is more realistic because relatively short-lived assets could be maintained and renewed such that they continue to operate until the end of the longest-lived asset's design life. But then the longest-lived asset could also be maintained and renewed to ensure its continued operation and so design lives do not provide a firm basis on which to set the appraisal period.

For Highways England schemes, each of our assets can be maintained and renewed to ensure their continued operation over an indefinite period. We currently include operation, maintenance and renewals costs in our scheme appraisals such that we can assess the extent to which benefits over a 60-year appraisal period outweigh costs to the broad transport budget over that same period.

Rather than tying appraisal periods to asset design lives we consider it is appropriate to set a consistent appraisal period for all schemes. This would be subject to there being sufficient evidence that the scheme will continue to deliver benefits over that period and perhaps an assessment that funding is likely to be available to maintain / renew the scheme to ensure its continued operation over the appraisal period. This approach will retain the ability to compare schemes on a consistent basis.

On the broader question, Highways England considers that the current practice of using a fixed appraisal period for all major transport schemes rather than one tied to asset design lives is unlikely to have a systematic material bias against particular types of schemes or options.

Outside of major transport schemes it is plausible that there could be some bias against cycling and behavioural change schemes by virtue of the shorter appraisal period used for these schemes. However, it is equally plausible that this is just a reflection of reality. To judge which of these is correct we would need some evaluation evidence of whether relevant infrastructure schemes are maintained and renewed to ensure their continued operation beyond their design life. If so, it would be reasonable for cycling schemes to use a longer appraisal period and include the estimated maintenance and renewal costs in their appraisal. For behaviour change schemes, we would need some evaluation evidence of the duration over which behavioural changes persist in order to judge an appropriate appraisal period.

Inter-generational effects

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

We consider that there may be a case for reflecting potential inter-generational effects through a sensitivity test in appraisal but we note that if this is applied only to the largest transport schemes there is a risk that the approach introduces a new bias in appraisal against small schemes.

The Green Book states that these considerations should be included in appraisal where *"the possible effects…are long term and involve very substantial or irreversible wealth transfers between generations"*. [4] DfT's consultation document states *"Arguably, some major transport projects fall into this bracket"*[5] which seems to imply that inter-generational effects would only be estimated for some major transport schemes and would not be included in the appraisal of other schemes.

The consultation document shows that using the Green Book methodology to include intergenerational effects in appraisal can have a substantial impact on estimated benefits. DfT's illustrative analysis shows that benefits would increase by at least 13% over a 60-year appraisal period and 19% over a 100-year appraisal period. For these appraisal periods, the later the opening date, the greater would be the boost to benefits by including intergenerational effects.

We note that there are alternative methodologies in the academic literature for capturing intergenerational effects. For example, the Intergenerational Redistributive Effects Model provides a more detailed approach than that set out in the Green Book and other specific methodologies may be available. It would be worth comparing the merits of the Green Book approach with those of other methodologies before determining whether and how to include intergenerational effects in transport appraisal.

Highways England agrees that if these effects are included in appraisal they should initially be a sensitivity test rather than included in the core analysis. This approach would go some way towards limiting the risk that the new approach has an unintended consequence of biasing transport investment towards the largest schemes by virtue of a methodology that has not been fully tested or debated in the context of transport appraisal. However, it is not eliminated entirely because sensitivity tests are important factors considered by decisionmakers and could potentially be a key part of any decision to proceed. DfT should consider how the results of this sensitivity test should be treated in advice to decisionmakers, particularly if it would only be available for a subset of transport schemes.

We would support efforts to more fully understand intergenerational effects in the context of transport schemes. Key areas on investigation should include the extent to which different types of transport investment result in intergenerational costs and benefits (e.g. by mode, funding method, investment value, scheme objectives etc.);

[4] HM Treasury (2020), 'The Green Book', page 122, paragraph A6.20
[5] DfT (2020), 'Appraisal and Modelling Strategy Appraisal Periods Consultation', page 21

available methodologies for capturing intergenerational effects; and the potential for including these effects in the core analysis over time.

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?

Highways England considers that the same economic growth assumption should be used to uplift appraisal values as is embedded in the discount rate. We consider that this principle should apply to all appraisal years, not just to the very long term. So if the long-term growth assumption used to uplift values is to decline in line with the discount rate, we consider that the shorter term growth assumptions used to uplift values should match that embedded in the discount rate.

On the specific long-term issue raised in the appraisal document we acknowledge the strong support for a declining discount rate based on economic growth uncertainty given in Arrow et al.'s (2014) expert review:[6]

"We have argued that theory provides compelling arguments for using a declining certainty equivalent discount rate. In the Ramsey formula, uncertainty about the future rate of growth in per capita consumption can lead to a declining consumption rate of discount, assuming that shocks to consumption are positively correlated." (p154).

If DfT also takes the view that the declining discount rate is driven by uncertainty in economic growth, it would be appropriate for the growth assumption used to uplift appraisal values to decline in line with the discount rate. However, this change to appraisal guidance cannot be made in isolation: if the principle of tying the growth assumption used to uplift appraisal values to that embedded in the discount rate applies in the longer term, the same principle must also apply in the short-term.

Economic growth assumptions in appraisal

As noted in the consultation document, economic growth assumptions play two key roles in value for money analyses:

- many appraisal values are uplifted over time in line with real GDP per capita growth rates
- estimates of benefits and costs are then discounted using the discount rates specified in the HM Treasury Green Book, which is based on an assumed real GDP per capita growth rate

In theory, the same growth rate of real GDP per capita should be used for uplifting appraisal values and discounting and any change to the Office for Budgetary Responsibility (OBR) real GDP per capita growth forecasts should be reflected in both the uprating and discounting assumptions. So, following the March 2020 change

[6] Arrow, K.J et al (2014) 'Should Governments Use a Declining Discount Rate in Project Analysis?' Review of Environmental Economics and Policy, 8 (2), pp145-163.

we would see a drop in the uplifting values of 0.5 percentage points on average, and a drop in the discount rate by 0.5 percentage points.

However, we recognise that the 2020 version of the Green Book has retained a growth assumption of 2%. This is unfortunate as it potentially opens a significant discrepancy between the uplifting growth assumption and that used for discounting, leading to appraisal results that are substantially incorrect.

This discrepancy could be remedied by tying the growth rate used for uplifting values to that embedded in the discount rate for the full appraisal period, including both the short term and the declining rates in the longer term.

A second-best solution with near-identical appraisal results

In theory, the discount rate should vary dynamically with growth rates such that the 'net' discount rate (i.e. the discount rate excluding economic growth) is always 1.5% based on current parameters in the Ramsey equation. However, current practice across government is to use a fixed discount rate based on a fixed growth assumption.

Current transport appraisal guidance uplifts appraisal values in line with OBR forecasts. Where these forecasts differ to the fixed growth assumption embedded in the discount rate, the 'net' discount rate can be substantially different to the theoretically correct figure of 1.5%. This can have substantial impacts on appraisal results and the magnitude of error in results increases the further away are OBR forecasts from the growth rate embedded in the discount rate.

As the 2020 version of the Green Book retains the fixed growth assumption of 2% in the discount rate, we require a second-best solution to this problem. Fortunately, a simple change to the growth values used to uplift appraisal values would resolve the issue and lead to appraisal outcomes that are identical to those which would be achieved using the theoretically correct approach of a discount rate which varies dynamically with growth rates.

The necessary change is to uplift appraisal values using the same 2% growth rate as embedded in the discount rate (up to year 30). This would give a net discount rate of 1.5%, precisely the same as would be achieved under the theoretically ideal method. This means that the present value benefits estimated using this second-best solution would also be the same as under the theoretically correct approach.

Between year 30 and year 60, the discount rate declines to 3%. If this fall is attributed to economic growth uncertainty, the growth rate embedded in the discount rate would be 1.5% and hence the same rate should be used to uplift appraisal values for these years. This would again leave a net discount rate of 1.5%.

The same principle would apply to future years.

A limitation on scope

The above discussion has focussed solely on the economic growth assumptions used for the purpose of economic appraisal. In transport, economic growth forecasts play another key role: they are a key factor in forecasting future travel demand. It is

right and proper that future demand forecasts continue to be based on actual growth forecasts and hence demand forecasts should respond dynamically in response to new OBR forecasts. Our proposal to tie growth assumptions to those embedded in the discount rate applies on to economic appraisal, not to demand forecasting.

Summary

Highways England considers that the growth rate used to uplift appraisal values should be tied to that embedded in the discount rate. While this is a second-best solution it nonetheless delivers theoretically correct appraisal outcomes.

If this approach is adopted – and DfT considers that the declining discount rate is due to uncertainty in economic growth assumptions – Highways England agrees that it is appropriate for the growth assumption used to uplift appraisal values to decline in line with the discount rate.

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?

Highways England considers that there is a balance to be struck between attempts to profile all relevant costs and benefits over the long term and the additional uncertainty that would result. Our responses to earlier questions have described the substantial increase in uncertainty that would result from extrapolating benefits with very robustly estimation methods beyond year 60. Even for these benefits we consider it critical that decisionmakers are aware of the additional uncertainty; our response to question 10 discusses this in more detail.

We recognise that some level 3 benefits estimated using supplementary economic models can represent a significant proportion of total benefits for some business cases. However, we also note that these benefits are typically estimated using bespoke methods which are less well tested, less well accepted and potentially less robust than those used to estimate benefits such as time savings or carbon impacts. Even over the standard appraisal period, the results of supplementary models will have a much higher degree of uncertainty than those of more established benefits. Seeking to extrapolate these benefits over the long term will add even more uncertainty and potentially make any quantitative results so uncertain as to be of little practical use to decisionmakers.

If DfT chooses to capture the long-term benefits of schemes by extending the appraisal period we suggest that it takes an incremental approach. Initially, any extrapolation should include only those benefits for which there is the most robust evidence and for which the approach is most widely accepted. This might include all level 1 benefits, for example. DfT could then assess the extent to which the approach creates additional uncertainty and review how these long-term benefits impact

investment decisions. Based on its findings it may then choose to expand the range of benefits for which extrapolation beyond year 60 is permitted.

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?

Highways England's programmatic appraisal guidance advises that when appraising the programme as a whole, the standard appraisal period – currently 60 years – begins with the commencement of the first scheme. Where different types of investment are involved, leading to different standard appraisal periods, the most common period is used and any maintenance / renewal investment required to extend the appraisal period of shorter lived investments is included in the analysis.

While this approach will understate the true incremental programme benefits we consider that this is a proportionate approach to appraising a programme or package of schemes where decisions are primarily based on individual scheme appraisals but informed by the programme assessment. It strikes a balance between alignment with the principles of TAG (e.g. using a maximum 60-year appraisal period for individual schemes) and avoiding the unintended consequences and substantial analytical complexities associated with alternative approaches.

We consider that it would not be appropriate for the appraisal period of any given scheme in a programmatic appraisal to exceed the appraisal period for an individual appraisal of the scheme. Assuming that any programmatic appraisal would complement rather than substitute for individual scheme appraisal, this approach could have the effect of overstating programme benefits (i.e. the difference between the programme appraisal and the sum of individual scheme appraisal results). This could potentially result in an unlevel playing field between schemes which are part of the programme and standalone schemes.

Taking an approach of overlapping, incremental appraisals such that the benefits of each scheme/phase are captured for 60 years would remove the problem of overstating programme benefits. In this case, the same standard appraisal period would be used for each scheme in both individual and programme level appraisal, an approach which is consistent with TAG. This approach would lead to the most accurate estimate of programme benefits but the analytical requirements are substantially greater than under the approach currently used by Highways England.

In particular, rather than basing analysis on a single Do Minimum, the overlapping approach requires the same number of Do Minimums as there are schemes in the programme. This would add significantly to the analytical requirements and must be considered in conjunction with guidance on how the results of programmatic appraisals should be used by decisionmakers.

If investment decisions should be taken primarily on the basis of individual scheme appraisals, the additional analytic burden of the overlapping approach would seem

to outweigh the potential impact of the analysis and so would be disproportionate. However, if future investment decisions might be primarily based on programme-level analyses then the benefits of achieving a more accurate estimate of programme level benefits would seem to outweigh the additional analytical burden.

A further point worth noting is that arguably if you extend the appraisal period, it would seem likely that more reasonably foreseeable schemes will be built creating greater potential synergies between schemes than a do minimum would assume. This is a particularly relevant consideration under the overlapping appraisal periods approach where the final scheme in the programme might open many years after the first scheme, and so the final appraisal year for the programme could be, say, 120 years into the future.

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?

As set out earlier in our response – and in particular our response to questions 3 and 4 – we consider uncertainty to be one of the biggest challenges in seeking to capture the long-term benefits of transport schemes. We note that the treatment of uncertainty in general is outside the scope of this consultation and so restrict our comments to the issue of increased uncertainty associated with long term benefits.

If any such change is implemented in TAG it will be essential to communicate clearly to decisionmakers the caveats to long-term benefits analyses.

We think that one part of the approach must be to present the results including longterm benefits / costs separately to those based on the current 60-year appraisal period. This will both allow suitable comparison between schemes with different length appraisal periods and partly to reflect the relative (un)certainty of benefits.

Another part of the approach must be to clearly illustrate the impact of different scenarios and sensitivity tests on appraisal results. Uncertainty fans could be used to communicate the plausible ranges of outcomes to decisionmakers.

Illustrating the proportion of benefits accrued in specific time periods (as per Figure 8 of the consultation document) could be helpful but any such figures should also consider uncertainty. The simple linear presentation shown in Figure 8 hides the fact that the range of plausible outcomes will be much wider for periods further into the future. This also links to our earlier comment that DfT must consider how to translate a range of uncertain benefits into certainty equivalents, particularly in the context of a longer appraisal period where the uncertainty fan may not be symmetric around the mean.

In terms of whether monetised longer-term benefits and costs should sit within the initial BCR, adjusted BCR, or ‘indicatively monetised’ category we think that a decision should be taken in line with the descriptions set out in DfT’s Value for Money guidance. If the long-term benefits are to be based on simple extrapolations subject

to a capacity test, it is arguable that the monetary valuation methods would not be considered sufficiently widely-accepted, well-researched or tried-and-tested to be definitive. Moreover, they would be subject to a high degree of uncertainty in the magnitude of the impact. Taken together, this suggests that it would be appropriate to include longer term benefits / costs in the 'indicatively monetised' category. This approach would provide a clear signal that the results are subject to significant uncertainty and should be treated with caution by decisionmakers.

Potential ways forward

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

We consider that the proposed criteria for identifying the preferred approach are appropriate. However, the consultation document does not specify clearly:

a) whether or not certain criteria will be given more weight than others, or if they will be treated equally
b) how, post-implementation, DfT would judge whether the new methodology has been a success

On the former point, our view is that additional uncertainty is a key consideration with any proposal to capture long-term benefits and hence significant weight should be attached to the ways in which different approaches identify, mitigate and treat uncertainty, including with respect to communication to decisionmakers.

In this context we would caution against placing too much weight on the potential for different approaches to provide precise estimates of social costs and benefits after 60 years: even if estimates are precise there is no guarantee that they will prove to be accurate in the context of substantial uncertainty.

Also, the significant uncertainty attached to any estimate of benefits beyond year 60 means that close attention should be paid to the proportionality of different approaches. If we know *ex ante* that any results are likely to be subject to significant uncertainty and hence lower weight placed on the results by decisionmakers, guidance should ensure that the additional analytical burden is commensurate with the impact of any such results on decisions.

On the latter point, we consider that it would be important in the future for DfT to evaluate the impact of any new approach and feed back the findings into future transport appraisal guidance. A clear set of success criteria would help in this endeavour and we encourage the Department to consider and communicate these alongside the final confirmed approach to capturing long term scheme impacts.

Expert Advice on Appraisal Periods, Residual Values and Economic Growth

Report to Highways England

Peter Mackie and Richard Batley

December 2020

ITS

EXPERT ADVICE ON APPRAISAL PERIODS, RESIDUAL VALUES AND ECONOMIC GROWTH

REPORT TO HIGHWAYS ENGLAND

ITS

Context

We were commissioned in November 2020 to develop this think-piece for Highways England in the context of the expected publication of the new Green Book and a possible consultation on the implications for transport sector appraisal. This paper was written largely before the Chancellor's Comprehensive Spending Review statement on 25/11/2020. The purpose of the think-piece is to inform Highways England's thinking regarding its response to a forthcoming consultation initiated by the Department for Transport.

In March 2020, the Office for Budget Responsibility (OBR) published its medium term economic projections for the UK. These reduced the medium term GDP per capita growth forecast to around 1.4% per annum. This is actually higher than the average annual growth rate in the last decade (2010-2019), which on a simple average was 1.14% pa. We have not found reference to any change in the assumed long-term growth rate, but presume that for simplicity the central prediction of this will equal the medium term growth rate.

If the long-term growth rate were to be reduced by 0.5% per annum, per cap GDP would be 16% smaller in 2050 than previously assumed. Also, on the basis of work by the ONS and judgements about central cases, population is projected to grow by 0.3% per annum less than previously assumed. If GDP/cap growth and population growth can be assumed to be uncorrelated (a big if), then the effect on GDP growth is a direct combination of these two factors.

There has been no further update from OBR since the pandemic[7], but it can be anticipated that any further update will need to consider inter alia:

- The shape of the COVID-related economic shock, the path of recovery and any onceand-for-all effect on the track of GDP.
- The longer term effects of debt on both public and private investment.
- Other issues including the effect of the Brexit settlement and exchange rate adjustments on long run economic activity.
- Related to the above, any changes in medium and long-term risk, especially as they manifest at the project, programme and macroeconomic levels.

It is fruitless to speculate on the size and even direction of these impacts, but they do mean that the position at the time of writing is in a real sense an interim position reflecting the trajectory of the economy as it was seen to be last winter rather than today.

[7] This has been overtaken to some extent by the OBR publications accompanying the Chancellor's statement

What are the consequences of these changes for the assessment of road schemes? In our opinion, there are three main ones:

- Unless there is some sophisticated spatial socio-demographic model, the reductions in population growth should feed through simply and directly into reductions in traffic growth.
- Any reductions in GDP/cap would similarly feed through into lower rates of traffic growth. So, combined with the previous effect, traffic growth might now be around 0.8% pa compound lower in the central case than previously projected.
- Some of the key values in the monetised part of the appraisal, most obviously the values of travel time, are assumed to be unit elastic with respect to GDP/cap. So if economic growth is expected to track lower, so too should the real terms growth rate in the values of time.

The three aforementioned changes, taken together, would be expected to have significant consequences for the absolute values of the appraisal results for the roads programme as a whole. Whether they also have implications for the relative results between types of scheme within the programme is a question that remains to be answered.

In the event, the 2020 version of the Green Book, published with the Chancellor's Statement, leaves the key parameters of the social discount rate unchanged[8] – in particular, an assumption of GDP/cap growth of 2% has been retained. Our interpretation is that Treasury and the Government have placed a high weight on stability of the appraisal system, introducing new material on 'place-based' analysis, but otherwise making few substantive changes. However, our view is that the ongoing turbulence within the operating environment is inescapable, and that by retaining the status quo in terms of the SDR, the analytical burden will inevitably be shifted to the modelling of social costs and benefits that populate the appraisal. There are tensions between the OBR analysis and the Green Book position which will need to be resolved in sectoral guidance.

The Social Discount Rate

The real changes in economic prospects, when reflected in the three changes noted above, have obvious and significant effects on the composition of efficient public capital spending. In relative terms they change the terms of trade adversely for long dated projects such as transport infrastructure. That is because the real growth rate of benefits falls relative to the social discount rate (SDR). However, it could be argued that the SDR itself should be adjusted, partially offsetting the effect of the three changes.

There is ongoing debate in the literature (eg Arrow et al., 2018) concerning the most appropriate formulation of the SDR. In this regard, the Green Book (2020) states that: *"For individuals, time preference can be measured by the real interest rate on money lent or borrowed. Amongst other investments, people invest at fixed, low risk rates, hoping to receive more in the future to compensate for the deferral of consumption now. These real rates of*

[8] See the following section for fuller discussion of the SDR.

return give some indication of their individual pure time preference rate. Society as a whole, also prefers to receive goods and services sooner rather than later. This is known as 'social time preference'. The discount rate used in the Green Book is known as the 'social time preference rate' (STPR). It is the rate at which society values the present compared to the future" (Para 5.33).

More formally, the Green Book adopts the so-called Ramsey Equation (Ramsey, 1928), which formulates the STPR as follows:

$$SDR = \rho + \eta g$$

Where: ρ is the fundamental discount rate at steady state zero per cap economic growth, comprising pure time preference in combination with 'catastrophic risk'[9]; η is the elasticity of the marginal utility of income, g is the growth rate of per cap income, and the product of the two is referred to as the overall wealth effect.

Our appreciation is that in the 2003 Green Book, ρ was taken to be 1.5, η was 1 and g was 2, giving a SDR of 3.5%. Since g was expected to fall over time, the SDR was set to 3% after thirty years. The 2013 revision to the Green Book retained ρ at 1.5 and was not specific about the values of η and g, but retained the value of their product (ηg) at 2. This was probably on the basis that g had fallen below 2, but there were arguments for saying that the value of η should be greater than 1.

In a recent review of empirical evidence on the SDR, Freeman et al. (2018) outline alternative positions which could be taken depending on the policy context. They note that, following Groom and Maddison (2018), the SDR could be updated to reflect the latest estimates of the elasticity of the marginal utility of income. With no other changes, this leads to SDR = 1.5% + 1.5*2% = 4.5%. They further note that the Stern Review (2007), concerned especially with long-term environmental impacts, recommended SDR = 0% + 1*2% = 2%. Applying a more pessimistic growth outlook would moderate the above discount rates to 3% and 1% respectively. In this way, Freeman et al. (2018) arrive at upper and lower bounds of 4.5% and 1%, and further note Drupp et al.'s (2018) survey which estimated a mean SDR of 3.48% – interestingly this survey was concerned especially with long-term (100 year) projects. In summary, Freeman et al. conclude (as of 2018) that "the current 3.5% is a good consensus position both numerically and procedurally" (p16).

It is worth saying that the tradition in Britain, unlike some other countries, is to specify the discount rate as the time preference rate for a zero risk asset class. The annex to this report documents possible extensions to the Ramsey Equation which take explicit account of risk at the macroeconomic and project levels – but the take-home message is that such extensions are more onerous in terms of implementation and have little impact on the resulting SDR.

The Green Book considers some aspects of risk at the project and programme levels through concepts including optimism bias, risk quantification and project/programme contingency – and TAG extends the scope to more specific aspects of risk which manifest in modelling and appraisal. However, the essence of this approach is to handle risk via distributional

[9] Whether given the pandemic the estimate for catastrophic risk has changed is a point for discussion but in this paper we assume not.

assumptions concerning the flow of costs and benefits. It is the certainty equivalent values which are then discounted by the (risk-free) social discount rate. We return to this issue below.

Our Appreciation

It follows from the above that there is no magic single number which must be the value of the SDR. There is a zone of reasonableness within which the SDR lies and 3.5% is within that zone. Suppose, however, that what has happened over the last decade (pre-COVID) is that, in practice, the expected long run annual rate of per capita economic growth, g, has fallen by around half a per cent. Then there is an argument for saying that, to maintain the same position in the zone of reasonableness, the SDR should also be reduced by half a per cent from 3.5 to 3. We have some sympathy with this position. From the point of view of sector appraisal, that is probably closer to maintaining the balance between long dated and short dated projects than leaving the SDR unchanged. Indeed it could be argued that this fall in the growth rate – were it to be acknowledged and carried through to the SDR – has arrived a few years earlier than the 30 years anticipated by the 2003 Green Book.

In the event, the 2020 Green Book retains the value of the SDR at 3.5% with the long-term per cap growth rate of 2% and the elasticity at 1. So the issue is whether this implies a decoupling between the SDR and the growth rate of traffic and unit values.

We have three other comments.

Firstly, the SDR as defined above is the social time preference rate (STPR). Except in unusual circumstances, the long-term risk-free social opportunity cost (SOC) rate, which equalises the demand and supply of public capital, is likely to be above the STPR. The traditional argument for the SOC is that, since the operation of the market reveals the rate of return on private sector investment, public sector investment should yield at least this return. On the other hand, the SOC does not explicitly account for inter-temporal consumption decisions – which is the basis of the STPR. Against this background, if we adhere to the STPR, some supplementary rationing device such as a minimum acceptable Benefit : Cost Ratio is required so as to encourage efficient allocation of public capital within a constrained budget. Where the balance will be struck post-COVID remains to be seen, but it is possible that attention may need to be paid to the definition of the Value for Money (VfM) metrics as ‘Good’, ‘Very Good’ etc, especially if these are indicators primarily of the relative value of alternative ways of spending public capital rather than of the absolute value.

Secondly, many commentators (eg Freeman et al., 2018) note the need for a shadow price of public funds or marginal cost of public funds to account for the excess burden of raising one unit of tax funding. Most calculations place the MC of £1 of public funding at around £1.20 to £1.30, although Spackman (2020) puts the value *“often closer to 2 than 1”* (p254). This has implications for the treatment of tax funding relative to user pays funding such as tolls, user charges and fares within the appraisal.

Thirdly, our appreciation is that as well as the change in the expected track of GDP per capita and in population, uncertainty has also increased. That is to say, the upper and lower quartile values relative to the mean have widened. The last twelve years have seen the worst global financial crisis for eighty years and the worst world public health crisis for a century, both with serious consequences for the path of the real economy including the transport sector. So, if

both the mean expected track and the variance around it have changed, it is necessary to consider the appraisal treatment of both.

Project Lives and the Appraisal Period

The Green Book (2018) states: *"Costs and benefits should be calculated over the lifetime of an intervention……In some cases, up to 60 years may be suitable, for example in buildings and infrastructure. In all cases, the maintenance and renewal costs associated with the servicing of these assets should be included. An asset's residual value or liability at the end of the appraisal period should also be included. A longer appraisal period may be suitable where an intervention is likely to have significant social costs or benefits beyond 60 years. This should be agreed with the approving authority*".

"*The market price at the end of an asset's lifetime – the best value obtainable from its sale, lease or alternative use—is part of the value created as a result of the public cost of creating the asset".*

(Paras 5.14-15)

The 2020 version of the Green Book changes this slightly to say:

"*An asset's residual value should be included to reflect its opportunity cost. Residual values do not depend on the actual sale of an asset*".

(Para 5.14)

Our understanding is that since 2003, this guidance has been interpreted in the context of transport infrastructure as a standard life of 60 years with no residual value at end of life. However, we understand that the Department for Transport is about to consult on whether that interpretation should change. We have been asked for our view on what should happen and on the implications for transport appraisal practice. We begin with some general points.

Firstly, we think the case for change should be made at the level of all infrastructure and not at individual sector level. What is true for roads and railways is also likely to be true for sectors such as water, sewerage, energy production and distribution, flood alleviation and telecommunications networks.

Secondly, we observe that much transport infrastructure has turned out to have a useful life of well over sixty years. The core rail network is an obvious example. Road projects from the 1930s such as the Kingston By-Pass are others, and the earliest parts of the motorway network have passed the sixty year mark. However, this is not universally true – for example the economic life of some canals and railways (the Great Central for example) did not extend beyond sixty years.

Thirdly, the point in the Green Book about maintenance and renewals is clearly important. Structures such as the Forth Bridge and First Severn Crossing have required significant structural investment. The Tinsley Viaduct on the M1 has had to operate for many years at reduced rated capacity. The structures on the Leeds Inner Ring Road are undergoing large scale renewal at the fifty year point in their lives. So, from the appraisal point of view, predicting

the life cycle of the various asset classes, allowing for uncertainty, and allowing for delays and disruption during reconstruction, are all necessary considerations. It would however be convenient to choose a project life at which all the asset classes were simultaneously life expired – for example, 60 years is a multiple of 20, 30 and 60. Then the issues of residual value would only relate to any cost components with unexpired life.

Fourthly and more important, life expiry may occur not for reasons of technical obsolescence but for reasons of market obsolescence. So, for example, if road travel is partially supplanted by telecoms or hyperloops or air taxis, or if the efficiency of road travel is revolutionised by technology, or if there is large scale behavioural change, then some capacity may become redundant before the end of its technical life. If we look back to the economic and technical conditions of the transport market in the inter-war period and compare that with today, that gives us an indication of the task of predicting the market at the turn of the next century. To say the least, there will be a great deal of uncertainty to be factored into the assessment.

Fifthly, the length of the appraisal period should not be considered independently of the profile of the SDR. The 2003 Green Book replaced a constant discount rate of 6% in combination with a maximum appraisal period of 30 years, with a declining discount rate (DDR) of 3.5% to year 30 and 3% to an extended default appraisal period of 60 years (but with provision for still longer appraisal periods where appropriate, with the DDR declining incrementally to 1% for year 300 onwards). In broad terms, the effect of this change was to place greater emphasis on longer-term benefits. In considering the case for implementing a DDR in the United States, Arrow et al.'s (2018) expert review is strongly supportive of this approach: "We have argued that theory provides compelling arguments for using a declining certainty equivalent discount rate. In the Ramsey formula, uncertainty about the future rate of growth in per capita consumption can lead to a declining consumption rate of discount, assuming that shocks to consumption are positively correlated. This uncertainty in future consumption growth rates may be estimated econometrically based on historical observations, or it can be derived from subjective uncertainty about the mean rate of growth in mean consumption or its volatility" (p154).

Uncertainty in Modelling and Appraisal

By definition, uncertainty plays a key role in the discounting of costs and benefits – but the practical question is whether uncertainty should be handled within a) the discount rate, b) the forecasted costs and benefits, or c) some combination of the two. As noted earlier, the approach adopted by TAG is essentially b), although DfT has acknowledged that this area is in need of bolstering, such that guidance remains fit for purpose within an increasingly variable and disrupted operating environment.

In April 2019, DfT published its latest 'Appraisal and Modelling Strategy' (AMS), with its primary aim being *"to provide appraisal and modelling tools that are robust, flexible and easy to use, to support the policy and investment decisions which will be made over the next five years"* (p6). The strategy identifies five key themes and priorities for developing the evidence base and making TAG more user friendly – one of which was "reflecting uncertainty over the future of travel" (p8).

In practice, two dimensions of uncertainty would seem especially pertinent:

c) The precision of models – in terms of both inputs and outputs – may impact upon the robustness of appraisal results.

d) Practical modelling and appraisal is being conducted over longer timeframes within an increasingly uncertain world.

As noted above, various aspects of uncertainty are considered by the Green Book, and in more detail by TAG, but DfT has acknowledged that, in totality, guidance on uncertainty is fragmented and is presented at different levels of detail in different parts of TAG. Responding to this critique, the AMS notes the strong support from stakeholders to collate all relevant guidance in a coordinated manner via an 'uncertainty toolkit' – and commits DfT to producing a prototype of this toolkit by 2021.

A specific workstream which has seen rapid progress over recent years is scenario analysis – the initial focus of this was the Road Traffic Forecasts (RTF), which in 2015 were developed for five scenarios, and in 2018 was extended to seven scenarios (Figure 1), covering variations in economic growth, fuel prices, levels of migration, and the shift to electric vehicles. Subsequently, DfT has continued to progress this workstream, with the objective of developing a standardised set of future scenarios for application across the breadth of DfT's policy and analysis work. Another active workstream has been to strengthen the evidence basis underpinning TAG guidance on optimism bias.

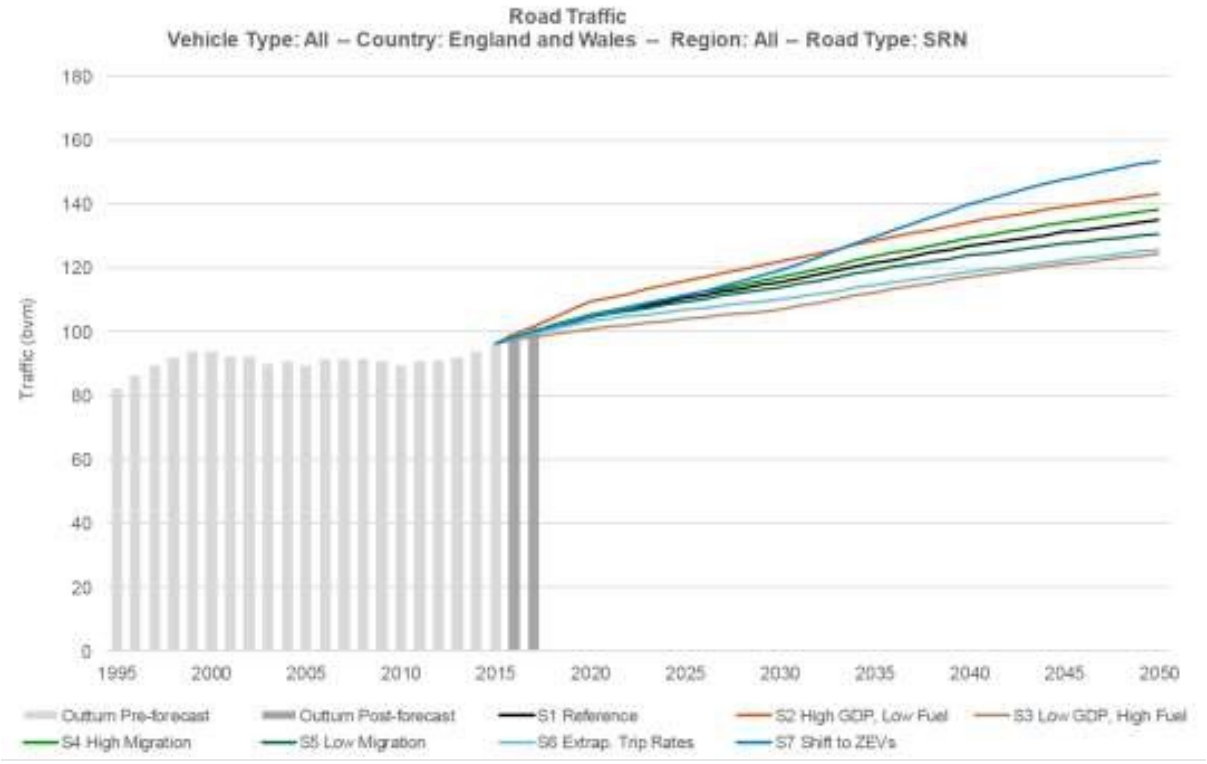


Figure 1: Vehicle miles for England & Wales on the SRN (Source: DfT, 2018)

Against this background, we see three challenges which would be accentuated by an extension of the appraisal period to (say) one hundred years. The first is obviously the need to extend charts such as Figure 1 above and its counterparts in terms of benefits and costs

over the second half of the century. The first step is to predict the range of circumstances which we are providing for in two generations time.

Then secondly, there is the need to consider whether the uncertainty fans are symmetrical around some central scenario or whether, in practice, the downside relative to the central case is greater than the upside. If that were to be the case, then it would be wrong to use the central scenario as the best measure of the (mean) expected value.

Thirdly, we have assumed so far that governments should be risk neutral, so that they have no particular preference between two portfolios of equal expected value with a high variance versus a low variance. If we are investing in sunk assets with limited alternative use value and a significant proportion of the payoff a long time ahead, this question, which has often been regarded as rather abstract, becomes more real.

Residual Value Methods

Following from the discussion in section 4, the concept of residual value (RV) arises where an infrastructure asset retains some value at the end of the appraisal period. In a recent review, Jones et al. (2013) report that: *"RV is an important component of CBA, often valued at 20% to 50% of total construction cost"* (p1). They identify three broad approaches to calculating RV as follows.

First, they highlight straight-line depreciation as the most commonly used method – since it is simple to use, being calculated as a percentage of the construction cost rather than real value:

$$RV = \frac{V}{T+V} \times K$$

Where T is the appraisal period, V is the residual asset life[10], and K is the initial capital cost.

Second, they note that the perpetuity/annuity method ignores the actual value of the asset, and instead reflects either:

a) annuity: where the present value (PV) of an annuity of C received for each year of the residual asset life is given by:

$$PV = C \times \left[\frac{1-(1+r)^{-v}}{r}\right]$$

where r is the discount rate.

b) perpetuity: where the PV of an annuity of C received in perpetuity for every year beyond the appraisal period is given by:

$$PV = \frac{C}{r}$$

[10] That is to say, T plus V gives the total asset life.

Third, they highlight the component method as offering a more rigorous but also more onerous treatment than straight-line depreciation – since it calculates a separate RV for each infrastructure component and then aggregates to a total RV.

Another set of approaches for estimating RV – perhaps more in line with that alluded by the Green Book – focus upon the potential scrap value of the asset at the end of the appraisal period, for example considering the interest return or earnings of the scrap value if invested in the bond market (eg Transport for NSW, 2016).

Our position is that, rather than formally extend the appraisal period to 100 years, our preference would be to continue estimating the flows of costs and benefits over 60 years – albeit using a more clearly articulated rationale for demand capping from 30-60 years. Then the residual value from year 61 to year 100 would be calculated using a bespoke version of the component method.

We think a possible working assumption is that it is always open to society as a default to invest in the project from year 60. So then we are looking at mutually exclusive projects in time – invest now versus counterfactual invest in year 60. So then the value of investing now relative to the counterfactual is NPV = PVB (0 to 60) minus PVC (0) plus RV. In the simplest possible case, the RV would be the cost in year 60 of those scheme elements with a life beyond sixty years, discounted to a present value at year zero. Complexity could be added to allow for long-term maintenance of earthworks and any RV at year 100. Some kind of risk adjustment might be needed to allow for the possibility of economic obsolescence before life expiry.

We would accept that this is a proxy, and there would need to be discussion with the engineers and testing to see whether it produced sensible results covering common situations. Our instinct is that this might be closer conceptually to what the Treasury have in mind in the Green Book than a full-on extension to the appraisal period.

Appraisal Periods – Our Appreciation

From the preceding sections, the principles are clear. The appraisal period should cover the expected economic life of the asset and its components. Uncertainty fans should be used to predict the ranges of costs and benefits. Guidance should be provided on how to convert these ranges into certainty equivalents. If those principles are followed, a restricted definition of the residual value – say, where RV is what the asset could be sold for at life expiry, or the expected value of the right of way at life expiry – is reasonable. These principles should apply to all government capital expenditure and certainly across the board to all infrastructure investment.

The difficulties arise when we attempt to put these principles into practice. Without 20/20 vision, it is not possible to say with certainty what the life of an asset is, whether it will be terminated by technical or economic obsolescence, and when that will be. So the natural tendency is to invent some rules – for example, use the technical life of an asset, not normally exceeding 60 years.

So then the question arises of what to do in the cases where the project life is predicted to exceed the specified appraisal period. Guidance on that needs to be consistently applied on

a cross-sectoral basis, so, for example, the National Infrastructure Commission might be involved in assuring the suitability of the guidance across sectors. Whether it is implemented through permitted extensions to the cost and benefit streams beyond the standard life assumption or through some RV method which effectively proxies that value is a technical issue; there are various ways it could be done. But whichever method is chosen, it needs to grapple with (a) the uncertain economic, social and technical environment of a world two or three generations on from today and (b) the need to convert that into a certainty equivalent for comparison with a risk-free social discount rate. Some of the practical challenges of doing that are identified in section 8 below.

What to do depends partly on the intended fundamental purpose of appraisal. Is it to provide estimates of the absolute social value for public money of sector investment? Or is it more about the relative value for money of different expenditure choices within programme. At its most extreme, if all projects in an asset class have the same lives and the question is their relative priority, then the project life question is unimportant. Whereas if asset lives are variable and we are very interested in absolute value for money, then the project life question becomes significant.

We note that in previous visits to this question (eg at the time of the 2003 Green Book when the discount rate was set at 3.5% and the project life guidance established in its current form), the Department for Transport adopted a relatively simple, pragmatic approach which erred on the side of conservatism. It will be necessary to demonstrate the case for change. This would be easier if the delivery agencies could demonstrate the practical consequences for the composition of their budgets, choice of technique, materials, land acquisition strategies etc of changing the project life assumption.

Implications for Modelling and Appraisal

In this section, we assume the OBR's lower growth rate in GDP/cap and the ONS's lower population growth rate, that (in line with the 2020 Green Book) the SDR remains unchanged, and that there is a redefinition of project life so that the maximum appraisal period is extended from 60 years to, say, 100 years. What are the implications of that for the world of transport modelling and appraisal guidance?

Standard Values and Parameters in TAG

The most immediate consequence of the revised income and population assumptions is that trip end growth and traffic growth factors would be significantly lower over the modelled period, starting from a given base. For schemes already under appraisal, the most immediate requirements are firstly to take account of ONS changes in population forecasts and secondly to take account of the short and medium term effects of the pandemic and other shocks to the economic system such as Brexit. Guidance will be required on whether this is to be implemented in forecasting as a once-and-for-all rebasing of the series between, say, 2019 and 2023, or in some other way. This is important because, depending on what is assumed, this may affect traffic forecasts for all years in the appraisal period.

Then, consideration will need to be given to whether the pandemic is likely to lead to series breaks of various kinds for reasons outside GDP and population. For example, will commuting

fall permanently, will employers business tripmaking fall, will LCV traffic rise, will leisure traffic of various kinds rise, and how will all this map on to flows on roads, the flow groups, and their expected trajectory over time? Leaving aside income and population effects, has the pandemic affected our collective view of what the forward structure of transport demand will look like?

As noted above, there are also consequences of the lower GDP/cap growth for the growth rate of the standard values of time. But, more fundamentally, has the shift to homeworking fundamentally changed unit values of travel time saving for commute and business?

Appraisal Implications of an Extended Project Life Assumption

Our appreciation is that a common approach to scheme modelling remains that of representing an opening year (say 2021) and a design year (say 2036). Exceptionally for very major schemes, further model runs might be undertaken for 2051, but that is unusual. We believe that many modellers consider anything beyond about twenty years away to be fraught with problems. So, while in principle, appraisal over a project's life sounds a reasonable idea, there are practical difficulties. These already exist for a sixty year life and require consideration anyway.

The main difficulty is that if benefits are only measured at, say, year 1 and year 20, that leaves the bulk of the appraisal period depending on extrapolation of the benefits stream far outside the conditions in the modelled years. Assume a real discount rate of 1.5% net (ie an SDR of 3.5% offset by growth in real benefits of 2% pa). In this simple case, two-thirds of the scheme discounted benefits over a one hundred year life would arise in the extrapolated period after year 20 – an outcome which, in our view, does not sit easily with the desire to use BCRs as an absolute VfM indicator.

This is, of course, already a problem with a sixty year life. So far, the solution has been to impose some form of demand cap at some point (eg the design year) and to assume that traffic conditions remain stable thereafter (though real benefit values are allowed to continue to grow in line with GDP/cap growth). However relying on such an assumption for over half the discounted benefits is, we would argue, quite prejudicial to the robustness of the CBA.

A problem with the demand cap which arose in the context of the HS2 appraisal was the basis for deciding when the cap should apply. In the roads context, if traffic growth is projected to be lower, does that imply that the modelled period should be longer, and the design year and cap year further away? This needs looking at.

Moreover, when we come to the effect on the relativities between different types of scheme, the demand cap approach can have different effects. This was discussed extensively in the long-term benefits report (Arup/ITS, 2016). Consider an inter-urban scheme such as the dualling of the A66 between Scotch Corner and Penrith. This scheme will have enough capacity to last a very long time. So capping traffic growth at 2040 levels for the rest of the appraisal period probably understates 'true' benefits over the rest of the appraisal period. But now consider capacity schemes on the motorway network in the vicinity of big cities – say schemes on the M62. In peak periods such parts of the network will be at minimum speed in the do-minimum and will probably be close to capacity in the do-something by the design year. Capping traffic may actually increase benefits relative to what would happen in the appraisal

without capping. So the issues about demonstrating the relative value for money performance of different parts of the roads programme would intensify.

Overall, we are quite sceptical about the ability of scheme modelling and appraisal to meet the challenge which would be set by extending scheme life. This is not because of the technical limitations of modelling and appraisal itself, but more because of the inputs to the process. For example, the tacit assumption of the demand cap approach is that service levels can be maintained at the design year level for the rest of the appraisal period, either by investment or by pricing/demand management. We think more work will be needed on the policy scenarios envisaged in order to substantiate the long-term vision.

Another example concerns the treatment of long-term risk and uncertainty. If the second half of the century is inherently rather uncertain, as shown by the width of the uncertainty fans under different credible scenarios, then decisions will need to be made on how to handle those broad spreads, perhaps different between scheme types, so as to enable value for money indicators to be related to the zero risk SDR.

Appraisal Implications of an Extended Project Life Assumption

We do not see any easy way out of these difficulties. As outlined in section 6 above, our preferred approach would be to continue the policy of estimating the flows of costs and benefits over the relevant appraisal period, defined at sixty years, and using a more clearly articulated rationale for demand capping within the second half of that period. If the decision was made to extend the appraisal to (say) one hundred years, we would favour a simple transparent proxy such as residual value at year 60 so as to signal the uncertainty surrounding such a value but acknowledging that its expected value is not zero. Any effects on the nonmonetised parts of the framework table would need to be taken into account. We suspect such an approach might be more consistent with practice elsewhere in the public sector than something apparently more sophisticated.

As indicated in this paper, we see the appraisal periods issue as one of several interlinked challenges which need to be worked through. Some of these are immediate, such as the way in which TAG takes on board the OBR and Green Book in its guidance on traffic and benefit growth rates. Others are important such as predicting the consequences for traffic levels and patterns of behaviour change following the pandemic, and the way in which uncertainty is woven first into prediction and then into decision making.

Our broader reflection is that, after fifty or more years, the moment has come for a significant shift in the structure of the analytical support in the roads sector. TAG is heavily oriented towards scheme appraisal, where the UK is strong, but there is a structural weakness at the more strategic level. Over the last twenty years, we have seen increased policy interest in

- Wider economy impacts including the effects of capacity on economic performance (Venables et al., 2014).
- Dependent development, especially in the housing sector (see Worsley and Mackie, 2019).
- Corridor level studies with implications for programmatic appraisal (see Arup/ITS, 2018).

- Increases in the length of project life with implications for appraisal (see Arup/ITS, 2016).
- Changes in the macroeconomic and natural environment with implications for risk and uncertainty.

Fairly consistently, the preferred way of handling these expansions of the appraisal agenda has been to develop scheme appraisal so as to incorporate them in a single level appraisal regime.

We think this process may have gone past its natural limit and that the current issue under consultation gives another push in the direction of multi-level analysis, with a much more open analytical approach at programme level, regional and corridor analysis within that, and a more tightly defined scheme appraisal process aiming more at cost-effectiveness and relative rather than absolute value for money within that. Issues such as displacement, economic development, carbon, programme risk etc should be handled at the upper levels in the hierarchy.

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Annex: Possible Extensions to Ramsey's STPR

As Freeman et al. (2018) observe, the standard statement of the STPR given in section 2 above contrasts with practice in some other countries, where there is treatment of at least two distinct sources of systematic risk via extensions of the Ramsey Equation.

First, macroeconomic risk manifests in terms of the growth rate of per cap income g. When growth is uncertain and uncorrelated over time, projects with sure benefits should be discounted using the following risk-free SDR (Mankiw, 1981; Gollier, 2012):

$$SDR = \rho + \eta\mu - 0.5\eta^2\sigma^2$$

Where

μ and σ^2 are the mean and variance of the growth rate

In totality, $0.5\eta^2\sigma^2$ represents a 'prudence' term – such that uncertainty about future growth stimulates an increase in demand for safe assets in the future, thereby reducing the effective discount rate. Freeman et al. (2018) remark that the volatility of UK consumption growth has been around 2.73%, implying a prudence factor of 0.037%, and in turn a SDR of 3.46%. In other words, the correction for prudence is small, a finding which follows from Weil's (1989) "risk-free rate puzzle".

Second, rather than represent in terms of the flow of costs and benefits, project risk can instead (or perhaps in addition) be represented in terms of a distinct risk premium component of the discount rate. Assuming a simple Consumption Capital Asset Pricing Model (CCAPM) approach to discounting, the Ramsey Equation can in general be extended (Gollier, 2012):

$$SDR = \rho + \eta\mu + \pi(\beta)$$

Where:

μ and σ^2 are the mean and variance of growth

$\pi(\beta)$ is the risk premium

β is the 'consumption beta'

Applying Gollier's (2012) proposal for one particular formulation of the risk premium in this context $\pi(\beta) = \eta\beta\sigma^2$, Freeman et al. (2018) remark that in the UK where volatility has been 2.73%, the risk premium when η=1 becomes π=0.075% using this method, subject to upward or downward adjustment if β deviates from one. In other words, the correction for the risk premium is – like the prudence factor – trivial.

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15th January 2021

Dear Sir/Madam,

Appraisal Periods Consultation

Response from Kent County Council

Enclosed is Kent County Council's (KCC) officer response to the Department for Transport's (DfT) Appraisal Periods Consultation.

Our key concern on the proposed extension of transport appraisal periods beyond 60 years is that we would incur additional costs to scheme development at a time when we are already heavily constrained.

The consultation document does not explain why the current 60-year appraisal period is considered inadequate to make robust decisions on the spending of public funds on transport schemes. Examples given are theoretical and simplified.

KCC itself has not identified length of appraisal period as an issue in enabling the Council to prioritise its spending on transport across the portfolio available to it.

Please find attached our response to the consultation. With respect to our position outlined above, we have responded to Questions 1 and 10 of the consultation.

Kent County Council Officer Response

Overall Approach

Question 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?

Proportionality is key, and given what is set out in the consultation document, there is not a compelling case to introduce extended appraisal periods along the lines of the quantified approaches proposed. This is because, at a time of high constraint on budgets across the public sector there is, ironically, probably low value for money in channelling more funds into appraisal detail, given the opportunity cost of that funding instead being channelled towards infrastructure to deliver the National and Local policies and proposals that exist.

At Kent County Council (KCC), budgets are under great pressure from the decade of reductions in Local Government grants and the renewed budget gaps existing from the impacts of the Covid crisis for which, as it stands, a full resolution as part of a longterm sustainable settlement has not been found. The proposals set out in the document are solely about extending the appraisal period, which could be a relatively low cost, mechanical process in terms of the mathematics, and may not incur substantial additional cost, either through the public sector's own resource time or that charged by private sector consultancies.

However, as the consultation document acknowledges, to make extended appraisal periods worthwhile, if conducted in quantified terms, brings with it the need to bring sufficiently robust work on forecasting and treatment of uncertainty. Due to this, there is a very high risk that the financial burden of extending appraisal periods beyond 60 years is one that none but those projects and authorities with the biggest budgets could afford. Thereby there is a risk of creating an uneven playing field and lack of consistency of robustness and accuracy in appraisal across parts of the public sector and transport industry.

The crux of the decision to extend appraisal periods must surely be whether it is going to change the decisions currently made about the channelling of funding into infrastructure and services in the transport sector. The consultation document does not set out either:

a)that the current appraisal system is failing due to the limit of the current 60-year appraisal period, and if the DfT considers it is then it does not provide any examples to demonstrate the consequence of appraisal periods ceasing at 60 years; or

b) that decisions made in recent times would have resulted in different outcomes.

Given the above points, consider a large scheme such as HS2 (£108bn) or Crossrail 2 (c£40bn). These schemes do not have their future determined solely or perhaps even largely by the Benefit Cost Ratio and Value for Money. Such schemes are political decisions and it is unclear that giving those decision makers more information about costs and benefits in year 90 or year 150 would be informative to their decision making. For HS2, that would mean giving Parliament as part of the Hybrid Bill process such information, and it is not clear that would have resulted in a different outcome of the cross-party support it had.

In contrast it is noted that the consultation document does highlight that the decision is not solely to be made with consideration of large 'transformational' infrastructure schemes, but also smaller schemes. In the instance of the latter, it is also not clear that a 60-year appraisal period is compromising the ability for making sound investment decisions across a portfolio of

options, or within the design and scope of an option per se. At KCC, appraisal period length has not been highlighted as a constraint on enabling the Council to determine where to direct its funding to transport services.

Given the overarching goal of the appraisal process should be to maximise the net social benefits within the available funds, the focus should therefore fall on having consistency across project appraisal periods, to allow a like-for-like comparison. Given the 60-year appraisal period within current guidance, that is achieved.

It can also be argued that the ability to be confident about how funds are to be allocated now, based on appraisal economics, is of most importance, so that the opportunity cost of diverting funding into any other area of public spending can be understood. Given this, reflecting on the fact that departmental budgets are set on a very shortterm basis (we do not know what the DfT departmental budget is beyond the next couple of years, nor the KCC budget), the priority to decision makers is arguably understanding the question of where to put today's funds. The ramifications for finances in 90 or 150 years become significantly less important, not least because of the recognition of the intense uncertainty that arises, and also given that the decision maker cannot realistically be held accountable, based on subsequent realisation on those timescales.

Supporting Decision Making

Question 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?

Given our response to Question 1 above, we propose a practical alternative concerning the Strategic Case of the transport appraisal process. We feel that appraisal of the longer-term potential value of transport schemes, as part of the existing qualitative Strategic Case assessment, is preferable to a quantitative approach for four key reasons.

Firstly, the Strategic Case is often more likely to be consulted by decision makers seeking to understand the reason for the proposal and its impacts, given the focus on prose rather than calculations, and the alignment it provides to the policies and plans that such decision makers are often responsible for having set themselves.

Secondly, using the Strategic Case allows the public sector scheme promoter to address the matter without the need for expenditure on consultancy support.

Thirdly, the Strategic Case can balance the issue of uncertainty far better, avoiding giving any false impression that quantified analysis can often give, or be used as evidence of. For example, the Strategic Case is a far better location to explain why a tunnel may have substantial residual value beyond 60 years, as there is evidence that tunnels can be maintained for significantly longer than 100 years; they can be repurposed for utilities, other modes, other activities, etc; or they can be subject to asset recycling, which can be expanded upon in the Financial Case. This point may also extend to the assessment of inter-generational effects

mentioned in the consultation document, although these should be picked up to an extent in policy objectives, such as climate change, carbon budgets, etc.

Finally, given the Strategic Case is the most developed and leading case at the early stages of a scheme's development, it provides the foundation for a discussion to explore whether there is value to extending the appraisal period to aid with its design and Financial Case development. Considering longer or shorter appraisal periods within assessments of a scheme's design and delivery should take place regardless, and should not necessarily lead to a need to do them for everything else. The critical thing is that where decision makers are determining whether to plough funds into one scheme or another, then the appraisal period should be consistent for like-forlike comparison.

We believe this approach also aligns with the recent Green Book update, with its reduced emphasis on the Benefit Cost Ratio, and corresponding increased emphasis on the Strategic Case in business cases.

DfT Appraisal Periods Consultation

Response by
Manchester Airports Group (MAG)

January 2021

MAG

Manchester Airports Group (MAG) owns and operates Manchester, London Stansted and East Midlands airports and, in 2019, these airports supported the travel of more than 62 million passengers, representing one in five of all air passengers at UK airports. Furthermore, our airports supported the movement of over 733,000 tonnes of air cargo to and from the UK, with a value of more than £27.5bn.

MAG welcomes the opportunity to respond to this consultation on Appraisal Periods that forms part of the DfT's Appraisal and Modelling Strategy. We support the Government's overall reform of the Green Book and the importance of embedding place and wider strategic objectives into investment decisions. Since transport investments can be some of the most significant place making investments with particularly wide economic spillovers it is important that the DfT's TAG framework is updated to translate the intentions of the new Green Book into reality.

Whilst MAG's investments into our airports are privately financed and not subject to public sector appraisal, we have a particular interest in the surface transport infrastructure that provides access to our airports, together with wider public investment into our host communities.

This document is intended to provide a short supportive response to the consultation, and focuses in on the first two more general questions. It is for appraisal experts to advise on the technical specifics raised in the remaining questions. However, we are keen to remain engaged with the DfT in the ongoing development of its TAG framework.

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?**

We are very supportive of the case for including long-term benefits beyond the existing 60-year appraisal period. Current priority transport schemes such as HS2 and Northern Powerhouse Rail are investments for the next 100 years or more, to create new capacity and capability over and above legacy railway infrastructure that dates back to the Victorian era.

These schemes, amongst others, have the opportunity to provide wider transformational benefits for the UK as a whole and contribute to the levelling up agenda for decades to come, and the appraisal system needs to reflect this.

The consultation highlights the relevant key challenges, including the uncertainty of longer-term benefits, the risk of obsolescence and the need to account for maintenance and renewal. The key risk is that of obsolescence, but this is impossible to forecast and should not be an undue barrier to the investments needed to unlock the potential of the economy. Environmental considerations should be the key factor accounted for when considering the risk of obsolescence.

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?**

It is important that as far as practicable appraisal attempts to capture the wide range of possible social, economic and environmental impacts over the longer term. This may require a range of methods both quantitative and qualitative through some form of balanced scorecard approach. The revised Green Book is clear that an over focus on narrow measures, such as BCRs, should be avoided, and the wider strategic benefits of investments should be the focus of appraisal within TAG.

Dr Alexander Roy, Head of Policy

Midlands Connect
Transport | Investment | Growth

Consultation Response

Date:	15th January 2021	**Confidentiality:**	N/A
Subject:	Appraisal Periods Consultation		
Author:	Henry Kelly		

Midlands Connect welcomes the opportunity to respond to the DfT consultation on changes to the standard appraisal period recommended by TAG.

The consultation document provides thorough coverage and discussion of the methodological challenges that would arise from an extension of the appraisal period from 60 to 100 years, but the advantages of the approach remain unclear.

It would appear that there are 2 possible changes that could arise from such an alteration to guidance;

i) A change in the relative ranking of transport infrastructure schemes in Value for Money terms
ii) A change in the absolute Value for Money of transport infrastructure investment in comparison to other investment options.

In terms of i) it is hard to see, given the challenges in modelling far into the future, how this change to guidance would do anything other than enact a consistent uplift to the benefit cost ratios of all schemes and in how as articulated in question 5 of the consultation document that any schemes would be biased against by the existing 60 year approach.

In terms of ii) the consultation document doesn't cover this in any detail. It may be helpful for a review to be conducted to compare and contrast the appraisal of non-transport interventions, potentially in the context of discussions around reform of HMT's Green Book.

The document itself and DfT's Appraisal and Modelling Strategy (AMS) more generally expressed an intent to update how uncertainty is treated in scheme appraisal. The move to a considerably longer appraisal period renders this topic more salient. Recent events have brought to the fore the challenges of assessing schemes over a long period and it would be more helpful for scheme promoters if DfT could move forward its plans to provide more guidance on a consistent

approach to uncertainty in appraisal, in advance of any alteration to recommended appraisal periods.

In addition the AMS plans to address gaps in guidance around the modelling of land use change, given that these impacts are likely to be the central component of any very long term impact of transport schemes, the development of an established approach to the modelling of these effects would seem to be a good precursor to the assessment of impacts far into the future.

A key objective of Midlands Connect is the development of holistic place and corridor based strategies that seek to combine the anchoring effect of transport infrastructure investment with complementary policies in fields such as housing, economic development, skills and industrial strategy. This creates a number of methodological and practical challenges. The extension of the appraisal period will make the articulation of a robust counterfactual (or Do Minimum) more difficult, particularly in the context of multiple interlocking sectors, each with different methodologies and timeframes.

In order for the appraisal of impacts over a 100-year period to be credible, it is likely that impacts will need to be modelled further into the future than is the convention with existing schemes. Midlands Connect recently conducted a Capacity and Capability Review engaging Local Authorities and other partners across the region. A key conclusion was that resource and skills constraints are acting as a barrier to the development of the pipeline of schemes and is undermining the bringing forward of quality investment options. The necessity for additional modelled years is likely to increase the burden of scheme development and worsen this problem.

Midlands Connect would welcome the opportunity for further engagement with DfT on this issue, ideally in the context of the interaction with wider AMS themes, in particular, uncertainty, land use modelling and the specification of additional modelled years, as there are significant advantages to resolving these gaps in guidance before reconsidering the length of the recommended appraisal period.

Appraisal and Modelling Strategy

Appraisal Periods Consultation

Thank you for the opportunity to respond to this consultation. Nexus is the passenger transport executive for the Tyne and Wear area, the owner and operator of the Metro light rail network and the Shields Ferry, and delivers public transport information and subsidises socially necessary bus services. We work closely with regional partners including Transport North East and the North East Local Enterprise Partnership to create policies and strategies which promote sustainable transport and deliver excellent public transport services.

This response reflects the role of Nexus both as a PTE and as a light rail operator.

Overall approach

Q1 *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?*

Yes, there does appear to be sound justification for the inclusion of benefits beyond the existing 60-year appraisal period for large schemes which take a long time to 'pay off' or could be considered transformational. Taking the Tyne and Wear Metro as an example, the network is now entering its fifth decade of service and will continue to deliver benefits well beyond a 60-year time horizon. Infrastructure such as the tunnels beneath central Newcastle and Gateshead effectively have an indefinite asset life subject to on-going maintenance and some renewal costs, as the consultation document states. Land-use planning decisions large and small across the Metro catchment area will have been made on the basis of proximity to fast and frequent light rail services; this applies to the existing 1980s network and will apply equally to a programme of network extensions that will extend the reach of Metro. In this context, taking account of the scale of investment involved, it seems appropriate to account for the key long-term benefits beyond the existing appraisal period time threshold, notwithstanding some of the challenges alluded to in the consultation and which are real and present issues during cycles of accelerating social, economic and environmental change.

The examples provided in the consultation and discussed at the consultation events provide good examples of this value (or where the value may have lost through earlier railway closures), and some

forthcoming strategic investment, in say coastal protection schemes at Dawlish on the Great Western main line, may similarly deliver benefits beyond the next 60 years. However, the desire to formally monetise these benefits may not be entirely appropriate (especially against the backdrop of the recent direction towards strengthening the strategic case in transport business cases) and has some significant theoretical and practical technical challenges that could actually undermine the messaging of the strategic benefits of long-term asset value in delivering socio-economic benefits. Nexus recognises this conundrum however we believe that a longer benefits horizon, if applied to the appraisal of all transport schemes, would derive net benefits in most cases – monetary, non-monetary and wider in nature – which would place the larger of the capital-intensive public transport schemes in a favourable position, compared to more local schemes.

Market-based residual value approaches

Q2 *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?*

As public transport capital schemes do aim to capture a wide range of benefit categories, there does appear to be merit in attempting to evaluate benefits which may evade a conventional market-based evaluation. A wider concern held by Nexus is that all approaches lack flexibility in representing local measures appropriately.

Ultra-long term impacts As noted in the response to Q1, the wider enhanced Strategic Case agenda appears to offer an opportunity to draw in a strong qualitative approach to scheme and programme appraisal to recognise the delivery of wider socio-economic and environmental benefits, especially for schemes or programmes that are exceptionally large and/or could be considered transformative. An approach could be to ensure that a qualitative assessment is provided to identify potential socio-economic value for a number of specific impacts, for example on strategic land uses, community connectivity and the environment. For example, an extension to the Metro network which provides access to jobs for people in deprived neighbourhoods could deliver a range of benefits such as lower unemployment support, better educational outcomes for family members and improved mental and physical health. Whilst acknowledging the difficulty of quantifying such benefits, far less monetising them, these are issues which could and should be considered during any overhaul of scheme appraisal methodology.

Environmental impacts Of the long-term impacts likely to arise for scheme delivery, it could be argued that the range of environmental impacts should be considered as the most or one of the most important over the next 30 years, given the UK commitment to reach net zero by 2050 – alongside the earlier commitments of an increasing number of local authorities. Supporting this target of getting to net zero relatively early in an appraisal period could be seen as an important performance indicator, suggesting the need to place an emphasis on the early part of the appraisal period with any longer-term extension to the appraisal period potentially diluting this message. This is linked to any discussion around whether discount rates should be used for different parts of the appraisal process, with schemes that reduce carbon likely to generate an increase in carbon-saving values if lower discount rates are applied for environmental appraisal components.

Treatment of uncertainty

Q3 What do you consider to be the key sources of uncertainty associated with appraising benefits over a longer timeframe?

Leaving aside the generally accepted issues surrounding the speed and direction of behavioural change and new technology – which are fundamentally difficult issues for any agency to accurately forecast – below are comments on a couple of specific topic areas which may help to frame thinking on benefits appraisal.

Do minimum uncertainty/counterfactuals This issue could be argued to be a concern with the current 60-year appraisal but become exaggerated with any further lengthening to appraisal periods. Whilst the theoretical position of appraisal using fixed/committed schemes for the do minimum is understood, requiring practitioners to assume more plausible do minimums that are realistic may provide a more stable and converged model, and thereby generating less spuriously high or low benefit estimates. The realism of the do minimum is an issue that can be tested at public inquiry, improving the credibility of any investment case. However, any move to include 'marginal gains' in the do minimum (especially if staged/phased over time to manage do minimum congestion levels), could genuinely erode the apparent scheme benefits (although this would also come with a 'cost' that would be 'avoided' in the core scheme appraisal).

Long-term operating costs, renewal costs and revenues There is a general need to strengthen the handling of uncertainty over ongoing operating costs, renewal costs and revenues/tolls that can sometimes appear disconnected as a result of the use of extrapolations or differing growth rates (noting the reference to 'normal profit' on page 14 of the consultation document). This guidance should be strengthened in the current 60-year appraisal guidance, but becomes more important, despite discounting, in the move to a longer appraisal period. In the case of a Metro network extension it would be important to disaggregate those elements of the scheme with an 'indefinite' lifespan from those with an anticipated lifespan of 'greater than 60 years'.

Q4 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?

The treatment of underlying demand growth and transport-facilitated development demand growth and linked demand caps is a general issue with the current appraisal framework which would be exacerbated by any extension to appraisal periods. This becomes a particular problem when the uncertainty in long-term forecasting significantly exceeds that of the impacts being measured.

It is acknowledged however that for the appraisal process to be appropriately rigorous and for the merits of individual schemes to be compared fairly, the application of a set timeframe does allow for consistent appraisal of uncertainty; even if the process is imperfect, recognition of its limitations and the application of appropriate adjustments will help to ameliorate these issues.

Differential impacts by project

Q5 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?

Concerns over treatment over the handling of short-term asset life schemes. Existing scheme appraisal can be challenging for interventions where operating costs and asset renewals represent the majority or a significant proportion of scheme costs, with high levels of ongoing spending and regular renewals required to maintain or protect the stream of benefits and revenues delivered over the long term. Any biases may work in either direction for such schemes, depending on the treatment of costs and the potential for benefit erosion. Biases may occur where low-cost or very-low cost alternatives are proposed for major schemes, for example for a light rail scheme where poorly appraised alternatives (or counterfactuals) can fail to identify the longer-term renewal costs and potential differential between long-term benefit delivery. Extended appraisal periods will add to this uncertainty and the extent of potential biases.

Scheme definitions and general appraisal periods Whilst TAG guidance suggests that the practitioner can deviate from established practice if they consider it necessary, in practice appraisal periods default to 60-year to provide comparisons across quantified BCRs (although some LEPs have considered 30 and 60-year appraisal for sensitivity purposes). It may be appropriate to consider the opportunity - or prescribe a requirement to offer more definition or clarity - to define a 'type of scheme' to be handled using a series of different appraisal periods most appropriate to the nature of the intervention lifecycles, rather than obliging promoters to default to 100 years (or even 60 years for smaller major schemes). The approach to be adopted could be defined at SOBC stage or earlier. There is an acceptance here that a mechanism would need to be developed if wishing to directly assess quantified economic appraisals/BCRs across scheme types (for example using 'staged' BCRs that could fall out of the discounted benefit and cost streams to illustrate, for example, the performance of a Metro network extension relative to a much smaller-scale smarter travel or highway junction improvement scheme).

In the case of exceptionally large and/or transformational schemes or programmes with large amounts of spending on assets with very long lifecycles (motorways, strategic rail projects) – longer-term benefits could be identified over periods in excess of 60 years, quantifying benefits and costs if appropriate (i.e. 'special case' Green Book compliant).

For 'very large' schemes with more limited spending on very-long life assets, but where some residual value may be appropriate for some scheme components – such as a Metro network extension - it may be appropriate to retain the 60-year appraisal framework (i.e. Green Book compliant) but qualitatively draw out any specific longer-term benefits.

For 'small' to 'large' schemes at local authority level, consideration could be given to shorter appraisal periods to reduce uncertainty over longer-term cost (operating/renewals) and benefit delivery streams (i.e. Green Book compliant, using a 30- year appraisal period).

We believe that this tiered approach would better allow schemes to be assessed in a way without inherent biases. Smaller more local schemes may be better served by a smaller appraisal period rather than a 'one size fits all' approach, which we believe would disproportionately favour bigger (national) schemes in most but not all cases.

Q6. Do you think there is a case for reflecting potential inter-generational effects in appraisal?

As a theoretical principle we see some merit in doing so from an altruistic perspective, however any change of appraisal policy in this context would need to be developed to demonstrate fairness of impacts and benefits to both current and future generations, taking account of the pace of change referred to in the response to Q1. This also links to the environmental elements of appraisal as noted in the response to Q2.

Q7. 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?

No, other than to echo the point made in the consultation document that the changes or extensions to appraisal periods must represent a trade-off between the rigour and accuracy of the process, and the potential to capture and quantify currently unmeasured benefits.

Q8. 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?

Consistency of Forecast Appraisal Profiles There is a need to ensure all appraisal impacts and profiles are carefully handled, and that any extrapolation beyond modelled years results in realistic growth profiles, including but not limited to implied benefit rates/demand unit, the relativities between public transport revenues/road tolls and operating costs, and renewal cost rates and inflation relative to value of time/other economic growth rates assumptions. This can be challenging for the current 60-year appraisal, but extended appraisal periods add to this uncertainty and could exacerbate any potential disconnect. The reminder on page 14 of the consultation document to 'normal profit' in forecasting revenues and operating costs is helpful in this respect.

Consideration of a profile payback period mechanism to consider when various quantified benefit to cost ratio thresholds are achieved This would require careful handling of ongoing cost and benefit profiles, but having reached certain BCR thresholds, the need for detailed appraisal beyond say 60 year may be reduced.

Q9. 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?

Special Cases for Programme Appraisal Whilst local authorities may aspire to deliver a long-term programme of major schemes over a number of decades, cases where funding availability can be assured for such programmes are likely to be exceptionally rare, requiring programme phases to be delivered (and appraised) as individual components, for example the light rail schemes in Manchester, Nottingham and the West Midlands. This could also apply to a future programme of Tyne and Wear Metro network extensions; Nexus would welcome the opportunity to have an

assured funding stream that could deliver our programme of additional Metro routes over the coming years, alongside an appropriate funding appraisal framework.

We note that scheme-based appraisals can make the first phases of network-wide schemes appear costly in establishing, say, area alignments, but with later extensions being marginally more efficient in using and realising some of the value of initial assets (through reduced costs). The issues raised in this question and illustrated in Figure 7 appear to be very special cases and ones that can be handled on a case-by-case basis where long-running programme appraisals (such as HS2) are appropriate, with the quantified appraisals using the approach model depending on the extent of overlap, interaction and delivery timing/risk between phases, and the need to test incremental value for money.

Q10. 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?

Messaging for Decision Makers Whilst benefit-to-cost ratios may appear to offer a relatively simple decision-making aid, the wider enhanced Strategic Case agenda appears to offer an opportunity to draw in a strong qualitative approach that could enable the potential socio-economic value of longer-term assets to be articulated without the need to push the credibility of technical appraisals into the realms of 100-year appraisals. Defending forecasts under the scrutiny, either from local members or during public inquiry processes can be a challenge for 60-year appraisal, and further longer extensions may lead to questions over the credibility of any numerical forecasts, blurring the strategic messaging that there may be some real long-term asset value (even if it cannot be quantified). TAG guidance notes that the other elements of a business case are just as important as the BCR, but in practice that may not be what is happening on the ground with decision makers. This particular point needs to be strengthened as part of any updated guidance.

Embracing uncertainty The likely move towards scenario testing (especially post-COVID) provides an opportunity to more thoroughly test the robustness of the quantified economic case, but it may place even more emphasis on the benefit-to-cost ratios, relative to the strategic case, and can also mean that decision makers can be faced with a too wide a range of 'certain futures'. This may make the messaging available to decision makers harder, with the extended appraisal periods having the potential to add another further dimension to this. Mitigation here could involve restricting the longer appraisal periods to only exceptionally large and/or transformational schemes or programmes.

Proportionality From a proportionality perspective, for the vast majority of local authority/PTE/LEP major schemes, constrained resources and timescales could best be spent focusing on technical efforts and messaging for decision makers on ensuring the best possible appraisals and business cases are developed, rather than pushing the full spectrum of the appraisal beyond realistic local authority/LEP planning horizons towards 100-year appraisals. We do acknowledge that for exceptionally large and/or transformational schemes or programmes some longer-term consideration may be required, either handled through the strategic case or if necessary, the quantified economic case. Indeed we are keen to illustrate the longer-term value of some of the key assets in Tyne and Wear, and in particular that of the Metro network where some of the infrastructure built for the initial network has underpinned service delivery for the last 40 years and with the expectation of continued delivery well beyond the next two decades.

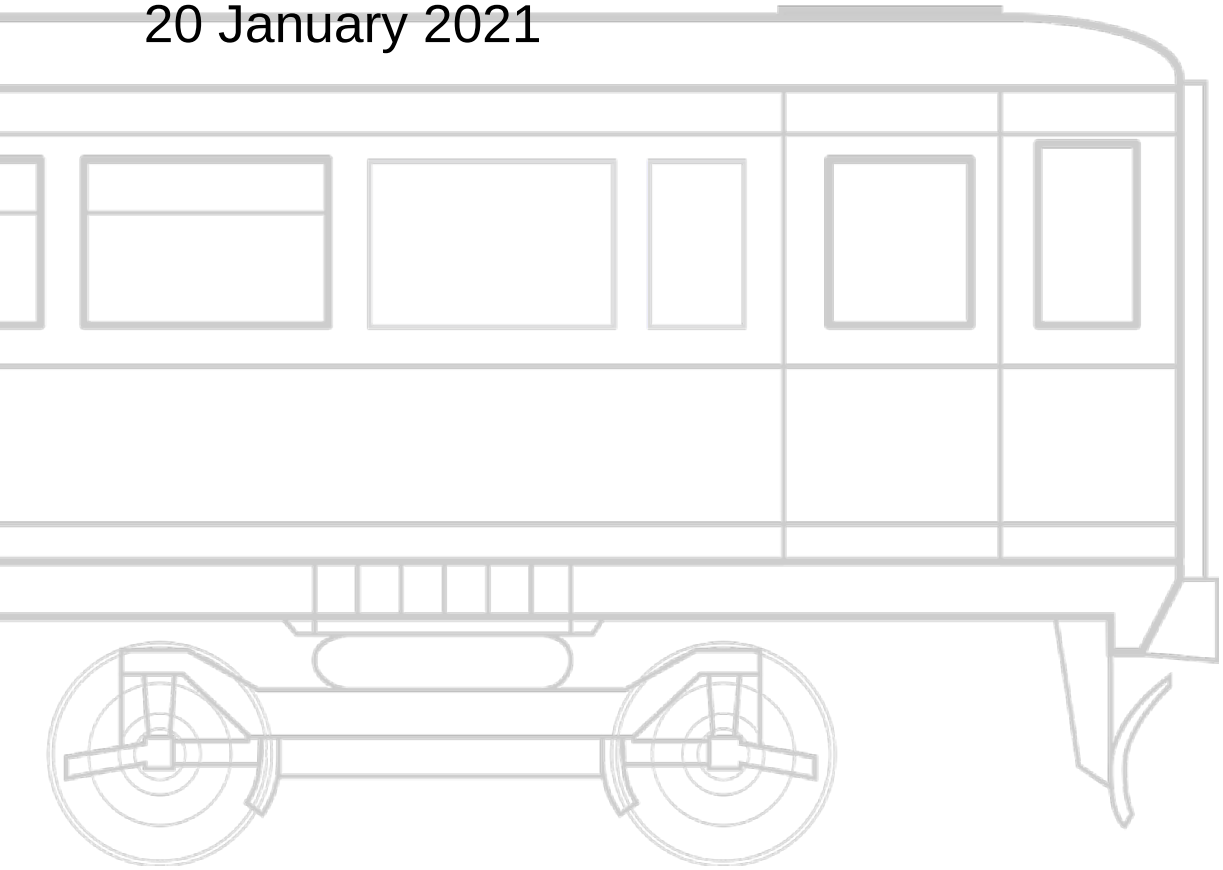
Q11 What are your thoughts on our proposed criteria for identifying the preferred approach?

All of the six criteria listed in the consultation document are relevant to identifying the preferred approach. We would perhaps attribute greatest weight to the following:

- Representation of uncertainty
- Proportionality
- Scope of impacts appraised

Network Rail response to DfT Appraisal Period Consultation

20 January 2021



The Green Book Review has recommended some significant changes to the application of appraisal in the U.K. However, the Department has yet to publish its response to the Green Book Review. We have therefore commented on this consultation in the context of current TAG guidance.

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?

We believe that the consultation has highlighted a number of solid reasons for reviewing the treatment of longer-term benefits:

- Stated design lives of 100 years+ for many assets
- Evidence of assets that have achieved or exceeded this asset life

Overall, therefore, we are broadly supportive of a longer appraisal period where it enables richer picture to be presented of the investment decisions we are presenting to investment decision-makers in terms of both socio-economic benefits and costs. Extending the scope of appraisals by extending the appraisal period is not a free good, however. The benefits associated with it need to be considered alongside the additional uncertainty associated with a longer planning horizon.

In particular, the longer the planning horizon, the higher the risk that estimates of scheme benefits will change in ways that are difficult to predict. This risk is unlikely to be adequately reflected in the overall catastrophe risk element of the discount rate because it is more specific to the asset in question e.g. a new mode such as hyperloop would have such an effect on the demand for rail and road – this is similar to the Inland Waterways example provided in the consultation document (i.e. there is some obsolescence risk that we do think needs some consideration for appraisal). We note that some assets are no longer used in the way that was originally anticipated (e.g. the primary rationale for most rail routes was the transportation of freight, however transportation of passengers is now the primary purpose of most of the rail network).

There also appears to be a risk that without clear guidelines for what longer appraisal periods would be appropriate, there is a risk that promoters of larger schemes (in terms of scale and cost) would invariably attempt to justify longer appraisal periods irrespective of the likely asset composition of a scheme. However, on the basis of asset life alone, a bridge designed for a 100-year life has a stronger justification for extended appraisal period than a far larger signalling scheme with an expected life of, say, 35 years.

Also, given the way that transport investment is currently compared, a fixed appraisal period has an attraction in terms of comparability across transport schemes. If a longer-term appraisal is indeed progressed, then we believe retaining a fixed backstop or reference "maximum" appraisal period (e.g. 100 years) should be considered to allow comparisons to take place across the portfolio. The consultation notes this point on page 28 and we are largely in agreement with this.

Finally: keeping key appraisal parameters consistent over time is helpful for backwards-comparability of appraisals and decisions and there will inevitably be a time lag in updating appraisals of schemes currently within the portfolio of investments either being actively progressed or considered. This is a potential downside which isn't discussed much in the consultation but should nevertheless be borne in mind when updating the guidance.

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?

We think it is sensible to rule out the market-based approaches in most cases. The value that a private company would be willing to pay for an asset is subject to similar uncertainties as the assessment of costs and benefits (e.g. future demand, cost of maintenance), but will miss important social costs and benefits that form a fundamental rationale for public investment. We also think that a market-based approach would be even more complex for road schemes where this could require assumptions about toll-setting behaviour in order to generate a value.

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

We believe there is a lot of uncertainty around parameters in the appraisal framework itself that will have an increasing bearing on appraisal outcomes with a longer horizon. For example:

- Fundamental market changes (composition of the economy, land use, environmental, economic, political and interactions between all of these)
- Long-term use for the assets in question – e.g. changes in society, affecting travel demand, that fundamentally alter the appraisal – obsolescence risk being a particular example
- Values-of-time and especially changes in the value of travel time savings over time or with respect to income. We think it might be sensible that any

  evidence in relation to temporal change or the income elasticity of travel time savings be revisited at the same time as considering a new appraisal period
- Carbon prices
- Future economic growth

In addition, whilst this question asks about benefits, we think that whole-life costs is also an area where extending the appraisal period makes life no easier for practitioners. We believe collecting robust evidence on whole life costs (including both the costs of renewing the "do-minimum" infrastructure and the "do-something" infrastructure) is often a significant challenge. The longer the appraisal period, the more challenging this is likely to become.

Clearly, appraisal practice needs to be driven by the needs of decision-makers, and the priority of appraisal should be to inform the investment decision at hand rather than necessarily tailoring schemes to fit too tightly into the appraisal framework. However, decision-makers need to be able to prioritise investment and a consistent approach is therefore helpful in this respect. Scheme promoters should therefore have the freedom to deviate, but the burden of justifying deviations should lie with scheme promoters.

Another consideration is optimism bias. Optimism bias applied to costs is only part of the potential optimism on the part of scheme promoters and funders. Potential sources of optimism relating to benefits include the extent of outputs delivered (journey time, capacity, performance) and the impact of the scheme on demand. The recent optimism bias study included some evidence on this in relation to demand forecasts. If longer appraisal periods are applied, we think it would be worthwhile considering this issue at the same time. For example, it seems that there is likely to be greater uncertainty in forecasting demand responses to substantial new journey opportunities than there is to

quantifying the time-savings associated with improving existing journey opportunities and the appraisal guidance should recognise this.

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 longerterm benefits of investment?

Appraisal is about providing decision-makers with the information that they need in order to make investment decisions. The information required to support investment decisions should not be "hard coded" into guidance because they need to reflect the real world impact of a decision rather the modelled impact.

However, longer appraisal periods should not be a "free good" to scheme promoters because longer asset lives aren't necessarily conducive to the public good. The longer the appraisal period, the more consideration of uncertainty will be required.

The trade-off between uncertainty and appraisal period should not be limited to the economic case within appraisal. It should be a consideration during the option generation process and when objectives are set. The responsibility for justifying long-lived assets therefore needs to sit squarely with scheme promoters rather than being presumed as a matter of course.

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?

There seems to be a view that large programmes (HS2, NPR) could be more suitable candidates for longer appraisal periods. However, we consider that there is a weak case for a different appraisal of these interventions than any interventions on the existing network that also include a substantial civils component. A grade separated junction (requiring land take and new civils components) should not be treated differently in terms of the appraisal period to a new rail line. A particular case where we think the current appraisal guidance could bias decisions is level crossings where bridge interventions have a probable design life of 80 or 100 years and are compared to lower capital cost options (or no intervention) over a 60-year horizon.

We believe that the guidance could usefully be clarified to ensure appropriate appraisal periods are being chosen relative to the balance of expenditure in different asset categories. For example, should a platform extension (small capital spend) supporting a large operating cost increase (longer trains) be treated as a capital programme (thus attracting the maximum appraisal period) or not?

One likely source of bias could be towards cost-saving schemes rather than benefit driven schemes. For example, the South West Rail Resilience programme sees a shift in narrative when a 100-year appraisal period is used rather than 60-years due to increasing importance of cost savings from more resilient assets. This also illustrates some of the inherent uncertainties with longer appraisal periods as the costs and benefits in this latter 40-year period are heavily driven by assumptions around the frequency of different weather-related events driven by climate change.

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

We believe this is something to be discussed in the strategic case and in some cases (e.g. decarbonisation strategy) it is likely to be of very high importance to decision-makers. With number of scenarios already requiring consideration we believe sensitivity tests on the discount rate itself are unlikely to help decision makers and will add to “BCR proliferation”.

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?

As mentioned above, we believe it would be a timely moment to review evidence on temporal change in VTTS and the income elasticity of VTTS.

The options in the consultation document that reduce growth in appraisal values in line with the discount rate reductions over time seem quite appealing and making this change at the same time as extending the appraisal period could be a way forward.

We note that the difference in the real GDP per capita growth assumption inherent in the discount rate (2%) and those used in the appraisal growth (c1.5%) has possibly opened the door to longer appraisal periods.

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?

[]

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?

The approach suggested of 60 years of operating costs and benefits from the point of each phase of a programme being delivered appears to be sensible. This is the advice we have received previously from DfT analysts during project development, and, subject to questions of resource, seems to be the best approach. We note that this differs to the appraisal of HS2 and others which have undertaken 60 years from the final phase leading to appraisal periods longer than 60 years already.

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.

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

Overall we think the set of proposed criteria are reasonable.

We are not sure about the capacity constraint issue in terms of the means of identifying a preferred way forward. If there was insufficient capacity on a new rail line to continue to allow for demand growth, then this could be rationed via prices (returned to the revenue line of the BCR) and therefore we are less certain about this criteria, compared to the others proposed, for choosing a way forward. Perhaps it should have lower weight in decision making than other factors.

In terms of ability to differentiate between proposals' vfm, we are of the view that for option selection, it is reasonable to assume that the key uncertainties facing different options will be the same (or similar). This isn't necessarily the case for scheme prioritisation.

Portfolio: Place **Service Area:** City Growth

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Dear Sir/Madam,

Appraisal Period Consultation

Thank you for the opportunity to respond to the consultation on appraisal periods in transport business case development. Our response has been produced by the transport planning team at the authority and represents the view of technical officers in the council.

General Feedback

Sheffield City Council welcomes the opportunity to comment on this consultation exercise. We understand and appreciate that the Department is reviewing and updating TAG through the modelling and appraisal route map, of which this consultation forms a component. We would welcome the opportunity to engage you on other material changes proposed to the modelling, appraisal, and wider transport business case guidance updates and as these are developed.

Reviewing and updating the guidance on a single issue can potentially cause issues for schemes part way through the approval process. The timing of implementation of any fundamental changes to TAG should be considered in packages where there are clear interactions, the appraisal period clearly has implications for the TAG data book and guidance on treatment of uncertainty as examples. There are also clear interactions between values and inputs used in appraisal, and therefore reviewing and updating one section of guidance will have implications for others. This is recognised in your approach to consultation on appraisal periods which is welcomed.

There are potential major impacts on scheme development for sponsors when guidance changes fundamentally. This is particularly relevant to schemes part way through the approval process. If for example guidance was updated between SOBC/OBC or OBC/FBC then this could impact on how a scheme performs and could result in major re-scoping of proposals, at the sponsors risk. Accepting that this is inherent to any update in guidance, it may be advisable for scheme sponsors to test the implications of draft guidance updates as part of sensitivity testing in their business cases.

Care should be taken in the context of being able to compare the quantitative appraisal outputs of a number of potential solutions to a problem, when the range of solutions means different appraisal periods are recommended. For example if both road or active mode solutions are identified then comparing their value for money (with one appraised over 100 years, the other over 30), would

potentially bias the outcome in favour of the solution appraised over a longer period. The guidance will need to consider these issues.
If the appraisal period is extended beyond 60 years then the certainty associated with all aspects of the case may be deemed less robust, particularly if a scheme progresses to a public enquiry. Defending a marginally positive scheme based on assumptions of what the study area will look like in 100 years will be a major challenge, and something which could easily be unpicked by those opposing the proposals.

To truly understand the longer terms effects of transformational schemes a modelling year further into the future would be required (accepting uncertainty issues). Then "switching off" the scheme will demonstrate the impacts on the transport system if the scheme was no longer available. This may be a useful exercise to understand the impacts when developing the guidance.

Extrapolation of costs and benefits for another 40 years does not inform scheme specification – i.e. the capacity provided in your scheme (number of lanes on a new highway, capacity of a new public transport route). Appraisal method should inform scheme specification and design, purely extending the appraisal will capture the costs and benefits of this, but as there is no feedback in terms of capacity constraint, for example, this limits its value.

Overall Approach

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?

The current guidance recommends use of appraisal periods over the likely life of assets on a scheme type basis – so 60 years for highways and rail, and shorter periods where either the impact of the investment or the life of the asset is likely to be over a shorter period.

The opportunity to extend the appraisal period is welcomed for major infrastructure schemes (such as strategic / main road network and improvements to the railway) where the benefits are likely to be realised over a longer period.

The guidance on forecasting and appraisal typically focuses on a scheme opening year and a horizon year 15 years post opening, with benefits extended over the appraisal period using these two forecasts. This means that a substantial number of future years are based on a forecast 15 years post opening. Extending the appraisal period further (depending on the extent) may require an additional forecast to reduce the extent of extrapolation. This presents its own challenge in presenting an evidence-based forecast of changes to demographics, economics, transport supply and demand in a forecast beyond 20 years after the forecast year (typically the life of a Local Plan).

It would be interesting to conduct scenario / sensitivity testing on schemes already subject to a 60year appraisal to include costs and benefits over a longer period (with all other inputs unchanged).

With public transport schemes there is a need to consider the deregulated market in which services currently operate. For example, a rail franchise or concession to operate a specific service will be contracted over a specific period, often with requirements for renewals (rolling stock for example), at specific intervals. It may bias the outcome of an appraisal depending on what appraisal period is adopted for schemes which incur such costs.

Market-based residual value approaches

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?

Agree that the options presented consider at a high level the available alternative strategies. The option to continue as per the current guidance was not included as an option, but it is assumed this remains one of the potential outcomes. Given that decision making is based on the full social and environmental impacts of an intervention, then these should be considered in the long term. For major investment decisions these will be quantified in the appraisal and being dependent on the same forecasting inputs and assumptions as the value for money appraisal will experience similar challenges. The "scrap value" of a decommissioned project at the end of the appraisal period will also be subject to market conditions at the time and introduce further bias.

Treatment of uncertainty

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

With the advent of new technologies in the transport sector, ranging from electric power, vehicle autonomy and Mobility as a Service, along with trends in behaviour changes (working from home, flexible working arrangements, home shopping, etc) there is a challenge to be able to forecast within the current 60-year appraisal period. All of those mentioned above are either already taking place and expected to grow, or likely to impact in the coming years. Extending the appraisal period is not likely to introduce new uncertainty – as anything 60+ years in the future is not being captured.

The key inputs / drivers of the appraisal over an extended period, from our own perspective are presented in the table below.

Table One: Factors influencing uncertainty

Factor	Issue
Economic assumptions	Sourcing robust data on economic growth beyond 60 years. Lack of feedback into the appraisal when extrapolating model outputs from 15 years post opening
Land use changes	Location, type and scale of regeneration and redevelopment of cities, will impact on forecast travel demand, and the ability of the network capacity to cater for this demand. Any extrapolation from the horizon year will simplify interactions between accessibility and land use
Supply changes	The longer the appraisal period the growth/technology and underlying policy and behaviour change have greater influence on outputs/outcomes. This is particularly relevant where system capacity becomes an issue in the DM on congested networks
Maintenance and ongoing operating costs	These become less certain beyond current appraisal periods. A good example of this being the Tame Valley viaduct carrying the A38M into central Birmingham. This is carrying traffic well beyond forecast demand from the 1960's and is now subject to a maintenance project costing circa £90M. Inclusion of these long term costs in the original VfM assessment would have potentially influence decision making at the time of planning.

Transport policy and wider policies	The longer the appraisal period the more applicable extrapolation of input data is to be used in the lack of local data or TAG data book information. This approach does not capture the likely policy changes (nationally and locally) which would impact on supply and demand beyond the current appraisal period.

The issues raised in the consultation on the specification of a do-minimum to inform decision making only based on the proposed intervention becomes a greater challenge when longer appraisal periods are considered. This is considered in the consultation, but an alternative approach may be outcome based, identifying the range of interventions required either in isolation or combination to achieve outcomes identified and agreed in overarching transport strategies. This could form a sensitivity test and is more relevant to the later question on the assessment of programmes.

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?

An alternative approach would be to extend the appraisal period but introduce additional forecast modelled years beyond the horizon year. The challenges with this approach are related to the lack of planning and economic data, and where available the lack of certainty around schemes and land use changes. This approach is consistent with current approaches, but it does not account for technology and behaviour uncertainty outlined in our response above.

Limiting the appraisal period represents the most effective approach from our own perspective, accepting that this will potentially undervalue the longer-term effects of major infrastructure investment. Most effort in appraisal should be invested in establishing robust forecasts which inform appraisal over the current appraisal period as this is will produce the most representative quantification of forecast impacts where certainty around impacts are more robust.

Differential impacts by project

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?

There are a number of challenges within the existing guidance outside of the appraisal period which can cause bias when comparing different options to achieve an agreed set of outcomes, purely on the basis of the economic case and value for money assessment. Different scheme types / modes require different appraisal approaches (e.g. highways, light rail, rail, active modes) which makes a comparison purely on BCR potentially favouring one option over another.

Appraisal of public transport schemes, and in particular light rail projects include the operational analysis of running costs vs revenue and require a revenue surplus to demonstrate that the service is financially viable. This in itself introduces a bias – a rapid transit scheme with a significant operating surplus will be advantaged by the extension of the appraisal period, whereas highway or other modal schemes will be disadvantages due to incurring ongoing costs, without revenue income to offset this in the appraisal. This advantage is reduced to an extent with indirect tax being included as a loss to the economy in the appraisal of public transport schemes, where car trips are removed from the system as a result of the new scheme.

Specific to active mode appraisal, typically conducted over a 30 year period, but using the same discount factor over that period as a 60 year appraisal potentially under estimates scheme benefits,

which for a major investment programme, will deliver benefits beyond 30 years (assuming these are maintained to investment standard and those costs are included in the appraisal). Earlier guidance from DfT for appraisals over 30 years previously used a 6% discounting rate.

Inter-generational effects

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

Reducing or removing the discount rate appears to be a rather blunt instrument to reflect the longterm benefits of major infrastructure. The current practice of reducing the discount rate beyond 30 years to 3% could be further reduced for a longer appraisal period. For example, this could reduce to
2.5% between 60 and 80 years, and 2% thereafter. This would reduce the impact of compound discounting which if applied at 3% per annum would produce negligible benefits year on year as the appraisal period is extended.

Some basic calculations using a scheme appraised over 100 years (using the same growth assumptions around population, GDP and demand growth as in the consultation period), changing the discount rate on a scheme which delivers £80m of benefits per annum (2010 prices) is presented below.

Table Two: Example discount rate calculations

Appraisal Period	Discount Rate (%)		
	Current	**Option 1**	**Option 2**
0-30 years	3.5	3.5	3.5
30-60 years	3	3	3
60-80 years	3	2.5	0
80-100 years	3	2	0
PVB (m,)	£1,223	£1,250	£1,406
% change		2%	15%

Assuming that the discount rate up to 60 years remains constant, the impact of reducing the discount rate for the later years is relatively small on total PVB values in this example, even removing the discount rate (while retaining the growth assumptions related to GDP and population) results in an uplift in benefits of 15%. This worked example demonstrates that in this case the extension of the period, using lower or even zero discounting rates only resulting in marginally small changes in the calculation of benefits.

Appraisal accounting

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?

Purely extending the appraisal period beyond 60 years and continuing the discounting rate of 3% per annum would result in values becoming insignificant for every additional year included (beyond 60th)

to a point where they become inconsequential to the appraisal. In a test we have conducted with a dummy scenario/scheme with £80m of annual benefits (2010 prices) and an opening year of 2024 , the present value of benefits in 2084 (60th year) are £8.3M, £5.6M in the 80th year and £3.8M in the 100th year, assuming current discount rates and flat growth beyond the 60th year.

To better represent the value of these impacts in later years of the appraisal the discounting rate, assumptions around growth in demand and GDP should be reviewed, with the potential to reduce the discount rate for years 60+ (as detailed in our response to inter-generational issues).

Profiling other appraisal impacts over the long-term

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?

As referred to in the consultation material, level three impacts are a source of major uncertainty in transport scheme appraisal.
The consultation considers benefits being accrued over the appraisal period in their entirety. There are potentially different associated with different sources of benefits over the appraisal period. For example, when quantifying journey reliability benefits, or amenity impacts for example, should these be assumed to be extrapolated in the same way user journey time savings are extrapolated?

There may be policy related issues which would also impact on longer appraisal periods, including the regulatory market in which transport services and systems are operated. Without empirical evidence on how this may be implemented and will impact on supply and demand it is unlikely that incorporating these into guidance would be possible.

Other appraisal period issues

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?

A programme should be as suited to a project appraisal. A project, which may be a package of discreet interventions - which when delivered in a coherent approach result in the desired outcomes and objectives identified. The challenges here are related to ensure that all impacts are captured, removing double counting, and including impacts which either cancel each other out, or deliver collective benefits over and above their individual contribution. This needs to be handled in both the modelling and appraisal framework.

The appraisal period for individual components of a package or programme of work should relate to the asset life of each component. A single appraisal has been produced for a multi modal scheme combining active modes, highways, and rail investment whereby the impacts are only calculated and incorporated into the appraisal for the relevant period – 30 years for active modes, 60 for rail and highways.

A relevant local example is our programme of Transforming Cities Fund (TCF) outline business case submissions to Sheffield City Region, which comprise a range of active mode, public realm, blue green infrastructure and public transport interventions, which have their own forecasting and appraisal guidance, and which then need to be combined into a single value for money assessment for each scheme.

The challenge here is that the appraisal period naturally focuses more attention to the longer appraisal periods where the majority of benefits are to be accrued (due to typically more users impacted), which can feedback into the scheme scope, reducing the contribution of the lower valued components within the package. This will, without care, result in schemes which are appraised over a longer period producing higher BCR's and greater value NPV's (understanding that PT schemes are different in their inclusion of operating costs and revenues).

Supporting decision making

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?

Decision makers, whether central government, LEPS or combined authorities require summary information on the business case outputs, as typically presented in an Appraisal Summary Table. Information which can be extracted in a format to fit with this level of information should be considered for inclusion. Any more detailed analysis should be dealt with at a technical approval level, as currently the case.

Table three presents the outputs of the analysis conducted in the example used earlier to demonstrate the impact of differential discount rates. As demonstrated below, reducing the discount rate (options 1 and 2) shifts the focus away from the early years of the appraisal in benefit terms and presents a more balanced assessment of impacts over an assumed 100-year appraisal period. It also confirms that the majority of benefits are captured within the current 60 year appraisal period, and therefore extending this will only capture around 20% (for an additional 40 years) of impacts. This supports the view that a scheme with a strong economic case over 60 years will remain so over 100 years, and likewise a poor performing scheme is unlikely to jump up VfM bands on the basis of an extended period of appraisal.

Table Three: Presenting PVB by year points

Years	Current	Option 1	Option 2
0-30	54%	53%	47%
30-60	28%	27%	24%
60-80	11%	11%	13%
80-100	8%	9%	16%

This would be potentially valuable information to present to decision makers in the AST, either as the absolute values of NPV and PVB, or as % of total benefits as presented above. This will allow decision makers to understand and potentially compare the short versus long term impacts of major investments, whilst also being able to directly compare the early year benefits of major schemes versus lower investment schemes appraised over a shorter period.

As with all other aspects of the business case it is important to ensure that when the economic case appraisal period is extended, this is reflected in the strategic case, to ensure a consistent evidence base is presented. There will need to be guidance on how this is included and presented, whether trend information is sufficient, or whether more detailed economic and policy analysis beyond the current appraisal period is recommended. Given the uncertainties around forecasting and appraisal in the economic case a trend-based assessment is likely to be more technically feasible and proportionate.

Potential ways forward

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

All covered in the points made in responding to specific questions and our general feedback introduction above.

Yours sincerely,

Mr Matthew Reynolds

Transport Planning and Infrastructure Manager

Sheffield City Council

Consultation Response
January 2021

Appraisal and Modelling Strategy: Appraisal Periods Consultation

Department for Transport
Our ref:240119E1

steer

Consultation Response
January 2021

Appraisal and Modelling Strategy: Appraisal Periods Consultation

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2 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.

3 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

3.7 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.

3.8 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

nonmonetised 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[11] in mobility patterns.

4 Modelling and Appraisal Challenges

[11] 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

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[12] • 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[13]
- While the original October 2013 version of TAG Unit A5.1 has a worked example appraisal using a 20-year period,[14] it does not specify an appraisal period *per se*. This example does not form part of the current (2020) TAG issue

[12] Paragraph 3.29

[13] Paragraph 2.26

[14] 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[15] 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[16] in his recent book *Licence to be Bad. How Economics Corrupted Us*.[17] 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*.[18] The scale of the impact on life increases with

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

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

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

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

greater warming. Reducing the scale of global warming reduces the number of people who will die because of it.

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"[19] [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,[20] 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.[21] 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:

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

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

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

- 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:

  - 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[22]
  - 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[23]

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.

[22] 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

[23] 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

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.

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.

4 5 Supporting Decision Making

10 How can we best ensure that decision makers understand the potential value of long 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*,[24] 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

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

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.

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*[25] 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

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

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.[26]

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.

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

[26] 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

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.

5 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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Surrey County Council

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?*

   There is a case on the basis that some infrastructure schemes deliver benefits beyond the current 60 year appraisal limit. However, there must be a clear rationale or objective for doing so. The change in 2003 from a 30 year to 60 year appraisal period was to bring it into line with the guidance in the revised Green Book to allow a comparison by both scheme promoters and government between scheme options and different types of project.

   In our view the main challenges include modelling, including whether this can only be done with an integrated land-use model (bearing in mind that these are likely to be transformational schemes and could change land-use over a wide geographical area, potential not just regional but also country-wide), and considering how travel behaviour will change in the future coupled with valuation of benefits (e.g. should the value of time be reduced the more one forecasts into the future beyond via the use of the discount rate.) In addition, maintenance, renewal and operational costs need to be fully taken into account: in our experience this aspect is understood poorly by scheme promoters and trying to obtain relevant data can be difficult.

   Furthermore, unless they are involved in economic / financial appraisal whether it be in the field of transport or not, many interested parties do not appreciate fully what economic appraisal is trying to achieve, and extending the appraisal period further could make justifying the benefits of a scheme harder.

Treatment of uncertainty

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

   Key sources of uncertainty include forecasting population and demand, predicting travel behaviour, taking into account land-use changes and therefore changing trip patterns, value of time, etc. In addition, TEMPro does not forecast 60 years at the moment: therefore, the use of flat line demand and

other values held constant (e.g. population and GDP growth) for longer into the future would need to be considered.

This aspect of uncertainty needs to be considered in terms of what decision-making benefit is going to be derived from using a longer appraisal period. As mentioned in response to Q1 above this does appear fundamental.

The degree of uncertainty can vary by mode: most people walk and there can be some certainty over the impact of new footpaths (e.g. some town paths are well over 100 years old), whereas for motorised related schemes uncertainty might much greater. Therefore, where the uncertainty is greater, the appraisal period should be shorter. Furthermore, this might be advantageous to modal shift schemes that are frequently seen as having low value. By allowing these types of schemes to be assessed over a longer appraisal period where the benefits and costs are more certain they could achieve a much more positive result even when significant investment such as land acquisition is needed. This compares with the current situation where such schemes are often rejected due to the high costs compared with apparent low return.

3. *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?*

   Different projects have different objectives and, therefore, require different appraisal periods. TAG already promotes a proportionate approach, but it might be helpful to give an indication of suggested appraisal periods for different types of interventions.

Inter-generational effects

4. *Do you think there is a case for reflecting potential inter-generational effects in appraisal?*
   If the scheme is transformational, there is a potential benefit. But these schemes are likely to be relatively few and might apply only to very large schemes such as a new fixed link river crossing where there is nothing in the vicinity at present, a new motorway link, a new rail-line (either light or heavy), etc.

   However, this is not to say that it is just these very large schemes that should be appraised over a longer period. As noted above, some small scheme could also benefit from a longer appraisal period and demonstrate equally good if not better value for money.

   This is where, possibly, guidance is required on appraisal periods for different types of scheme, otherwise it will be difficult to compare different projects of a similar nature should proposers use different periods.

Profiling other appraisal impacts over the long-term

5. *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?*

Possibly introduce a third year beyond the opening year and design year.

Supporting decision making

6. *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?*

Being able to report simply the breakdown of time periods by year period (e.g. 0-20, 20-40, etc.) would be helpful. However, one approach we have found successful with decision-makers is being able to illustrate first year rate of returns. The suggestion of being able to identify how many years of operation are required to achieve value for money is similar, and so we would welcome this.

Clear demonstrations of the different aspects would be very helpful which could be used as a basis for explanations to decision-makers and other interested parties. In particular, some commentary on how very small time benefits be 'beneficial' and the alternative of how land-use value uplifts have or have not been taken into account and why would be very helpful.

Sustrans

Sustrans is the charity that is making it easier for people to walk and cycle. We're working with families, communities, policy-makers and partner organisations right across the UK to encourage active travel. We aim to support people to choose healthier, cleaner and cheaper journeys, with better places and spaces to move through and live in.

Key points

The key points of our response are:

- Forecasting of impacts over the 60 year appraisal period is already extremely weak; extending the forecasting period would amplify uncertainty beyond acceptable levels
- Any extension of the appraisal period would hinder priority Government agendas, most notably Net-Zero by 2050 and Levelling-Up
- Transport appraisal guidance and Government environmental and health objectives are contradictory; measures to align appraisal approaches with Government policy should be prioritised above extending the appraisal period

Response to consultation questions

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?

No, we think that there is no case for including benefits beyond the 60 year appraisal period in the case making. On the contrary, we think that any extension to the 60-year appraisal period would be counter-intuitive to all that experience has taught us and common sense would suggest.

Other major challenges are related to uncertainty and change, and are discussed below in our response.

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?

We think we should be considering reducing the appraisal period as an option. To try to forecasts over 60 years in the context of social and political changes is a fallacy. Transport model forecasts barely hold up over a decade, let alone over longer periods. Benefits and costs cannot be reasonably extrapolated over this sort of period.

We do think that we should be focussing on a range of social, economic and environmental impacts, but over a much shorter time frame. We face immediate challenges in all these areas, as reflected in Government policies, and we need an appraisal process that faces up to this fact and that better supports decision making in these areas. It is difficult to see how extending the appraisal period contributes in any meaningful way.

We also appreciate that there is a balance to be struck between sustaining a vision over the longer term and the short term nature of the electoral cycle. But we don't see that extending the appraisal period supports us in finding that balance.

Treatment of uncertainty

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

Looking back over 60 years, from 1960 we failed to foresee environmental challenges, social changes, population movement and pandemics, to name but a few society-changing factors; we cannot possibly expect to foresee the issues that might play out over the period to the end of the century.

Transport modelling is already weak over even relatively brief timeframes.

The 'predict and provide' paradigm that transport economic appraisal serves to underwrite represents a significant failure of policy support. Some observers suggest that a 'decide and provide' scenario would be preferable, enabling us to break out of the 'things tomorrow will look similar to how they look today' proposition. It is our view that transport economic appraisal is locking-in some of the shortcomings in transport provision, and we are of the opinion that extending the appraisal period would exacerbate this problem.

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?

In our view, limiting the appraisal period is the best way to reduce the impact of uncertainties. But uncertainties that affect cost and benefit accruals play out over much shorter time windows than the current 60 year period. So the set time frame should be shorter than it is currently set.

We don't know other approaches that better balance uncertainty with potential longer-term benefits of investment. But we would contend that artificial inflation of benefits, such as the disproportionate effect of time savings in the long term,) does a disservice to the principle of scheme appraisal.

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?

Yes, we think that current practice in relation to appraisal periods materially biases against particular schemes or options. The guidance as we understand it currently suggests that the appraisal period for walking and cycling schemes is significantly shorter than that for e.g. road and rail schemes. On the one hand, there is no particular rationale that says that infrastructure to support walking and cycling is shorter-lived than other transport infrastructure (indeed there are many good examples of cycling infrastructure from the 1930's; and pavements for walking endure). The benefits accrued by walking and cycling schemes would be even greater if we were to use the same appraisal period for these as is applied to other schemes. On the other hand, many of the health benefits of active travel schemes accrue over longer periods. The health benefits of encouraging children to walk and cycle now may well be realised in later life. The one (the only?) point in favour of extending the appraisal period is that future health benefits could be incorporated into the modelling more easily.

Inter-generational effects

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

We are not conversant with the intricacies of this proposition. But the tone of the consultation text feels rather different to the tone of the Green Book guidance cited at that point in the text. The Green Book guidance references irreversible environmental damage; the consultation references 'significant benefits for generations to come'. Both play out, of course. But the emphasis of the consultation does not feel helpful, and supports our suggestion (Q10 below) that the current appraisal framework is not the impartial and even handed process it purports to be.

We would point to the experiences of the Office of the Commissioner for the Wellbeing of Future Generations in Wales, and their work in investigating the case made for the M4 schemes. The conclusion of this exercise was that, among many other shortcomings, the case did not adequately take into account the likely impact on future generations. Consequently the Commissioner took a position against the proposed schemes. The broad proposition is that it is not OK to implement road schemes that will have a significant effect on 'locking-in' the most damaging forms of transportation which will have ramifications during the lifetimes of those who are not even born yet.

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?

We cannot comment on this in any detail other than to observe that the application of the discount rate and the growth in appraisal values remain a highly dubious component of the overall appraisal equation.

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?

Of the many works of creative contrivance that are core components of the current appraisal system, we would highlight the calculation of wider economic benefits, the extrapolation of small time savings and the failures of transport modelling as among the most deficient. A longer appraisal period would amplify the misleading effect of these and other components.

We wonder how the narrative might change if some of the issues that present notable challenges to established appraisal approaches, such as the principle of 'the two-way road' (the fact that economic effect can simply be shifted from one place to another without any particular beneficial effect), gaps in understanding in land use planning consequences, and the weaknesses of approaches on social distribution of benefits were considered in respect of extended appraisal periods.

We also wanted to mention the Levelling-Up agenda. Levelling-Up seems to have a number of variants of interpretation. But in the context of both reducing regional disparities and of making social distribution fairer, it is difficult to see how a proposal to extend the appraisal period is helpful. It is rather surprising to see consideration of the appraisal period as a consultation priority given some of the other challenges of the appraisal system.

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?

This is another reason why appraisal works better conceptually rather than practically. Few transport schemes happen in isolation, and it is hard to set a clearly constrained perimeter (spatial or temporal) around schemes. We don't have a simple answer to the question posed here.

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?

We often see appraisals set out in a way that emphasise the benefits and play down the costs. So we would like to see this question changed to '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, costs and negative consequences'.

Also key is elimination of the ‘presumption of benefit’ that pervades around big transport projects. The appraisal model in its current form remains a device that overstates potential benefits and underplays disbenefits.

Transparency is also key. We would like DfT to maintain a public database of appraisals which will shed light on what is currently an opaque and poorly understood area of government decision making.

Potential ways forward

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

The criteria feel very arbitrary. The implication is that ‘if it suits us, we will find a way to justify it’. At best this is another layer that reinforces the capacity of the appraisal system to allow decision makers to justify the status quo of ‘predict-and-provide’ transport planning (or indeed their own pet projects), and reduce the likelihood of sound provision for future travel.

We think that the proposal for extension of the appraisal period in any circumstances should be abandoned.

Andy Cope and George Macklon, Sustrans
January 2021

SCRMCA's response to DfT's consultation on Appraisal Periods.

Author: David Andrews, Programme Manager (Modelling), with input from colleagues.

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?**

Response:

No. We believe the case for doing this is not well founded. In our experience public transport assets (trains, trams, information systems, rails and shared track) only last 20-30 years without renewal due to technical obsolescence and wear and tear. Some assets such as OCS and structures last longer but will start to accumulate significant, some exponentially increasing, maintenance and renewal requirements after 60 years. Extending the appraisal period may not have the desired effect of increasing BCRs for these schemes and if they do, such increase may only reflect over-optimism regarding benefits. Clearly a longer appraisal period for all schemes could be used if changes in technology and its uptake in the distant future were predictable. Certainty does not exist, and project periods are generally used that reflect the life of the main operational assets to be funded with the expectation of a return being made within this period. Even this may be optimistic.

Where a scheme involves substantial investment in assets lasting physically much longer (with minimum maintenance) than that of comparative or competing schemes a question arises as to what will happen to these assets beyond the end of the period. If the issue is ignored, the asset is effectively written off within the period chosen and the BCR may arguably be "biased" downward. But extending the appraisal period (or inputting residual values reflecting "in use" values for long lived assets) to "correct" this, risks making the appraisal of a scheme reliant on assumptions regarding technology and behaviour in the far distant future.

Current practice in South Yorkshire is shown in table 1.

Table 1: South Yorkshire schemes appraised and submitted in 2018-2020

Type	**Main Asset type funded**	**Appraisal period (years)**	**Main monetised impacts**	**Last modelled year**	**Treatment of demand between last modelled year and end appraisal period**	**Core Public sector BCR**
Highways and car parks	Road	60	Travel time and costs, accidents, Reliability, wider impacts, Land value uplift	2036-2041	Capped	2.5
SY Rail stations	Buildings, footpaths IT eqpt	60	Travel quality, accidents, congestion	2039	Pop forecasts used	2.1

Tram renewal	Rollingstock, Track, Street furniture, buildings, IT equipt	30	Generalised cost, wider impacts	2042	Capped,	1.7
Housing (non-transport dependent)	Earthworks	10	GVA	2022	Capped	1.9
Public realm	Refurb Buildings, pavement	10	GVA	2018	Capped	5.0
Cycleways	Pavement, Storage, Signage	20-30	User health and environment	2021	Capped	2.3
Skills training	Training courses and equipment	10	FTE jobs	2020	Capped	3.7
Superfast broadband	Utilities, IT	10	GVA	2021	Capped	14.5
Flood relief	Buildings	10	GVA	2019	Capped	8.0

In short, we do not support routine extension of the standard project appraisal period for all transport beyond 60 years because:

1. Increasing uncertainty of benefits due to changing government policy, competition and social standards, changing patterns of settlement and preferences, and local and wider population and economic growth/decline;
2. Some assets may be long-lived with minimum maintenance, but many (certainly in public transport) are movable and subject to wear and tear and technical obsolescence that reduces their relative attractiveness compared to private transport – hence we would hope for a social return well within 60 years.
3. Forcing all schemes to report BCRs based on the same period would be possible but extremely time consuming. A better approach would be to recognise the sensitivity of BCRs to the period chosen and explore long term impacts within the Strategic case, perhaps in the context of "Transformational Change" but not to attempt their modelling or extrapolation;
4. Model convergence issues in future years where demand and supply changes are large
5. The lack of reliable data to support forecasts of underlying demand.

We recognise that the shorter the appraisal period used and the greater the proportion of long lived, low maintenance assets, the greater the likelihood of underestimating net benefits. In addition, if the public sector operates or takes revenue risk (e.g. for heavy rail) and where losses are more likely than profits and hence add to public sector costs, BCRs are more likely to be lower than for schemes where the private sector takes revenue risk (or where there is no charge). Extending the project period for those schemes affected may offset this, but is not, we think, the appropriate course of action for mitigating this.

We would expect schemes to give a return on investment to the current generations, given their rationale rooted in the resolution of current problems and market failures. Clearly this is likely to underestimate benefits over the very long term, which could be important where schemes are specifically designed for this (as perhaps energy and environmental schemes are). We would not oppose a requirement to report on the period of time over which a transport or housing scheme is likely to recoup its initial investment as an indication of the comparative certainty of benefits that may not be

adequately reflected in the discount rate and appraisal parameters to highlight dependence on near term or distant benefits.

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?**

Response: Market-based residual values (other than scrap values) could over- or underestimate the economic and social benefits of the asset as they assume the assets continue in their current use beyond the project period. Taking the residual value as the depreciated historic cost assumes the operation will be as beneficial post the end of the appraisal period as before. The residual value input is merely a reflection of implied future benefits, and adding social benefits, whilst theoretically correct, requires the same assumption of continued benefits.

Effort to forecast benefits into the distant future (which would inevitably involve dubious assumptions) would be better spent on improving the quality of cost and benefit quantification and modelling in the slightly more certain time between the modelled and final year of the appraisal.

Treatment of uncertainty

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

Response:

- Population growth/decline in area affected by scheme and globally,
- Technological and Government regulatory and policy changes,
- Resource cost changes in view of climate change and mitigating policy
- Behavioural changes by humans/consumers

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?**

Response: Lengthening project periods does not reduce the uncertainties and could result in shifting all BCR's upward by similar proportions, which would not help prioritisation across scheme types. Schemes with a large proportion of long-lived low maintenance assets could be appraised over longer than standard periods, provided clear and consistent guidance is given on assumptions to use with demand modelling/extrapolation. We believe more emphasis on the strategic case is required where net benefits are clearly likely to be very long term in duration.

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?**

Response: In SY we think this is not a significant problem, as we are not prioritising all schemes against each other solely on the grounds of BCRs. Our schemes are generally designed to solve various,

immediate or medium-term issues and would be expected to generate an adequate return on capital within the accepted project period used for each. If assets last longer than expected without substantial renewal and maintenance then the programme could be biased in favour of small schemes yielding returns over a short term but given local politics and other constraints on our budgets, it is appropriate that we focus on a wide range of schemes over the whole geographic area and portfolios of stakeholders. Biases that exist, such as low current land market values which mitigate against development, and indirect taxes for motoring that do not reflect externalities, particularly at peak times, should be directly addressed, not by arbitrary extensions to the project period.

Inter-generational effects

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

Response: For public transport schemes, the possible existence of these benefits is of less concern and importance than the needs of the current generation and the next. Should a scheme not be justified for these users we would look carefully at their specification to see if a lesser cost or differently designed scheme would be able to do so. In an era of rapid technological change there is a danger of "white elephants" being built if we assume demand for travel (as opposed to communication) will, as in the past, move in parallel with population. We have plenty of evidence that human behaviour can change rapidly but not predictably.

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?

Response: Not specifically.

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?

Response: Is there evidence that including more effects would change priorities in terms of schemes? We think schemes should originate from clear current or anticipated future problems that the private sector has been or is unable to meet. If the proposals fail to generate a net social return within 60 years, "doing nothing" (or another scheme) could be a better alternative (and at least worthy of further investigation) rather than putting more effort into forecasting demand change into the far distant future.

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?

Response: South Yorkshire's approved schemes are expected to start within two or three years of receiving approval of the full business case. If the start date or costs change significantly, the scheme may be dropped and another selected, provided it has achieved a medium value for money BCR and is

feasible and ready to start. Having a consistent BCR for the entire programme is of less interest to us than the BCR's of the individual schemes (and options within them).

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?

Response: We would support the reporting of the payback period associated with the appraisal period used in the Economic case (whatever this may be) as the basis for a more consistent comparison of the efficiency of capital expenditure among different schemes than at present. For schemes whose assets are long-lived with minimal maintenance and stable demand and where these represent a significant proportion of capital costs, we would support including appraisal over a defined longer period and not just using residual valuations to "fudge" this. This would need to carefully consider cyclical renewal costs for some assets and a range of potential responses.

Potential ways forward

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

Response: We don't think there is a demonstrated need to extend appraisal periods for our schemes beyond the standard 60 years. Indeed, we routinely use 30 years or less as being more reflective of the longest foreseeable and productive life cycle of the assets we use, taking account of the problems we are attempting to resolve , the people who we wish to benefit and the uncertainties into the future. This might bias against larger, long physically lived schemes, but we are aware of this possibility and do not rely solely on BCR's.

Response from Transport for London.

This is the Transport for London response to the DfT Appraisal Period Consultation. It has been produced taking views from a number of people across the organisation. Our over-arching recommendations are:

1) Do not extend the appraisal period beyond 60 years.
2) Do more sensitivity tests for high / low demand scenarios – using NPV Benefit factoring predominantly but also modelling for large schemes.
3) Use Strategy / Portfolio / Programme cases (Five Case format) more to take the analytical burden off individual projects
4) Use a balanced investment portfolio approach to allocate funding into pots reflecting different objectives and Government priorities. Prioritise projects within each pot and not across the pots.
5) Improve uncertainty and ability to forecast within the existing appraisal periods rather than expand the uncertainty by going longer.
6) Work with the HMT to understand how VoT Growth interacts with the declining marginal utility of income in the discount rate. It is unclear if these are supposed to exactly offset each other? Also tighten recommendations around Health and Safety and the discount rate of 1.5% as specified in the Green Book.
7) If making the case for transport investment is more difficult within Government, then the industry should come together to help make a case. Lining up major projects across sectors to compete for funding is possible but not desirable and a balanced scorecard approach would be preferable.

Direct Response To Consultation Questions

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?

No, we are not convinced that extending the appraisal period is worth the added uncertainty that this will bring. Acknowledging that benefits may last longer than this, the added uncertainty over such a long time horizon introduces compounding errors and making the cases less informative for decision making. A good case should be capable of being made over 60 years maximum – if the case hinges on having a benefit stream beyond this, then it is a poor case because of the uncertainty. If a case cannot be justified over 60 years but can just about be beyond 70 years, is that really a good case for investment priority?

Impacts such as Carbon are also a case in point. Again, yes carbon needs to reduce in the long term, but it also needs to be reduced in the short term and quickly. If a case hinges on reducing carbon in the long term but does little in the short term, then again, it is a poor case.

The industry should be very mindful of not increasing appraisal periods just because they struggle to justify schemes over a 60 year horizon. If some impacts are felt to be undervalued, then that valuation should be re-examined and not just extend the period of analysis.

The main challenge going beyond 60 years is uncertainty. How can the future possibly be predicted with any degree of accuracy? It is better to deal with this using sensitivity tests and ranges over a more certain 60 year horizon than to go longer with the central case.

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?

We agree that longer appraisal periods are preferable to market based or residual valuations. If a residual value is certain and it extends beyond the appraisal period, then this should be included, however the residual value of a railway line after 40 or 50 or 60 years is also not obvious. Market based valuations such as the value of a concession to operate the asset are again works of fantasy in the long term – and are ultimately based on the demand of people to use it. Changes in technology or demand will change the residual value, market value and long term benefit stream for an asset in a similar way, making the value a lot less than current expectations.

The benefits in appraisal should reflect the direct social value of the infrastructure. In addition to this, appraisal should be simple and straightforward. More and more convoluted ways of estimating the benefits are not useful in helping to explain the benefits to decision makers and the public.

On balance we do not think that there is sufficient justification for a major change to the appraisal period or the alternatives set out. If a scheme fails to make a good case, then the valuation or quantification of the benefits is the problem or there are insufficient benefits.

Treatment of uncertainty

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

Appraising over 60 years is already starting to hit problems of uncertainty at the tail end of the appraisal period. Pretending that we can predict the future so far out is a bit of a stretch and going beyond 60 years seems unreasonable and would exacerbate the problem.

Whatever the results of this consultation, it would be useful to present the social value break even point. This would reveal the point at which decision makers have to have more certainty in the predictions to proceed.

Obviously the most difficult thing to predict is use of the asset being appraised. Demand predictions are based off population, jobs, trips rates and spatial assumptions on activity. Many things affect the use of an asset and income and distributional issues are also important, as well as the social and environmental issues that policies and infrastructure schemes need to address. These are difficult to predict 60 years ahead, let alone longer. Given the added uncertainty, it is not worth extending the appraisal period. A good scheme should be capable of being identified with a 60 year appraisal period.

It is our view that as much uncertainty should be stripped out as possible so that clear decisions can be made.

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?

Yes. Going beyond 60 years is unreasonable because of the added uncertainty with trying to predict the future so far out. The use of sensitivity tests (or modelling sensitivities for very large schemes) to produce sensible high / low ranges (not extremes) should also continue to be developed. It is simpler, therefore cheaper to do and more informative to decision makers and analysts in identifying what are the uncertain elements.

If a scheme can only make a good case by going beyond 60 years, then in our view it is a poor case for investment now and we would argue that schemes which can demonstrate a strong BCR within the 60 years period would represent a better investment. The examples provided in figure 2 of the Consultation document show that both schemes are good over 60 years and even better over 100 years. These cases show that there would be no difference in decision making between 60 or 100 year appraisals. The 60 year appraisals are considered more informative and less uncertain, despite having a lower headline value for money ratio. It may be useful to find a real world (non-Hypothetical) example of a scheme where the decision making would swing – i.e. a poor case over 60 years but a good case over 100 years. Such a case would be invaluable in being convincing that the current approach is insufficient.

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?

There is a feeling that many people use the appraisal period and methodology as an excuse as to why their benefit to cost ratio is not good and struggles to get approval. They inevitably claim that the benefits for their scheme would go well beyond this.

Take a local urban realm regeneration scheme. TfL would not consider that the impacts are predictable beyond 30 years. And historical evidence tells us that urban areas are upgraded more frequently than once every 60 years. A segregated cycleway would be appraised over 30 years as part of this, given that after 30 years, new standards and investment would probably be required anyway. In addition, if any benches are added to the scheme, then we would include the cost and benefits for say 10 years instead of pretending to spend the same money every 10 years and including a new benefit stream. It is much cleaner and simpler to include the initial cost and the benefit stream over the life of the asset. A repeated investment cycle may be necessary 10 years down the line, but it may not and we may want to do something different. It is much better to strip it out of the appraisal and just include the initial investment. A separate business case in the future should consider replacing the bench after the design life.

Another principle followed at TfL is to consider how long the scheme is likely to be in beneficial use rather than the asset life. Cycling / local urban regeneration projects are again a case in point. The individual assets such as tarmac / surfacing may last only 15 years, but the space / configuration is expected to last much longer. For cycle routes in particular, the principle of establishing the space allocation is more important than the life of the tarmac. 30 years seems reasonable for the time being on that. For cycling business cases, it is irrelevant to consider extending the appraisal period beyond the 30 years that we use. It is more important to be consistent. Once the principle is established to invest in cycling, then a consistent approach reveals the best value next schemes to do. It is more robust to appraise for 30 years with more certainty, than to do 60 or 100 years with much less certainty. The main problem holding back active travel cases is the ability to forecast future use and mode shift and not the length of the appraisal period. Extending the appraisal period on other larger projects will make it more difficult for active travel

schemes to directly compete on the headline BCR. Instead of adding more uncertainty into all appraisals, it would be better to improve the ability to forecast within the existing timeframes.

There may be a perception that very large schemes struggle with the current approach. Schemes such as HS2 and Crossrail 2 are a good example. These schemes are very expensive and struggle to demonstrate benefits from existing users. They are transformational in nature but actually it is the ability to forecast that transformation convincingly that is the difficult part. If the transformation could be forecast for 30-60 years ahead the appraisal would be improved. The longer delivery period before the 60 year benefit stream starts for these schemes adds further uncertainty and compounds the inability to forecast the future. Again, it is not the appraisal period holding these schemes back.

A much simpler project like replacing a bridge will have a much quicker delivery time, will have more certainty and will be largely built off existing user benefits.

Step Free Access / Accessibility schemes may also suffer. These tend to get lower benefit to cost ratios than schemes that will provide capacity to many more users. The reason for this is that they are often expensive (e.g. sinking a new lift shaft to a deep underground station) and are used by far fewer people, and information on potential demand is hard to obtain as this is not revealed by existing demand. It is felt that understanding potential demand and the benefits associated with not being excluded from travelling are more important to understand than extending the appraisal period. Also, these schemes should not have to be compared to capacity enhancements and compete on a benefit to cost ratio footing. A proportion of the budget available should be allocated to the different objectives (such as accessibility) and the competition should be between the different schemes that are to address that objective. It is more important that within each funding pot schemes should be analysed on a consistent basis.

Schemes with wildly different delivery and timescale options can get very messy under the current approach. The upgrade of a London Underground line is a case in point. Comparing options for replacing trains now or life extending for 20 years or replacing signalling now or in 20 years is a very messy procedure if consistently appraised over a certain timeframe because the major assets get a misaligned lifespan. It is much better to examine the fair benefits for the costs incurred for each option in a simple way. Decisions on a case like this are much more likely to be made on affordability grounds and the key is to identify the best next case for investment within the pot using value for money analysis.

In summary, discussion about appraisal periods biasing against certain schemes is a distraction and complicating. It is only relevant if all schemes are lined up against one another to compete for funding. A more sensible approach that is simpler is to apportion the budget available into pots representing various objectives (accessibility, capacity, renewals, active travel etc.) to a degree that fairly represents the priorities of the Government (or funding body). Projects should only have to compete with each other for funds within each pot. Extending the appraisal period therefore becomes irrelevant, so long as the best value schemes are identified that best meets various selection criteria (BCR, fair geographic allocation etc.).

Inter-generational effects

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

Yes, but this needs to follow better geographic and income distributional effects, which are a higher priority. Learning from implementing this will aid understanding of inter-generational distributional effects. Inter-generational effects are about wealth and income distribution across generations and removing option values for having access to a clean environment and green space. A role for Government should be to ensure that the distribution across these generations is fair. For transport, this means access to affordable homes and well paying jobs and playing our part in distributing activity fairly and trying to ensure that the environment is protected. There is a lack of understanding in how to massage the

economy and society in a fairer direction with numerous complementary measures. Affordable homes for instance is a basic demand-supply problem with many factors affecting both the demand and supply. It is impossible for the transport industry to predict all of those factors necessary and to take credit for newly accessed affordable homes.

It would be much better to have a Portfolio / Strategy case (developed as ever using all Five Cases) to identify the interventions necessary to address inter-generational problems (as well as income and geographic distributional problems) at the Central Government level and individual programmes and projects prioritised to help address those issues. As a result a project would not have to stand up to others on a raw value for money basis, it could be poor value on its own quantifiable benefits but it is approved on the basis that it contributes significantly and in the best value way to delivering inter-generational improvements within the programme / portfolio / strategy case, which has a good value case. These impacts may be not directly quantifiable for a transport scheme, and it would be unreasonable for the transport scheme to have to quantify them. An example here would be for a Tram system in Leeds. An overall programme to help regenerate the region could involve numerous transport access schemes but also relocating Government Offices, encouraging private investment in high quality jobs, encouraging housing and industrial development, investment in modern apprenticeship schemes and supporting young peoples education and health opportunities. The transport scheme for a tram should not have to become so complicated that it needs to consider and reflect all of these things. The business case for the tram, should be along the lines of "given the budget of £xm to help deliver this vision, this is the best value tram scheme for moving people based on this forecast distribution of housing, jobs and activity and this forecast demand for movement. We could distribute activity differently supported by a different scheme and the value for that is X".

Better supporting individual project business cases with higher level Programme / Portfolio / Strategy cases should be a priority so that not so much analysis that is spurious, unnecessarily complicated and inconsistent has to take place at the project level.

For inter-generational environmental issues there should be no net loss of biodiversity and green space and wherever possible this should be expanded. Poor air quality should be addressed and Carbon content of the air stabilised and reduced to required levels. In addition there should be no net loss within generations for life satisfaction. This should be analysed and determined in Government Strategies / Portfolio cases and schemes should be selected on the basis of driving the statistics towards the identified goal. Individual projects should try and produce metrics to inform this and monetise impacts where possible but a lot of the time this is highly complicated and not suitable for project level quantification and analysis.

The question and consultation is hinting at inter-generational issues being addressed through extending the appraisal period. Getting these into the benefit to cost ratio is not desirable. A wider set of Central Government metrics should be used to ensure this is addressed. Like many distributional issues (geography, income, generational), benefit to cost ratios should not / cannot objectively identify the right point. They always identify the net national position. A distributional impact grid alongside the BCR and other metrics is the best way to represent the effects to inform decision making.

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?

Problems with the exact specification of the discount rate are only apparent where long appraisal periods are used. This again indicates that it is better to stick to a more certain 60 year appraisal than to go longer.

Furthermore, this has highlighted a problem with the discount rate / benefits growth and simplicity and spurious accuracy of appraisal parameters.

The Green Book says discount at 3.5%, apart from health / safety which use 1.5%. TAG just refers to 3.5%, but grows time impacts by real income growth (historically 2% but more like 1% since the financial crisis to represent income growth). We are also advised to use this same growth for safety.

Some of these effects more or less cancel each other out, but there is a lack of confidence that we are doing the right thing. For time impacts we grow by income growth adjusted for the elasticity of time with respect to income. Then in the discount rate we discount the pure time preference AND the marginal utility of money with respect to income. The estimation of these two figures makes a big difference as to whether benefit streams are growing, declining or remaining constant and there is a lack of confidence that the tinkering of these values is arriving at the right solution. They need to be re-estimated together or left to cancel each other out. It is advisable to strip out these complicating factors beyond the time preference discounting. Also note that these issues are less relevant if we stick with a sub-60 year appraisal period.

If the DfT is not able to influence the HMT over this, then the VoT Growth parameter should be set to cancel the marginal utility of money element out. Clarity should certainly be provided on the different approach recommended by the Green Book for Health and Safety and explain the TAG approach. It seems that health/safety is specified to be treated differently, but they seem to be treated exactly the same as time in TAG.

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?

It is unreasonable to assume that the fleet composition should be flat lined from 2050. We know that we have to move away from fossil fuel. It is better to assume some decline and end point for fossil fuel propulsion and revise over time with better information than to assume a flatline. There will be a market forces led natural decline in fossil fuel propulsion and policy / project interventions can speed this up.

Air quality research will need to move to tyre and brake wear.

Forecasting the economy in terms of growth, population, employment, homes and trip rates and other factors is incredibly difficult over 30-60 years, let alone going beyond this. Instead of over-thinking it and turning appraisal / forecasting into an expensive exercise in spurious accuracy, perhaps that level of analysis should be left to central Government and Portfolio / Strategy level analysis. On large schemes there could be some iteration (HS2, Crossrail 2 etc.). For smaller schemes supporting economic regeneration – like tram networks, perhaps the best approach is to get a vision for a city and then appraise the best value transport network to fulfil that. Ultimate value for money comes from the Portfolio / strategy case, the optimal solution comes from the project case.

This would avoid transport agencies having to develop economic models to forecasting changed land use.

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?

Whilst acknowledging that forecasting beyond 60 years is difficult with any degree of certainty and is therefore largely undesirable, it is important that cost benefit analysis evaluates a fair stream of benefits for the costs incurred. This is the most important principle rather than consistently appraising all projects /

programmes over the same standard period. For large projects and programmes it would be sensible to standardise appraisal period on the life of the main asset up to a maximum of 60 years from scheme opening (not present day). For programmes, just add all the individual projects together if phased – so do not appraise earlier elements for longer to finish at a consistent point.

A programme / portfolio / strategy should be constantly managed and reassessed in response to developing outcomes with individual projects re-prioritised to optimise delivery. The appraisal robustness for individual projects would therefore improve in robustness as it moves towards the point of approval.

Furthermore, the use of programme / portfolio / strategy appraisal should be undertaken as an alternative to extending the appraisal period for projects. This will increase the rigour of long term forecasts and remove some of the analytical burden from individual projects. There may be additional benefits that can not be ascribed to individual projects that are derived from the programme / portfolio / strategy as a whole. This level of analysis should be more complicated.

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?

Start off by emphasising that a good long term project should be able to demonstrate good benefits over 60 years. For something like climate change, actually, stripping out carbon now and in the next few decades is more important than whether we count those carbon impacts over 60 or 100 years. We know we need to strip it out and 60 years strikes the right balance between short term focus and long term benefit stream. Relying on analysis too far down the line would just introduce too much uncertainty. We don't want to be trying to estimate the probability of volcano's shielding sunlight for months or years or the increased efficiency of carbon capture as highly hypothetical counter-factuals. Also, we don't want to be getting distracted by longer term climate solutions at the expense of short term action. Yes we need to expand the Amazon again but that should not distract transport agencies from trying to strip out carbon from vehicle emissions in the next decade. Perhaps there is a role for longer appraisal periods for projects like rewilding the agricultural land taken from the Amazon – but that should be a national Government / Global strategy / portfolio / programme / project and not one led by the Department for Transport or subservient transport agencies.

Emphasise that it is incredibly difficult to forecast the state of the world in 60 years time, let alone beyond this. Referring back to the state of the world 60 years ago (1960) and show that it would have been impossible for them to have predicted the world in 2020. Yes the Victoria line is still useful, but we now understand unchecked car growth, urbanisation, home working, and have avoided personal airborne vehicles and jet-powered rocket pants.

Even 60 years out involves a lot of guesswork and as well as the central case, decision makers should make sure that they understand the key uncertainties affecting the value of a scheme so that they can make a decision that it is still robust in most scenarios. It would be advisable to devise some quick factors for demand scenarios / distribution of trips. These should be applied to NPV benefits mostly rather than be modelled, but modelling for large schemes is still sensible.

The discussion of shunting long term benefits into the Strategic Case is unhelpful. The Strategic Case and Economic Cases are not separate and should not talk about different things. This was clear from the review of the Green Book. Exactly the same drivers for the scheme (which are verified as social benefits) should go through into the Economic Case for consideration when assessing value for money. Within the Economic Case the choice is to monetise, quantify or talk about it to inform the decision. The TAG team are advised

to branch out from modelling and BCR's to include making better value for money judgements taking BCR and other information into account.

To help higher level Central Government decision makers allocate funding across sectors, we would recommend a dashboard approach and a balanced investment portfolio. This means that all sectors receive a fair pot of funding to achieve Government objectives. The dashboard would identify the biggest risks to achieving Government objectives, such as energy supply, lack of connectivity, health risk, affordable homes etc. Rebalancing the pots would be informed by the dashboard metrics but then a benefit to cost ratio for schemes that best address those risks would help select the right scheme. The point of this is that it is a much better way to allocate funding across sectors rather than to line all potential projects up to compete using a BCR. If the DfT is struggling to justify spending on transport against other sectors, then as an industry we should come together to make a case for this or to suggest an alternative allocation approach that does seem fair or represents better the Government objectives. Extending the appraisal period as a way to address any perceived unfair allocation is crude and not the best approach. At worst, HM Treasury could lose faith in the robustness of transport cases.

Potential ways forward

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

The proposed criteria are sensible to help make a judgement. The following additional criteria are suggested:

- Fair consideration that the benefit stream reflects the costs incurred. Consistent lengths of benefit streams for the same type of investment and asset lives are more important than rigidly sticking to a 60 years appraisal from present day.
- Application to Strategies / Portfolios / Programmes / Projects – particularly at the National / Global level it is ok to go beyond 60 years but these must be robust and actively managed.

Subject: TfN Response to the DfT Appraisal Periods Consultation

Author: Jack Snape, Analysis Manager

Sponsor: Tim Foster, Interim Strategy & Programme Director

Submission Deadline: 15.01.21

1.	**Transport for the North (TfN) – our role**
1.1	TfN published its first Strategic Transport Plan (STP) and Investment Programme in January 2019. This was the culmination of an unprecedented collaborative effort between TfN and its Partners. Our role is to add value, ensuring value for money funding and strategic decisions about transport in the North are informed by our local knowledge, expertise and needs. We reflect the views of our Partners, bringing the regions together to consider transport solutions that connect the economic assets across the North, both internally to create a regional economic mass, but also externally as part of a global marketplace.
1.2	As a sub-national body, we support our constituent Local Authority Partners in the creation of their local transport and spatial strategies, and integration at regional and national level. This response has been shared with TfN's partners before its submission and member views have been gathered through the existing TfN governance cycle.

2.	**Background:**
2.1	The appraisal of long-term benefits is a critical issue for TfN for several reasons: - Intergenerational inequality: There is strong evidence that inequalities in the UK are exacerbated by intergenerational effects[27], suggesting that policies to reduce this inequality will need to consider how their effects will play out over multiple generations. Levelling-up is an inherently intergenerational mission. - Timescales for construction and economic re-structuring: Levelling-up and transforming the North's economy is an objective that is likely to take decades to be fully realised. This is partly due to the time taken to plan and construct infrastructure, but also because the structural changes in the

[27] https://www.resolutionfoundation.org/app/uploads/2020/10/Intergenerational-audit-2020.pdf

	economy our investments are designed to support require changes to land-use and labour markets, which also require time to change and adapt. - Climate change: Another strand of TfN's mission is our commitment to ensuring the transport network is fully decarbonised and adapted for the potential effects of climate change. It is critical that these effects are considered over the longer term. - The North still benefits from 100-year-old assets: As the region that was at the forefront of Victorian investment in the first intercity railways, it is apparent that the North still benefits from many of these investments well over 100 years after construction. Whilst these investments have not simply been maintained in their original form, it is clear that technological improvements and policy interventions have allowed them to be adapted to changing circumstances, using the initial investment as a steppingstone to ongoing incremental benefits. To maximise their future benefits, it is essential that new investments are designed with this adaptive, future-proofing mindset.
2.2	TfN welcomes this DfT consultation on appraisal periods as a helpful step towards recognising the long-term value that infrastructure investment can generate. Whilst we recognise the analytical challenges associated with forecasting benefits, revenues and costs over this period, there are pragmatic solutions available to addressing these issues. In particular, we believe the use of Future Travel Scenarios, wider sensitivity testing and qualitative option value analysis are more informative ways of addressing long-term uncertainty.
2.3	To provide some context, we have included an illustrative example based on TfN's appraisal of Northern Powerhouse Rail (NPR), a major rail infrastructure scheme for which we are currently completing a Strategic Outline Case: - NPR includes construction of new rail lines and major upgrades to existing lines between the North's largest cities. This includes new and upgraded stations with associated economic development and regeneration impacts. The transport and wider economic effects of NPR are expected to be transformational and long-lasting. - We have tested the impact of moving from a 60-year to a 100- or 120-year appraisal period. In both cases we have reduced the growth in benefits in line with the declining discount rate, as suggested in the consultation document. The assumed opening year for NPR is 2040. - Our initial calculations suggest that Present Value Benefits increase by around 24% for a 100-year period and around 35% for a 120-year period. - Present Value Costs (CAPEX plus OPEX minus Revenue) increase by around 5% for a 100-year period and around 6% for a 120-year period. This includes ongoing capital renewals and OPEX, but the upfront CAPEX dominates the calculation.

	- Overall, this suggests that increasing the appraisal period would improve the value-for-money case for a major rail scheme such as NPR. - These results will be presented to decision makers in the NPR SOC alongside the existing 60-year appraisal. Further details on forecasting assumptions will be included in documentation. The time profile of benefits will be visualised in figures to provide greater transparency for decision makers. - In addition to appraising the long-term benefits of the main NPR scheme, high-level work is being carried out the option value of further improvements unlocked by the scheme. For example, moving fast inter-city services onto new lines presents significant opportunities to re-purpose existing parallel routes for local, high frequency mass transit. However, in many cases this would require incremental additional investment, so this is not typically considered as part of the NPR case. Use of qualitative option value analysis presents an opportunity to value these opportunities, particularly where some NPR options offer them more clearly than others.

3.	**Overall Approach:**
3.1	**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? - TfN is generally very supportive of a move to using a 100-year appraisal period for major transport infrastructure business cases. Following consultation with partner organisations, we believe the choice of appraisal period should be based on an assessment of asset lifetimes and the extent to which scheme objectives are inherently long-term. In some cases, shorter appraisal periods are likely to be more appropriate. - We recognise the analytical challenges associated with forecasting benefits, revenues and costs over this period, but these issues also exist for the current 60-year period, and we believe DfT's proposals include pragmatic solutions to addressing them. Specific forecasting issues are considered in our responses to other questions. - One such solution is the use of Future Travel Scenarios to address long-term uncertainty in societal and travel trends. Scenarios and sensitivity analysis are a much more informative set of tools for understanding the effects of different exogenous and endogenous long-term uncertainties than the precautionary approach of simply setting all long-term impacts to zero. We recently published a report on our refreshed approach to Future Travel Scenarios[28], which makes consideration of wide-ranging

[28] https://transportforthenorth.com/future-travel-scenarios/

	uncertainty integral to all of our transport strategy and business case activities going forward. We are also aware of the Department's work on the Uncertainty Toolkit and we intend to make use of the associated Common Analytical Scenarios and other tools where appropriate. - We believe that a key missing element from the consultation is recognition that policy makers can, to some extent, make policy choices that reduce the risk of infrastructure obsolescence. There are undoubtedly uncertain exogenous factors, but in many cases, it will be within the gift of policy makers to adapt assets to the needs of the time. We believe that a combination of Future Travel Scenarios and qualitative option value analysis can be used to consider these effects and provide confidence in the use of a 100-year appraisal period.

4.	**Alternative approaches for reflecting long-term value**
4.1	• **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? • - It is our view that extrapolation of all benefits and costs, including social, economic and environmental factors, is the most appropriate approach to take. We agree that care is needed when considering scope for demand growth, particularly in the case of fixed capacity, but that this is not insurmountable. This is discussed further below. - We believe that the market-based residual value approach is too narrow a perspective to take when valuing the impacts of major infrastructure projects whose objectives are to have very wide-ranging effects on the economy and society.

5.	**Modelling and appraisal challenges**
5.1	**Treatment of uncertainty** 3. What do you consider to be the key sources of uncertainty associated with appraising benefits over a longer timeframe? - The consultation document sets out a series of key uncertainties for longer-term appraisal, with which we are in broad agreement. TfN accounts for these uncertainties in the following ways. o **Exogenous factors**, such as those considered in TfN's Future Travel Scenarios – economic growth, spatial planning policy, technological change and behavioural change. From TfN's perspective, some national policies are also treated as exogenous uncertainties. o **Modelling and appraisal parameters**, such as values of time, elasticities and other travel demand parameters.

	We typically represent uncertainty in these parameters through sensitivity analysis. o **Endogenous factors**, such as the transport network improvements that are assumed in the Do-Minimum scenario, as well as further potential investments that could be enabled by the transport scheme in question. We represent these uncertainties through a combination of high-level sensitivity testing and qualitative narrative. This can include model runs in which additional capacity and connectivity is provided in the Do-Minimum scenario. - As the consultation document notes, representing all of these uncertainties can generate a significant amount of additional work in the development of business cases. Guidance on use of these approaches should therefore be coupled with schemes and initiatives to make modelling and appraisal a more efficient and cost-effective process. TfN believes that Sub-national Transport Bodies have a key role to play in developing modelling and appraisal tools, including those focussed on handling uncertainty, that can be efficiently applied across their geographies, supporting Local Authorities to implement best practice at low cost. - As noted above, it is also important to recognise that adaptive planning can help to respond more proactively to uncertainty and shape future outcomes. To some extent, these approaches can be explored through the analysis of the endogenous factors described above, but more broadly this should be captured in a narrative about how the scheme could be adapted to continue to deliver benefits in a future with dampened demand. 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? - It is our view that the most appropriate way of handling long-term uncertainty is through scenario and sensitivity analysis described above, as this provides a much richer, more informative understanding of the relative importance of different factors. - A fixed appraisal period does represent the possibility that a major societal shift could render a transport scheme obsolete, but there is an argument that the 'catastrophic risk' element of the discount rate already captures this effect, in which case the effect is double-counted. - We accept that the use of an indefinite appraisal period presents further analytical challenges, but the consultation document does propose a way that this could be handled through a balance of discounting and growth assumptions. We would be supportive of the use of such an approach, provided that a pragmatic analytical implementation can be identified. - If it is deemed that a fixed appraisal period is still required, use of a 100-year period would fit both with design lifetime of many

	key assets, but also the fact that we can look back and see that assets developed 100 years ago are still being used.
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? - As the consultation document notes, the existing 60-year appraisal period gives rise to a bias in favour of road schemes relative to rail schemes. It also is worth noting that this effect is exacerbated by different approaches to the 'demand cap' between road and rail, which also biases decision making in favour of road investment. Extending appraisal periods for major schemes would go some way to addressing this road versus rail bias. - Whilst there is a strong case for extending appraisal periods for major infrastructure investments, there is a valid argument that smaller scale, shorter-lived investments should use shorter periods. For example, a typical local investment in traffic signals mainly consists of assets with lifetimes of a few decades and does not have include intergenerational effects in its list of scheme objectives. Some TfN Partners have advised that they already use a shorter appraisal period of 30 years for such schemes, and we believe this should continue to be the case. - Guidance should therefore recommend that the choice of appraisal period is based on an assessment of asset lifetimes and scheme objectives. A simple decision tree could be included to support this.
5.3	**Inter-generational effects** 6. Do you think there is a case for reflecting potential inter-generational effects in appraisal? - TfN's Investment Programme has an objective to transform the North's economy, providing long-term, sustainable and inclusive growth for subsequent generations. As this objective is inherently inter-generational, and appraisal frameworks should assess scheme performance against objectives, it is essential that we use an appraisal framework capable of assessing inter-generational effects. - This point is especially valid for schemes that will take a decade or more to plan and construct, such as Northern Powerhouse Rail. In such cases, a significant proportion of scheme benefits will be experienced by younger people and subsequent generations and it is critical that the appraisal approach does not undervalue the benefits to those groups.
5.4	**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?

	- This is a technically challenging question to answer, but we can see a logic to using value of time growth that declines in line discount rates, assuming they are correlated. - However, this represents a move to make discount rates a more dominant factor in the representation of risk and uncertainty, and it also solves the analytical issues associated with indefinite appraisal periods. It would therefore seem to be justified to only move to the use of a declining value of time growth if significantly longer or indefinite appraisal periods were also adopted.
5.5	**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? - We are in agreement that environmental impacts should be profiled in line with vehicle demand assumptions, as suggested in the consultation document. We would also like to flag the need to consider the study being undertaken as part of the Green Book review on the potential rationale for reducing environmental impact discount rates to 1.5%, which will affect the profiling of these impacts. - For static Wider Economic Impacts (WEIs), we are in agreement that extrapolation with values of time is generally appropriate. - For dynamic WEIs, referred to as Level 3 benefits, we believe that these effects are long-lived and should typically be assumed to grow in line with incomes. However, we agree that there are some conceptual challenges related to the long-term pace of land-use change in the Do-Minimum relative to the Do-Something and recognise that further research in this area would be beneficial. - Guidance currently also states that real growth in rail fares should be frozen at the demand cap year, whereas some operating costs continue to grow in line with inflation. Moving to a 100-year appraisal period widens this gap between rail revenues and operating costs. Consideration should therefore be given to updating guidance so that rail fares at least grow in line with income following the cap year.
5.6	**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? - It is our view that use of a series of phased appraisal periods would be most appropriate, but we recognise this would create significantly more work.

	- Ideally, a proportionate approach would be taken for different stages of scheme development, using simplifying assumptions during the early stages, moving to the full phased approach at Outline Business Case or Full Business Case stage. Simplifying assumptions could include use of a single assumed scheme opening year or grouping phases into a small number of opening years. In cases where different scheme options have different delivery profiles, it may be necessary to use the full phased appraisal approach to account for these differences during the earlier option selection stages of development.

6.	**Supporting decision making**
6.1	**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. - As noted above, it is our view transport schemes should be subject an approach to valuing long-term benefits and costs that is consistent with asset lifetimes and scheme objectives. For major road and rail schemes, this is likely to mean that a 100-year appraisal period is appropriate, but for much smaller schemes a period of 60 years or less could be used. This will ensure that the effort involved in appraisal activities is proportionate to scheme costs, as well as linking appraisal approaches more closely to scheme objectives, as recommended in the 2020 Green Book review. - Visualisation of the time profile of benefits could be an important aid to decision makers, illustrating the relative importance of long-term benefits and the pace of benefits realisation for the scheme. - It is our view that long-term benefits should be allocated to their relevant Level 1, Level 2 and Level 3 categories, as combining user benefits with Wider Economic Impacts could create a communication challenge and confusion about what each grouping is attempting to represent. - We are strongly in favour of the introduction of a qualitative assessment of option values for speculative incremental improvements to new infrastructure, that could be captured in non-monetised impacts. This could be applied in cases where a new piece of infrastructure has the potential to unlock further improvements at an incremental investment cost that would not have been possible in a scenario where the infrastructure was not constructed. This could be done using a qualitative scoring system, similar to other non-monetised benefits. This would provide an important new means to value scheme options that provide additional optionality in the future more highly than those that don't. •

7.	**Potential ways forward**

7.1	**Potential ways forward** 11. What are your thoughts on our proposed criteria for identifying the preferred approach? - We are broadly in agreement with the proposed criteria for identifying the preferred approach. - However, we would like to emphasise that Future Travel Scenarios and wider sensitivity analysis are more appropriate and informative ways of representing uncertainty than use a fixed appraisal period. This is especially true given that the discount rate already represents catastrophic risk. - Overall, we believe that the consultation contains pragmatic and analytically sound solutions to representing long-term impacts, as well approaches to ensuring any updated guidance is applied in a proportionate manner with a focus on major infrastructure schemes. We would be happy to support DfT in the development of detailed guidance in this area and support its implementation within the North.

TransportPlanningSociety

DfT Appraisal Periods Consultation: TPS response

January 2021

Introduction and context

This submission is in two parts: a general response to the topics raised and a more detailed response to the DfT consultation document and the list of questions.

Before submitting our overall response to this consultation and replying to the individual questions, we want to make it clear that the discussion on appraisal periods must be seen in the context of the significant criticisms and proposed reforms following the Treasury Green Book review. Addressing these is an urgent matter and it would be wrong to divert resources to making adjustments in a detailed methodology which has been the subject of such a clear and consistent critique.

Objectives of the response

These can be summarised as:

1) To address the way in which many future impacts are undervalued – although the ones listed in the consultation do not represent the main problem areas.

2) To address uncertainty in appraisal and how it varies widely between impacts: this would be an issue in any circumstances but is particularly important given the changes which are flowing from Covid 19.

3) To contribute to the reforms identified in the Green Book Review, especially to reflect policies for net zero and levelling up: the latter also needs urgent work to provide a better analytical framework and should be a priority.

4) To reform the current system so that appraisal identifies schemes which achieve objectives rather than, as at present, over value schemes which don't.

The consultation: appraisal period and key role of discounting

Changing the length of the appraisal period, in particular raising it beyond 60 years, raises fundamental issues well beyond an academic discussion of economic theory and its application to cost benefit analysis. It is inextricably linked with the approach to discounting costs and benefits over time, which itself raises major issues, for example about inter-generational equity.

While some major future impacts are discounted too rapidly in the current system, others are assumed to continue for decades without such a strong decline. One reason is that some benefits are assumed to grow in value over time, offsetting a major part of the discount rate.

Reflecting uncertainty and risk

There is also poor representation of uncertainty and risk, these are critical to the selection of time periods and rates of discounting. Some impacts are given precise values decades into the distant future when it is doubtful they can be identified after even a few years. Driver time savings are an example – they are rapidly "spent" in ways which are not tracked by current methods and the ways in which they are spent have hugely different impacts. These in turn are likely to generate new disbenefits and change the outcome of the appraisal. Spending time savings to travel further might continue to benefit users, but are likely to have major negative impacts on non-users not included in the original appraisal. Ironically, there will also be negative impacts on the users – extra travel causes congestion and erodes the time savings. But in the meantime the longer journey patterns have had land use and locational impacts which are hard to reverse. There will also be equity disbenefits to those not included in the group which is benefitting from the time savings. These effects suggest that the simple discounting approach and a long fixed time period is simply not fit for purpose, at least for this type of impact.

We suggest a way forward would be to categorise impacts and treat each in a different, more suited to their individual nature.

Discussion

We begin by dividing relevant impacts as follows:

1) fundamental, long lived and hard to change (e.g. landscape, climate, health, land use)

2) tradeable, short lived and likely to be used for different purposes (e.g. time savings, operating costs)

3) fundamental but mutable (e.g. safety, air quality, noise)

4) unknown and fundamental to the extent that the predicted impacts are rendered irrelevant by natural, social or technological change.

In the first category time scales will be long (possibly perpetual) and discounting is inappropriate. The concept of valuing damage to future generations less than the current one is a well known problem and discount rates of zero (or very close) are used to deal with this. That issue in particular was extensively discussed in the 2006 Stern review[29] and subsequently[30].

This is compounded by the fact that monetisation in terms which can be compared to other costs is extremely difficult and probably impossible to the level of accuracy required.

In the second category time scales would be short and discounting high, to reflect uncertainty, volatility and risk. Valuation is easier but still with problems, for example business versus private time savings and the use of national equity values (to avoid penalising the less well off).

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[29] *Stern Review on the Economics of Climate Change*, Stern N, UK Government October 2006
[30] *Decision making for sustainable transport,* Buchan K, Green Alliance February 2008

In the third category valuation is also problematic, for example assessing the cost of a death[31], the non-linear nature of noise impacts and their correlation with other costs and benefits[32]. If used, discounting would have to be at a low rate, but this would not adequately represent uncertainty and sensitivity to other policies and technologies.

The fourth category contains what could be called known unknowns and unknown unknowns. The former may contain elements where we have some idea of what they might be but not the effects. Autonomous vehicles is an example. However it also contains elements which are game changing and we don't know about, usual examples include pandemics or climate disasters. The likelihood of having such an event rises over time – how can this be factored in? All impacts need to reflect this and compound discounting may not be appropriate. Borrowing from accountancy, a straight line reduction might better reflect this impact.

Overall this shows the impossibility of addressing such a wide range of impacts with one time period and a common discount rate.

One rate: many divergent purposes

In the list below we distinguish some of the key areas which are included in the current approach.

- uncertainty over future demand – patterns of travel change as do the people who travel ("churn"), change may also result from restructuring the economy, but is inextricably linked to the location of homes and workplaces and to transport and communications networks. The latter are subject to rapid and sometimes unpredictable developments (e.g. smartphones, social media)

- uncertainty over how those changing transport/comms networks are used, for example changing transport system technology such as vehicle autonomy could let people drink and drive, on the other hand substitutes for travel, especially communications (remote working, internet shopping) will lead to different journey patterns

- how people value future costs and benefits compared to today: "pure time preference", but note serious inter-generational issues

- chance of a one off change reducing or removing value (including catastrophic events)

- erosion of, and substitution for, tradeable values over time

- rising value (ramp) effects: environment, health

Different rates and timescales

It is important to note that discount rates can be calculated using different methods:

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[31] For example older people who are drawing a pension may generate a net benefit if they are killed in a transport accident. There is no balancing loss from productive work. The system currently generate values for not dying at least partly to avoid this unacceptable outcome.

[32] Such as visual intrusion and community severance.

- Compound discounting
- Straight line depreciation
- Mixed discounting including rates from zero upwards for each category

The first is the current catch all approach, the others could be applied in a new approach. In this case it will be important to apply any separate rates sequentially to avoid double counting. This is common practise where multiple impacts are applied (such as in Active Travel).

It is also important to distinguish different time periods for different effects and this runs counter to the desire for an overall absolute measure of value for money: the Benefit to Cost Ratio (BCR). This in turn requires long appraisal periods to generate enough benefit to "justify" the scheme being appraised.

Given the Treasury criticism, and the fact that the BCR has always been portrayed by DfT as being part of the picture (even if it has in practise dominated), the requirement for long time periods to produce total value should be removed. We prefer a disaggregated approach which will represent the differing nature of impacts and give the decision makers greater clarity. The existing Assessment Summary Table (AST) was originally designed to go some way towards this, but has not been implemented as a valuable element in its own right. Too often it has been an afterthought. The disaggregated approach will now be possible since the purpose of undertaking of a cost benefit (or cost effectiveness) analysis in future should be to choose between different options to achieve common strategic objectives. It cannot overrule a failure to meet strategic objectives.

This would return CBA to its original purpose: to choose between different schemes which have common characteristics. In other words if there is a fixed budget for a certain type of scheme and no other, it will inform the choice between different schemes of that type. It will not decide whether that type of scheme is the best intervention. That is the task of the strategic assessment. However, that assessment must be taken at the individual scheme level or it will have no impact.

Conclusion and way forward

The use of long time periods and discounting has been used inappropriately for some very significant impacts in transport appraisal. The difference in nature of the impacts has been subsumed in a single rate and time. The economic theory on which this is based is narrow in scope and does not reflect key elements such as uncertainty and inter-generational fairness.

We suggest a classification of impacts including those which may not be easy to value, and which would be able to reflect uncertainty in a transparent and effective way. This would lead to a revived version of the AST which indicates timescales during which benefits will be gained or lost and the nature of the costs and benefits being included.

Thus the impacts would be classified according to their longevity and level of certainty. For those which are monetised this would be reflected in a reduction in value over time – much faster than at present for elements such as road time savings and much slower than at present for impacts such as carbon emissions and damage to landscape. We do not consider current valuations for

either are satisfactory, in particular carbon emissions should be measured in tonne years before end date rather than tonnes.

We would also caution against focussing on technical improvements to appraisal when more fundamental issues, such as the lack of an objectives led analysis and strategic assessment should be the priority. The consultation is in the end seeking to adjust benefit to Cost Ratios (BCRs). The over emphasis on the BCR was a major criticism in the Treasury Green Book Review.

However, the consultation could contribute to the important debate about uncertainty[33] and the way in which the current system works against schemes which would achieve social objectives and in many cases promotes schemes which undermine them. A more realistic approach to the transient nature of time benefits and disbenefits would, for example, remove current barriers to sustainable schemes which cause time delays for road users[34].

[33] Which the DfT is already engaged in, for example through the scenario based forecasts

[34] See the joint professional body submission to Treasury and DfT on the Green Book Review, LGTAG, TPS, CIHT, RTPI, 2020

Part Two: Detailed response to the consultation document

In this section we go through the individual sections of the consultation document and respond to the questions asked.

DfT Executive Summary

This starts with some examples of assets with long term values. However, these were transformational, not marginal: East Coast Main railway line, M1 motorway. This distinction needs to be made: most appraisal is of marginal changes to an existing network. We recommend that transformational infrastructure projects need great care and a different approach. Scenario building and cross disciplinary work is required to test the validity of the claims made for transformational projects and to compare them to other major projects. Transport is especially sensitive in this regard since it is closely linked with the provision of other, often non-physical, means of communication.

"Overall, a balanced appraisal framework should be able to consider the possibility that project benefits could last into the very long term, while also acknowledging the risk of obsolescence or catastrophic failure and the increased uncertainty associated with any modelling and appraisal outputs when using a longer appraisal period."

The DfT also say "uncertainty about the future increases very significantly over time, so we need to explicitly address uncertainty as an integral part of any change to the length of the appraisal period."

We think the consultation needs to recognise that uncertainty is **not** being addressed in the current time period of 60 years and that this could be too long rather than too short for some elements of appraisal. This borne out by the TPS Annual Member Survey[35] and by a survey of 200 transport planning practitioners by Professor Glenn Lyons for CIHT. This identified their lack of confidence in the current forecasting and appraisal system.

We have no problem in using different time periods for different elements but recognise this may cause concern for some more traditional economists. In this case the answer is to ensure that uncertainty is applied with a rapid and escalating impact while still being theoretically present through the appraisal period. The present system of discounting does not cover this explicitly and its true significance is lost.

DfT Section: Background including the current approach

This describes the way in which longer term costs and benefits are not modelled beyond 20 years and the uncertainty associated with extrapolating for the remainder of the 60 year period. The 2016 research quoted by DfT is clear about the way in which uncertainty rises, and the way that congestion can cause benefits can be "significantly curtailed towards zero". This is important because most current appraisals for road infrastructure deal with mitigation of a future with

[35] See TPS Annual Member Survey

worsening congestion, not an improvement in present day conditions. This of itself is a source of uncertainty not recognised in the current system.

DfT Question 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?
There is a case but not for transient benefits where it should effectively be shorter. Long term costs must also be included – especially climate change and loss of natural capital. Uncertainty needs to be taken into account – at present it is poorly represented if at all.

DfT Section: Alternative approaches for reflecting long-term value

This sets out three options: longer time period, market based valuation and scrap value. Understandably the latter two are rejected and but this is not a reasonable approach to considering alternatives. For example the differential time period approach should be considered, together with the consideration of costs as well as benefits. These are particularly important given the long term nature of costs such as carbon emissions, landscape damage and loss of habitats.

DfT Question 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?

The three alternatives do not represent a full range of alternatives and the idea of a scrap value is hardly a realistic option. We set out an approach which better reflects the reality of appraisal and the different timescales and certainties of different costs and benefits.

DfT Section: Modelling and appraisal challenges

This is a long section with several questions. The opening is confined to the question of how to extrapolate benefits and discusses conceptual problems such as infinite value. There is an interesting description of the difficulties in extending time periods, for example when the modelled period ends after about 20 years and benefits are simply extrapolated after that. While interesting it could be said that a more practical approach is needed and the key problem is that no modelling beyond the 20 years would be feasible or reliable.

Given that parameters and money values are in many cases based on the preference of individual people, the idea of extending to time periods outside normal life span, let alone normal working lifetimes, should at least be questioned. This immediately raises the issue of impacts which are long term and fundamental in nature, not tradable and transient, and how they need to be treated differently. For example, it seems reasonable to assume that future generations beyond 60 years will continue to value landscape and that very long term changes to that landscape (say 100+ years) will also have long term impacts. On the other hand a marginal decrease in the time taken for a future journey may have a different value in a much shorter time than 60 years and may not actually be there after a very short time, probably well below 10 years.

Later in this section the DfT consultation sets out 3 types of uncertainty:

1) Direct Inputs, such as GDP or fuel costs

2) Methods for translating those inputs into transport demand
3) Methods for translating changes in that demand into appraisal values

We think this classification fails to represent some key aspects of uncertainty.

Transience and uncertainty

The DfT analysis does not recognise the special nature of transport which makes the level of uncertainty for some impacts very high – this is due to the transient nature of many elements amalgamated into DfT categories 2 and 3 above. For example, transport demand is not comparable to the need for food, shelter, social activity or education. It is largely a derived demand and is very susceptible to technological change and to behavioural change. Travel demand is also highly substitutable. This is at least in part a reflection of the high level of infrastructure provision and activity choices in many, although not all, parts of the UK.

Most appraisals are focussed on marginal changes in predicted travel patterns which produce benefits by being aggregated over a long period of time. However, it only requires a modest change in the overall pattern or level of travel to have a massive impact on the marginal changes. A good example is road travel time. In congested conditions a small reduction in traffic flow will have a major impact on congestion and thus completely change the conclusions of a conventional appraisal.

This suggests that a rapidly declining level of certainty should be applied to some elements currently accounted for. It is important to note that this is separate from the economic theory underpinning the current discounting approach. Nor is it the same as the "catastrophic event" element which DfT say is already included in discounting.

Parallel to this the DfT classification does not recognise the long term nature of some of the external costs and third party impacts which are far less transient or substitutable. For example this applies to CO2 emissions, which persist for about a century and have a continuous warming impact throughout that time. This means that the level of uncertainty associated with that impact is low and declines slowly over time, probably not at all. This also applies to a number of significant and well known environmental impacts such loss of habitats, eco systems and landscape.

In addition, the DfT analysis underestimates the inherent difficulties in bringing together benefits over a long time period which have progressively higher levels of uncertainty. To avoid these there could be an uncertainty discount in addition to those commonly applied to other benefits. Alternatively they could have a very short appraisal period. It is also important that the uncertainty function is applied at the time of the analysis (including the data), not the predicted opening year of the scheme.

In summary, the current system justifies schemes on the basis of benefits which are uncertain and transient, and costs which have a high and enduring level of certainty, in some cases the effects are to all intents and purposes permanent.

Land use timescales

Land use changes, which are strongly influenced by transport planning, are also long lived and hard to reverse. But within existing patterns of land use, people can choose to change where they live in relation to where they work, or choose different locations for their social, educational and leisure activities. One powerful element in house prices, for example, is the catchment area of well performing schools.

There seems to be widespread recognition that this is an important factor, but action to include this in the appraisal of transport plans or programmes has been and still is largely absent. The inclusion of single elements, such as a station or a road scheme enabling housing, ignores the full range of other impacts on patterns of travel and locational choices. We know that journeys have been getting longer in distance at the same time that average speeds have increased.

There are a number of questions from this section which we address below.

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

We have identified examples in the body of the response and conclude that there are some elements with stable impacts over time (e.g. carbon) and some which are more transient (e.g. non-work travel time). To address this we propose a classification of elements at least into high and low categories. In the high category an uncertainty discount would remove the majority of costs or benefits in a much shorter timescale than 60 years. A major example is vehicle time savings. In the low category elements such as carbon emissions and landscape impacts would retain their value over time and should be seen in the context of their lifetime, probably exceeding 60 years. This would however, require reform of the way these elements are measured and recognition of the problems created by over zealous monetisation.

DfT Question 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?

Again the body of the response deals with this but one example supplied to the DfT in another context was a sustainable transport package with good local support that was deemed poor value because of time delays to road users.

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

Yes, if applied to impacts we define as fundamental such as carbon, habitats, landscape, townscape.

DfT Question 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?

We suggest that this is an issue which must be addressed whether or not the appraisal period is extended. As DfT say: "discounted benefits are driven by the combined impact of growth in appraisal values (e.g. values of travel time savings) and the discount rate." This effectively reduces the impact of the discount rate for time savings. The only previous DfT research we know of did not find a direct relationship between GDP growth and growth in the value of time savings.

DfT Question 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?

Again we consider current profiling needs to change without a longer period. Our view is that the powerful differences between the different cost and benefit streams in terms of stability, longevity and inter-generational fairness are not currently included and should be. If this were done there would fundamental changes in the economic assessments of major schemes and a significant change in the decisions taken.

DfT Question 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?

Given that we are relaxed about different time periods for different elements of appraisal, we agree with the DfT that each element should have its own appraisal period is right in principle. However the process needs to take into account the way in which some benefits are interdependent. This is an area where strategic assessment should be the guide: the bigger picture implied in this question needs to be identified.

DfT Section: Supporting decision making

This section discusses some impacts on decision making in particular increasing the BCRs of some schemes. This seems to go against the idea of reducing the absolute dependence on BCRs which is a consensus view across transport planning and in the Treasury Review. We therefore think that the idea of adjusting appraisal periods should not be allowed to distract efforts from reforming the system. The DfT do mention the Strategic Case as a substitute for lengthening the period and using a scoring system to indicate long term impacts. This is the option we would support, but in the context of the other reforms contained in this response.

DfT Question 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?

A classification into some simple categories such as stability, longevity and inter-generational fairness would help of itself to make uncertainty more transparent and an improved risk analysis would also help. This scoring system would enable the production of realistic Assessment Summary Tables – these have been part of appraisal for years but poorly implemented in many cases. They could be of great value to decision makers and public alike – as they were intended to be.

DfT section: Potential Ways Forward

This is cast in the light of lengthening the appraisal periods which we think is too simplistic an approach to the several major problems with current appraisals, especially high uncertainty in relation to the key benefits and the high discounting of long term fundamentals such climate change. We think that the DfT list of "criteria" which should be applied to longer appraisals should be applied to all schemes, with the addition suggested below.

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

They should be applied at present but the level of uncertainty needs to be prioritised and made more explicit. Proportionality is important but is process guidance rather than part of the appraisal itself. We suggest different types of uncertainty are listed and how they apply to individual elements of the appraisal as above.

DfT section: Seeking Your Views

This sets out the consultation process and says that the aim is to publish a response to the consultation and plans for new guidance in February 2021.

There is no consultation question on this but we consider this timetable completely inappropriate considering the context of the Treasury Review and the strong criticisms of the current system, many of which are highly relevant to this consultation, made across the profession and its institutions. Now that we have had the opportunity to consult with our members and produce this response, we do not think changes should proceed without further discussion with the profession which was not afforded by the Christmas period and the Covid 19 situation.

The Transport Planning Society

January 2021

Appraisal Period Consultation

Background:

1. The Department for Transport (DfT) launched a consultation on the recommended appraisal period for transport appraisal, currently 60 years, in order to gather evidence on the issue, seek the views of relevant stakeholders which ultimately may help it to reach a decision on changes to Transport Analysis Guidance (TAG).

2. The following observations are from appraisal officer from the West Yorkshire Combined Authority (hereafter referred to as the CA) tasked with business case review and it is hoped that it may be beneficial for the DfT to consider in deciding future steps.

Consultation Question 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?

3. There are indeed transport assets with useful life extending beyond 60 years. Even assets with shorter design life (e.g. 15 year design life of road surface) can continue to provide benefits beyond 60 years with appropriate maintenance regime (e.g. motorways).

4. Economic appraisal is used by central government to decide where to invest. In this regard, understanding the benefits and costs over potential useful life (not design life or appraisal period) will help to reach a better decision when competing investment sectors are being considered (health, transport, technology, defence etc).

5. Also, the kind of transport asset where longer appraisal period may be material in decision making are decided upon by the central government and not regional authorities such as the CA. This may include transformational transport schemes (e.g. HS2, Northern Powerhouse Rail, Lower Thames Crossings etc) where longer life aspects (tunnels, bridges etc) may be more relevant too.

6. But for many organisations operating below central government remit, such as the CA, it is often the case that ring fenced funding is the parameter within which organisations will need to work in decision making. The key use of economic appraisal in this case focuses more towards selection of preferred option from short list options and reaching a final VfM position of that option. The investment options in these cases are not as diverse generally faced by the central government. With this mind, in most transport decision making situations comparing options in a consistent

manner is more important and use of longer appraisal period may not add much depth in decision making.

7. One exception to the above will be when the CA will need to assure a minimum VfM threshold sometimes set by the central government as condition of funding approval (e.g. minimum of High VfM/BCR of 2 etc). As the consultation document suggests longer appraisal period is likely to have more impact on improving BCR (not so much on Net Present Value or NPV), it will help the CA in defending its decision making to the central government.

8. As a result, unless more of decision making powers will be devolved to the regional authorities, increasing appraisal period may be more useful to the central government than it will be to the regional authorities.

9. Notwithstanding the above, there are significant uncertainties associated with 60 year appraisal anyway and increasing it even further into the future will only amplify the uncertainties.

10. After a very long period of absence of radical change in transport modes, service offerings and travel habit there is potentially significant disruptors in the horizon which may change transport as we know it and it may happen in not so distant future. These includes:

    - Automated Vehicle: change of trip rates and ownership models and making vehicles lot more safer.

    - Working pattern: better technology enabling more work from home. More automation reducing human input requirement at workplace.

    - Land use change: Increase in WfH and rise in popularity of flexible working resulting in demand for larger accommodation away from city centres and large cities to smaller areas and thus changing travel behaviour.

    - Online shopping: less trips to centres and shopping areas, but more Light Goods Vehicles (LGV) on the roads. Disruptive delivery technologies such as delivery bt drones also may become reality, further altering traffic flows.

    - Public Transport: More WfH, competition from technology based disruptive services and rise of AV reducing PT demand.

    - Electric Vehicle: by reducing perception of guilt over environmental impacts of transport influencing travel behaviour. It is also applicable to air travels.

    - Emerging technologies: Few well know organisations are considering delivery via drones and even flying taxis and cars. If these will be successful then parts of current transport infrastructure will become redundant and investment in new types of infrastructure may be required.

11. Wider economic impacts of transport are considered somewhat uncertain anyway. DfT's own research showed limited influence of transport provision in business decision making. Rise in

popularity of WfH and flexible working further eroding benefits such as static clustering/agglomeration impact of transport may further reduce confidence in such impacts.

12. Accounting for cost associated with future maintenance and operation of transport at present is not carried out in a robust manner. When it is done, it is not based on robust method and broad brush and weak assumptions are often used. Increasing appraisal year without strengthening the methodology of accounting for such costs in a robust manner may introduce further weakness in appraisal and 'gaming of the system' by some to justify scheme.

13. Impact associated with improved public realm, especially the perception of enhanced quality aspects, cannot be reliably monetised at present. There is also an argument that such benefits are subject to decay as regular users get used to the quality features. Such benefits may need to be subject to a short appraisal period, not long. However, if robust way ofcapturing such benefits can be devised this may reduce the problem.

14. Cycling schemes which requires highway capacity reduction (e.g. converting general traffic lane to cycle lane) generally struggles to provide enough benefit to offset the large dis-benefit to motor users. Increasing the appraisal period is likely to accentuate the issue and reduce VfM further.

15. Vehicles are getting increasingly sophisticated and safer. Using current assumptions of safety rates in accident analysis within 60 year timeframe is already questionable, extending appraisal period further may only amplify this uncertainty.

16. Once capacity is reached the benefits offered by the transport investments largely diminishes. It is likely that this condition may occur within 60 years for most transport investments, if not all. Increasing further than 60 years may not add much benefit anyway, if analysis is robustly carried out. This is also acknowledged in part in the consultation paper too.

17. Large transport investment may influence land use pattern and local economy. However, if Green Book's advice on net national impact is considered much of these impacts may be attributed to displacement anyway. So trying to capture these impacts over a longer appraisal period may not be that significant, not at least at a national level. However, these may present greater impact at a local level with a longer appraisal period.

Consultation Question 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?

18. There is no particular observation on alternative methodology. It is noted that current DfT understanding is increasing appraisal period may be the most plausible approach. It should be noted that such approach should consider the uncertainties discussed under Consultation Question 1 and will require a more robust approach and renewed emphasis on capturing future maintenance and operation costs.

Consultation Question 3

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

19. This is discussed under Consultation Question 1.

Consultation Question 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?

20. After a very long period of absence of any radical change in transport modes, service offerings and travel habit there is potentially significant disruptors in the horizon which may change transport as we know it in not so distant future.

21. Also, if future maintenance and operation costs are robustly carried out potential for major repair costs etc may largely offset the additional benefits beyond 60 years.

22. As such, limiting appraisal period to a shorter timeframe but with higher confidence may potentially be more robust approach.

Consultation Question 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?

23. There is no designed bias due to appraisal period. But there may be some practical considerations.

24. Cycling schemes which results in highway capacity reduction generally struggles to provide enough benefit to offset the large dis-benefit to motor users. Increasing the appraisal period is likely to accentuate the issue and reduce VfM further.

25. Impact associated with improved public realm, especially the perception of enhanced quality aspects, cannot be reliably monetised at present. There is also an argument that such benefits are subject to decay as regular users get used to the quality features. Such benefits should ideally be subject to a short appraisal period, not long.

26. Due to proportionality, larger transport investment schemes tend to cover more benefit streams in appraisal than small transport investment projects. Increasing appraisal period will disproportionately improve VfM position for larger investments with respect to smaller intervention which often includes active mode schemes.

Consultation Question 6

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

27. It is important to capture inter-generational impacts with fairness in mind. If impacts to environment are more robustly captured, this will ensure key inter-generational effects are captured to a good extent in appraisal.

28. There are significant uncertainties in transport sector in not too distant in the future, which may make some investments being made now redundant due to technological changes. As a result, it may not be practical to place significant attachment to the inter-generational impact of transport investment decisions currently being made.

Consultation Question 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?

29. The proposals for this particular aspects appears to be reasonable and pragmatic.

Consultation Question 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?

30. It is very important to ensure all impacts are captured in a consistent manner covering the full appraisal period – 60 years or extended.

31. Environmental impacts such carbon, air quality, noise etc are monetised using models developed with transport model outputs. Further assumptions made in the process introduce increased uncertainties than transport model forecasts. Motorised vehicles are going through considerable technological changes and predicting environmental impacts too far into the future (e.g. beyond 60 years) may be too uncertain.

32. Capturing full lifecycle cost of EV may be more important than forecasting environmental impact too far into the future.

33. Wider economic impacts have greater uncertainties anyway, even at shorter term than 60 years. Extending such benefit appraisal even further will introduce further uncertainty in the appraisal.

34. Vehicles are getting increasingly sophisticated and safer. Using current assumptions of improved safety in accident analysis within 60 year timeframe is already questionable, extending appraisal period further may only amplify uncertainty.

Consultation Question 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?

35. The three proposed method appears to have merit. It is also agreed that the third option proposed (having three overlapping, incremental appraisals such that the benefits of each scheme/phase are captured for 60 years) appears to have the most merit to be consistent with current TAG practise.

Consultation Question 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.

36. Considering significant uncertainty in forecasting too far into the future and appraisal of impacts, it may be more pragmatic to consider it in strategic case with clear guidance on how it may be used.

37. Should the appraisal period is extended it should come with clear guidance on how future maintenance and operation costs are to be captured and a requirement to identify clearly who will bear responsibility for such costs.

38. As well as the maintenance costs, the proposal for banding benefits by years and advice on use of time banded benefits in Initial and Adjusted BCRs will ensure better understanding of impacts and confidence in appraisal.

Appraisal Periods - Consultation Response

January 2021

As a consultancy actively engaged in the UK transport sector, WSP is very pleased to have the opportunity to respond to this consultation.

We recognise the issues identified in the consultation on scheme appraisal and have drawn together a consolidated response from a range of transport professionals within our organisation – which should provide a broad view from those, for example, using the output of appraisal to support client decision-makers as well as those tasked with practical implementation of modelling and appraisal guidance.

In a few instances in our responses there may be a range of opinion which we have tried to capture – and we would be happy to engage further with the Department if this would be helpful.

Our overarching view is that although we agree that the long-term benefits of some interventions may not be captured using the current appraisal methodology, we feel that there are significant challenges to extending the appraisal period to capture these, and are of the view that alternative methods of assessment should be considered.

Our response to the specific consultation questions are provided below.

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?**

We agree that there is a case to be made for capturing the long-term benefits of interventions – and there is clear evidence that for some interventions there are potentially significant benefits that accrue beyond the current appraisal period (noting that the impact of the final forecast year used in an appraisal and the methods used to extrapolate benefits can have a significant impact on benefit calculations as well as the assumed appraisal period).

The challenges to capturing the long-term benefits of interventions are however significant. The main issues are listed below:

- The ability to robustly forecast far into the future to capture long-term benefits.
- The impact that, for example, societal and technological changes will have on the uncertainty in long-term forecasts.
- The ability to robustly capture future revenues and operational and maintenance costs, which may all change significantly over the long-term.
- Assumptions that would need to be made about valuation of benefits in the long-term.
- Gaining wider ‘public acceptance’ to using methodologies that forecast far into the future to supporting decision-making. This may lead to a loss of credibility from some groups.

So, although we agree with the principle of the argument for forecasting further into the future and capturing long-term benefits of interventions, we feel that the practicalities of extending the appraisal period may not lead to more robust decision-making, depending on the assumptions made in application and the consistency of approach (both of which we feel will be difficult to address comprehensively). We also feel that implementation of a significantly longer appraisal period may cause credibility issues with the wider public, with the potential to

Appraisal Periods - Consultation Response

weaken the 'outside' perception of the decision-making process if the underpinning assumptions are not credible.

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?**

We agree that market-based valuation approaches are unlikely to capture the wide range of possible long-term impacts, and forecasting further into the future and using a longer appraisal period would be the most theoretically appealing way to assess long-term impacts.

We have already identified in response to Q1 that there are key practical difficulties in longer term forecasting (which we feel is a pre-requisite) and implementation of a longer appraisal period. We feel that alternatives that are more qualitative/semi-quantitative in nature, that could sit outside the Economic Case, may be more appropriate to support decision-making (e.g. including narrative/evidence in the Strategic Case on the potential for longer term impacts of interventions – and how robust an intervention may be to societal/technological/etc. change over the longer time).

Treatment of Uncertainty:

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

We have identified some of the main drivers of uncertainty in our response to Q1. To expand on that response, we feel the main uncertainty sources are:

- Future estimates of travel demand. The uncertainty in the underlying assumptions supporting demand forecasting becomes more significant the further into the future we forecast, especially when using extrapolation methods. This includes both the forecasts of known drivers of growth (e.g. population, socio-economic factors, etc), but also whether the relationships and parameters that underpin our forecast models can be reasonably assumed to remain stable into the distant future (e.g. how technological change might impact the accessibility/travel needs of society).
- Estimates of costs/revenues. The uncertainty in cost and revenue estimates becomes increasingly large the further into the future the estimates need to cover (e.g. technological changes may significantly change any current short to medium term assumptions of operational costs).
- Future valuation of impacts. The way society values some impacts (whether, for example, time savings or carbon impacts) is more difficult to predict in the longer term, with the underlying assumptions about how these will change in the future likely to be subject to significant uncertainty.

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?**

Appraisal Periods - Consultation Response

Across our organisation we had a range of responses to this query, with some views suggesting that the current appraisal period strikes a reasonable balance in providing a robust estimate of benefits and handling uncertainty, with others suggesting a limit to the appraisal period would be reasonable, but it should be longer than that currently used.

An alternative view by a number of our practitioners was that we should accept that the greatest uncertainty in scheme appraisal is in estimating long-term benefits and their valuation, so we should limit the appraisal period to a shorter time frame and compare the VfM of schemes using benefits estimated over a period of significantly greater certainty (e.g. align appraisal periods more closely with current practice on final modelled years), and/or rather then solely use the BCR over a defined appraisal period as the metric for VfM analysis, identify the time period over which scheme benefits will outweigh costs and use that as a metric to support VfM considerations. Any transformational/long-term impacts could then be picked up in the Strategic Case using qualitative or quantitative analysis.

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?**

Current appraisal practice has developed to support assessment of 'traditional' infrastructure schemes that support motorised modes, where the benefits are largely captured in the current appraisal period, this may lead to an inherent bias in the process. Schemes that potentially deliver benefits in the longer term (beyond the current appraisal period) will subject to bias (by definition). Schemes that support active modes (where current appraisal guidance suggests use of shorter appraisal periods) will also be undervalued if the scheme delivers benefits beyond that shorter appraisal period.

Inter-generational effects:

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

There is a balance to be struck between the uncertainty in assessing such impacts and the potential to improve decision-making by including these impacts. There are theoretical challenges here (e.g. forecasting future benefits and capturing how these will be perceived by future generations) and the method of accounting for this through a change of the discount rate, as advocated by the Green Book, is one way of addressing this.

Our concern here relates to consistency of application of methods, and we feel it would be helpful to provide further guidance on the potential application of the sensitivity testing suggested in the Green Book.

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?**

In earlier responses we have identified our concerns and highlighted potential challenges to extension of the appraisal period. We agree there may be an argument for further investigation of the discount rate and potentially use of different discount rates for different

types of impacts, with or without extension of the appraisal period, however this should be supported by further research/evidence.

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?**

As touched on in earlier responses, we believe that further consideration needs to be given to how the valuation of impacts may change over time. The question is how to capture changes in the relative importance of different environmental/societal concerns; e.g. changing valuations of carbon/air quality or the concept of agglomeration in light of changed ways of working.

A further issue that has been identified is how technological changes may impact on construction costs and construction periods and whether these impacts can be better captured for schemes that are proposed to come on stream significantly into the future (given cost estimates and construction durations are based on historical evidence).

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?**

The response to this query will depend, to an extent, on what decision the analysis is supporting (e.g. identifying the best performing package – and the timing of that – to address a particular set of problems, or for more wider ranking of proposals).

In codifying the methodology that should be employed, the overarching considerations should be to reflect the reality of benefit delivery and ensure consistency in the appraisal process, where early schemes in the package deliver benefits, but these schemes will not maximise their benefits until the whole programme is complete, and the benefits across the programme should be fully captured.

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?**

The use of scenario and sensitivity testing will provide the opportunity to help decisionmakers understand uncertainty/risk and the limitations of analysis. In relation to understanding the particular uncertainty related to long-term benefits we have earlier identified that these impacts may be better captured in the Strategic Case which could, for example, focus on particular aspects of the uncertainty in long-term benefits either in a qualitative or quantitative way (e.g. likelihood of benefits beyond the appraisal period (and/or residual value) and key drivers for these; potential impact of technological change; potential impact of policy change; etc.).

Potential ways forward:

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

Appraisal Periods - Consultation Response

We generally agree with the proposed criteria but suggest that vulnerability to policy change and how valuation of impacts may change over time (especially environmental impacts related to climate change) should be captured in some way.

Our view is that a key consideration should be making the best use of the forecasting processes which underpin the appraisal and carefully considering the time horizons over which such forecasts are reliable. Any extrapolation of forecasts will become less accurate the further into the future it goes given the uncertainty in the assumptions that underpin the extrapolation process.