

**A57 LINK ROADS
TRO10034**

DEADLINE 4 - 16th FEBRUARY 2022

RESPONSE TO ISSUE SPECIFIC HEARING 2 FEBRUARY 10TH

**Report by Keith Buchan, MTRU
for
CPRE Peak District and South Yorkshire Branch**

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A57 Scheme Carbon Impacts Deadline 4 supplementary submission by CPRE

Introduction

There is no doubt that policies on carbon emissions affecting this scheme have changed very significantly in the last few years. This includes legislation, such as net zero and parliamentary acceptance of the Committee on Climate Change 6th Budget, policy statements such as the DfT Decarbonisation Strategy, and ongoing work revising guidance, for example the commitment in the Decarbonisation Strategy for a review of NPS and the Secretary of State's statement to Parliament on 22nd July 2021 with a similar commitment. Meanwhile the existing NPS is in force. This Examination therefore is taking place immediately following a period of major change. It has to deal with that in the context of what is in legislation and policy but not yet necessarily in habitual use by practitioners or clearly set out in fresh guidance. This submission seeks to clarify the position referring to the new legislative and policy context while still being guided by the NPS, in particular paragraph 5.17, which states:

"It is very unlikely that the impact of a road project will, in isolation, affect the ability of Government to meet its carbon reduction plan targets. However, for road projects applicants should provide evidence of the carbon impact of the project and an assessment against the Government's carbon budgets."

In relation to that statement there are five important questions considered in this submission:

- 1) Which carbon should be counted and costed?
- 2) What is the real "Do Minimum"?
- 3) What is the cost of undermining Government and local policy?
- 4) What is significant?
- 5) What about the De Minimis argument and the NPS?

1) Which carbon should be counted and costed?

In the current system, a marginal change is assumed between a Do Minimum and a Do Something future. To assess this, the appraisal must calculate how much carbon will be produced by the forecast levels of traffic. This is done in a simplified way by the DfT programme TUBA, and in a more complex way using DMRB guidance. The latter is used for the carbon cost calculations. TUBA covers a shorter time period than the DMRB method so is an underestimate. Despite this, the figures show that the total amount of carbon being emitted in a year is far higher than the marginal change in carbon over 60 years. The reduction in carbon from electrification is clear, although it does not reach zero in 2051.

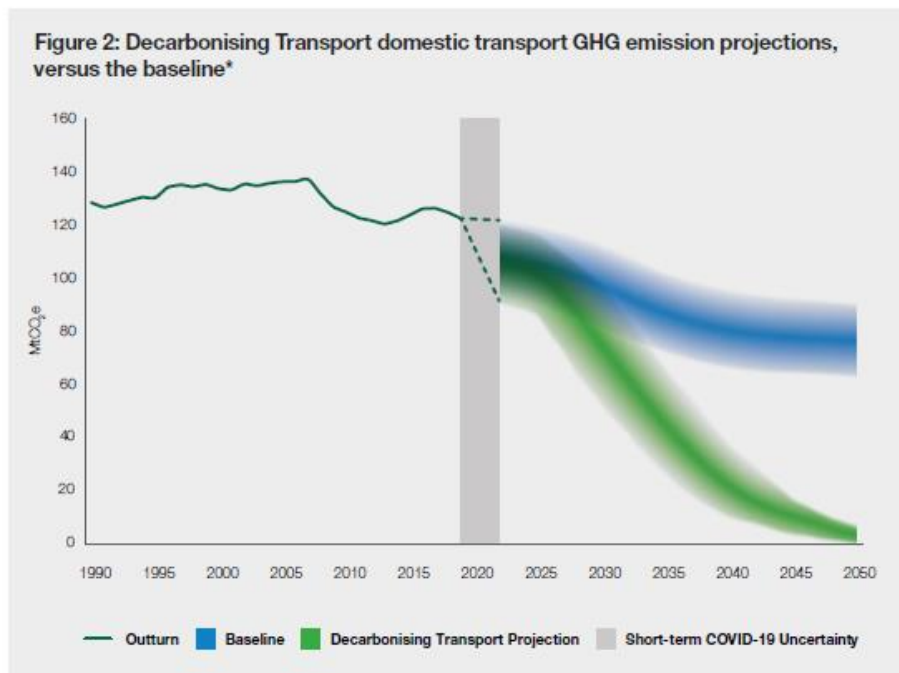
The question considered here is how much of that total carbon is in excess of the amount required to meet the net zero/6th Carbon Budget requirements.

Table 1
Carbon emissions A 57 Do Something Core forecast

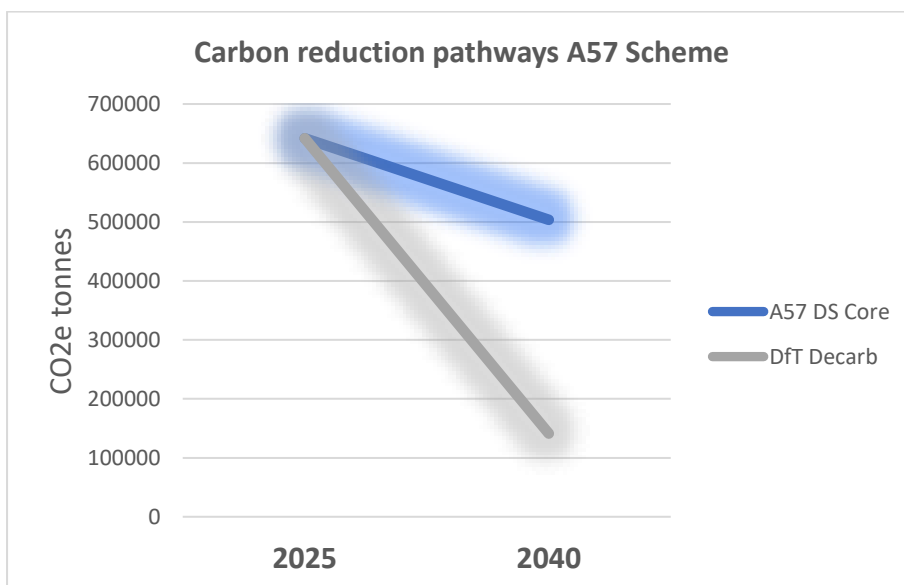
CO2e emissions based on TUBA (tonnes) per year	DM	DS
2025	641379	641842
2040	503272	503643
2051	480538	480650

Thus the cost of the Do Something in carbon terms should be tested against what the Government considers is essential to meet its climate change obligations. If the Do Minimum is assumed to fail to meet Government commitments it cannot be considered to be realistic. The key assumption is that nothing would be done by central or local Government in response and this cannot be the correct basis for comparison. To test this, carbon emission data for the DM and DS were requested from NH. Only TUBA data was available but at least provides a minimum guide.

From the table above, the Do Something presented in this case shows clearly that there will be, after allowing for some electrification of the car fleet up to 2050, insufficient decrease in carbon to meet Government requirements. These are reflected in the chart in Figure 2 (page 45) of the Decarbonisation Strategy, shown below.



Translating the current scheme data from TUBA in Table 1 gives the chart below.



Note: NH does not seem to include latest Government plans in its modelling

Obviously we only have the data supplied by NH but the key point is that the NH best estimate shows the scheme as presented is delivering a huge amount of carbon in excess of the Government legally confirmed targets. Our serious reservations on this are included after Table 5 below.

Of course, a more aggressive electrification programme could deliver further reductions, together with HGV electrification, for example through catenaries. However, some demand reduction will be required even in this instance. This is clear in the Committee on Climate Change (CCC) 6th Budget.

The table below is extracted from the CCC transport sector document published with the 6th Carbon Budget.

Table 2
Range of car traffic reductions from different measures

	Traffic		Trips	
	Tech (e.g. home working)	Car occupancy	Walk and cycle	Bus
2030	-1 to -4%	-6%	-5 to -7% <i>(-1 to -2%)</i>	-9 to -12% <i>(-5 to -7%)</i>
2050	-4 to -12%	-19%	-9 to -14% <i>(-3 to -4%)</i>	-17 to -24% <i>(-10 to -14%)</i>

It is important to note that the trip reductions for sustainable modes are higher than the traffic reductions would be because of lower trip lengths¹. Using the standard NTS data for average trip length which CCC uses the trips have been converted to traffic (vehicle kilometres) in the figures in italics. The extensive work by CCC is used for the final central requirements in Table 3 below. These are reductions on the baseline – i.e. in real terms traffic is predicted to grow (as in the A57 NH appraisal) but the CCC identifies the required reduction on that figure.

Table 3
6th Carbon Budget combined demand management required

	Combined impact: car traffic reduction on baseline (as vehicle kilometres)
2030	-6%
2040	-12%
2050	-17%

Note: 2040 is derived from CCC table as a half way point

This does not appear to be taken into account in the NH traffic forecasts. What should happen is that a future scenario which achieves these reductions should be the one which is compared to the Do Something scheme, which is clearly part of a future which encourages driving rather than the modes and behaviour change in the CCC 6th Budget.

There is a lack of basic data for this scheme which has been a source of ongoing frustration. This makes it hard to assess how much additional carbon over the level required to meet the 6th Carbon Budget is being produced. The best indicator supplied so far is the NH “Low” forecast. This has carbon emissions in the TUBA table for a Do Minimum which can be compared to the Core (baseline) forecast for the Do Something. This reveals reductions as below.

¹ This can be compensated for by substituting a short walk trip for a longer car trip but is not included in this analysis.

Table 4**Carbon emissions A 57 Do Something Core compared to Do Minimum Low**

2030	-6.3%
2040	-9.2%
2050	-10.9%

While 2030 Low is close to the 2030 CCC requirement, the Low forecast increasingly underperforms at the required level. Despite this it is possible to use the Low forecast to indicate the missing amount of carbon reduction and, most importantly, its cost.

The TUBA table supplied by NH is shown below, with the carbon emission differences calculated by MTRU.

Table 5**NH TUBA carbon outputs**

	Core Scenario			Low Growth Scenario			
GHG Benefit from DMRB	-17.45			Not assessed			
(£m, 2010 PV)							
GHG Benefit from TUBA	-0.46			-0.79			
(£m, 2010 PV)							
CO₂e emissions based on TUBA (tonnes)	DM	DS	DS – DM	DM	DS	DS – DM	Difference tCO₂e
2025	641379	641842	462	601341	602011	668	40,501
2040	503272	503643	371	457101	457433	330	46,542
2051	480538	480650	113	428,325	428610	286	52,325

The differences between the two can be annualised from the point years assuming a straight line. These can then be put through the carbon cost toolkit to provide an estimate.

This produces a cost of £223million over the 60 year appraisal period and would turn the BCR negative

As a test of whether the carbon deficit is robust the carbon toolkit was run against a cut off date of 2051 (on the optimistic assumption that everything is net zero by then). This still produced a carbon cost of over £120million.

At this stage we wish to say that there must be serious concerns over the way in which carbon has been treated overall for this scheme. Our view is that the modelling includes some electrification but apparently not the latest commitments in 2030 and 2035. For this reason much of the NH work

must be considered with a high level of uncertainty. However, at the moment everything done for this submission has followed the same procedures as NH so can be directly compared.

2) What is the real “Do Minimum”?

This issue is familiar to transport practitioners and is directly related to the previous section. In the current system, a marginal change is measured between a Do Minimum and a Do Something. This approach was justifiable when comparing futures in which the existence of the Do Something was totally disconnected from the Do Minimum, in this case building more road capacity in Greater Manchester has no impact on what the future without would be. Hence the same core forecast is used for both in the NH analysis. This is fundamentally wrong.

In fact, there are two different futures being considered, the first is one in which there is less traffic, which requires a shift in competitive advantage toward sustainable modes. The other is one in which driving is given sufficient encouragement that traffic will continue to rise. The latter is the core forecast. However, DfT has moved to what it calls “scenario” forecasts which allow for different assumptions about the future. It has also published the uncertainty toolkit, which suggests that the modelling and forecasting parameters should be considered, including the impact of demand management and behaviour change. This was set out in our previous submission so is not repeated here. However this package is not the same as the old “low, central, high” forecast.

It is also important to say that this is not dealt with by modest adjustments to trip making in the modelling through the Diadem software. This starts with the same base forecast and has only minor impacts, as shown clearly in the NH documentation. Evidence of the widespread understanding and acceptance by the profession of the approaches set out in questions 1 and 2 can be found in the PTRC paper submitted with this submission and the TPS Annual Review extract in the Annex.

3) What is the cost of undermining Government and local policy?

The second is the Strategic fit of the scheme with relevant national and regional policies on carbon, including how it fits with Committee on Climate Change budgets. It is clear that encouraging people to use alternatives to the car needs to make them relatively more attractive. This can be done by making them faster or cheaper or more convenient (in the case of buses more frequent as well). The other method is to make car use less convenient or costly. Such approaches are well known and often referred to as “stick and carrot”. Clearly anything which makes car journeys faster will move that balance of competition against sustainable travel, i.e. creates a carrot in the wrong direction.

At the moment Government policy is focussed on travel in towns and cities and there are clear targets for changes in the mode share for walking and cycling, and indications that mode switch is desired for public transport.

Using the information now obtained from NH it has been possible to assess how much of the economic advantage is provided to car use reasonably considered to fall within the scope of those targets. This information is not in the original submissions to the Examination. It is covered in more detail in the submission on the A57 scheme and negative impact on Government and local policies for sustainable travel.

Another approach to this has been suggested by Professor Greg Marsden from the DecarboN8 partnership. This includes academia and local authorities (including Manchester and Sheffield) and runs a number of innovative projects. He proposes that schemes which have forecasts in excess of

the CCC required reductions should identify specific additional reductions elsewhere and count the cost in the appraisal.

4) What is significant?

In this submission the question of whether NH has counted the amount of additional carbon correctly is considered in a later section. However, it is important to note that there is an issue over the significance of the amount estimated by NH and used for its carbon assessment. During the Issue Specific Hearing it was clear that a straightforward and widely accepted definition of what was a significant amount of additional carbon was not available. There are two critical aspects to this specific issue:

- 1) is the amount calculated by NH significant?
- 2) should the significance of amount used by NH be viewed “in isolation”?

In relation to the first, the 401,000 tonnes of CO₂e calculated by NH can be judged against published emission reductions which are part of the net zero strategy and 6th Carbon Budget. For example, the Committee on Climate Change estimates that an average battery electric vehicle (**BEV**) bought today will “save more than 35 tonnes of CO₂ over their lifecycle versus a conventional equivalent”.² Thus to compensate for the A57 NH carbon deficit an extra 11,457 BEVs would have to be bought this year, above what would otherwise be the case. This number rises over time because conventional vehicles are getting more efficient, for example if they had to be bought in 2025 the number would be higher.

An alternative would be to consider the Government’s urban policies for walking and cycling, these are estimated to save between 1million and 6million tonnes CO₂e by 2050, clearly displaying a high level of uncertainty. The A57 NH carbon deficit (over a longer timescale) would be 40% of the lower figure and 7% of the higher level of achievement. The cost of the measures to achieve the 1-6million tonnes reduction is £2billion over the first 5 years. Despite the wide range in estimated impact, using extra measures of this type to compensate for the A57 NH carbon deficit would be in the hundreds of millions of pounds.

5 What about the De Minimis argument and the NPS?

The final issue is probably the best known - the “de minimis” argument – where the amounts of carbon from an individual action (or scheme) are considered too small on their own to undermine carbon reduction.

This has been argued over extensively and to summarise: if this scheme were an isolated occurrence with no accompanying or associated actions or schemes this might apply. This might be the case if there was only one road scheme in RIS2 or elsewhere in the UK. Clearly this condition does not hold true. A further issue is that the existence of a number of schemes to increase road capacity underpins the road traffic forecasts (and has done since the 1997).

The amount of carbon increase suggested by NH is an isolated figure. It assumes that there is no relationship between this scheme and RIS2 as a whole. A more realistic question in this context would be: what would the position be if every scheme in RIS2 produced as much carbon as the A57 proposal?

In the A57 case there is capital expenditure of about £180million in today’s prices. RIS2 is valued at £24.5billion but about £14billion is on capital schemes. If all of them produced as much carbon as

² Box M2.2 of the Transport Sector document of the CCC 6th Carbon Budget

the A57, it would amount to over 31million tonnes of CO₂e. This is approaching the estimate for the total impact of electrifying the whole bus and coach fleet in the Decarbonisation Strategy (35-37million tCO₂e). The total impact of electrification of all cars, taxis and vans is 620-850million tCO₂e.

RIS2 should not allow schemes which produce carbon on this scale to remain in the programme if the Government target is to be met.

TPS influences Transport Appraisal Guidance

TPS proposals to reform transport appraisal

The Department for Transport (DfT) undertook a major consultation on its approach to transport appraisal which closed in October 2018. TPS strongly welcomed this and put together a comprehensive response led by Keith Buchan and Martin Wedderburn. Keith led an appraisal workshop at the TPS supported the Local Transport Today (LTT) Local Transport Summit in November. This confirmed our view that the Strategic Case element of appraisal was being ignored and that other major reforms to support sustainability were essential. The DfT have been very much engaged with the profession in this instance and we will be interested to see their full response, due in May 2019.

Key elements of the TPS proposals were as follows:

Ensuring existing best practice

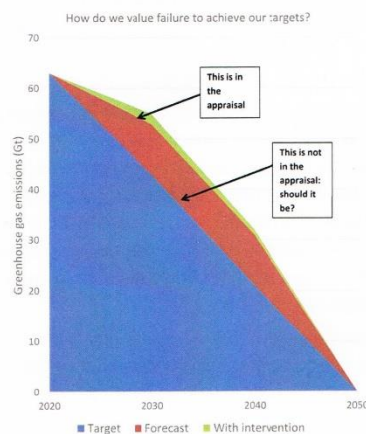
Appraisal guidance needs to ensure that:

- There is far greater emphasis on the Strategic Case in the current Treasury 5 case model as interpreted by DfT.
- The Strategic Case is not an afterthought with invented objectives but an assessment against existing strategy, for example on sustainability, employment and health.
- That genuine alternatives are considered – again a strengthening of guidance to prevent bad practise rather than a major departure.
- The use of scenario based forecasts for Strategic and Business Cases, building on recent DfT changes, becomes the norm.
- There is far greater use of objectives led (such as multi-criteria, vision and validate) analysis.

Responding to current weaknesses

Reforms are needed so that:

- Forecasts are used which reflect local policies and packages (thus recognising the problem of self-fulfilling traffic growth predictions).
- Central estimate benefit cost ratios (BCR) are no longer used in appraisals; instead there should be policy and package dependent high and low forecasts.
- There is full inclusion of the negative impacts of motorised modes, especially health and environment.
- Reform of carbon costs to reflect failure to meet reduction targets in the Business as Usual Do Minimum, without this schemes will continue to be implemented which lock in damaging emissions.
- For all impacts, there should be an assessment of Do Something against the desired end state, not an unrealistic Do Minimum.
- Wider economic disbenefits to be included as well as benefits.
- The Strategic Case will act as a filter to prevent schemes whose impacts run counter to quality of life objectives, but may have a high BCR.



TWO WRONGS MAKE A RIGHT - MESS OF TRANSPORT APPRAISAL

Keith Buchan

Director of MTRU, Skills Director Transport Planning Society

Introduction

This paper deals with two critical flaws in current transport appraisal, the way we measure carbon and how much carbon we include in an appraisal (or rather how very little we include). In the case of the former, I argue that we should not use tonnes, but measure tonne years before the end target date (2050). This is because the warming effect of carbon dioxide lasts for about 100 years and the tonnes only measure does not reflect this. The second issue is that scheme appraisal only takes into account marginal changes in emissions, and ignores the far larger total emitted by the users of the scheme being appraised. It is this total which needs to be reduced in order to achieve Government policies to address climate change. The effect of these two critical flaws is to conceal the true impact of many of the schemes being appraised. As a result we have invested huge amounts of public money in transport interventions which have undermined efforts to control emissions instead of helping to control them.

However in order to understand how these problems have arisen I need to briefly set out the long running disagreement about the economic theories which underpin the current appraisal system. In particular this centres on the difference between social cost benefit analysis and objectives led policymaking. This is still very much being debated today, as witnessed in the 2018 consultation on transport appraisal. TPS made a submissionⁱ which reflected the problems and made suggestions for reform, a summary is appended to this paper. This is underpinned by the results from the TPS annual members' survey – consistently 40-50% of members think that major reform is needed and less than 5% think it is entirely satisfactory, with 15% thinking all decisions are political and appraisal is not relevantⁱⁱ.

Background

The background to this paper therefore goes back to the 1990s when practitioners were working on new ways of appraising transport interventions, both "hard" and "soft". The former included the road programme, new tram schemes and bus lanes, the latter behavioural change such as the workplace based "Green Travel Plans", wider Travel Awareness campaigns and new ways of paying for public transport (Travelcards and simplification). One aspect was the understanding that "infrastructure" should not be limited to traditional road or track construction but to skills and networks which could, for example, manage travel demand and reduce the need to build more physical capacity. It would be true to say that understanding how great an impact such measures can have has grown exponentially since the 1990s.

Fortunately the linguistic bias of using the terms hard and soft has fallen into disuse, but appraisal, and transport policymaking in general, has not kept up. It is a reasonable premise that the persistent undervaluing of the long term value of behavioural change reflects this lack of progress.

It was understood even in the 90s that the so-called softer approaches were undervalued in the appraisal system and also that there were specific biases in the economic assessment.

An example was the way in which less fuel use resulted in lost tax revenue which increased the *capital* cost of a scheme and thus disproportionately undermined the value for money of anything that reduced car use. In other words the BCRs of sustainable transport schemes were always significantly lower than would otherwise be the case. Even this modest and glaringly obvious problem was not corrected until 2009ⁱⁱⁱ, following intense pressure from practitioners.

Another, even bigger anomaly was the way time savings were calculated and used. They were given a constant value no matter what their size and this was coupled with an increase in real terms over the appraisal period. The latter undermined the impact of discounting and boosted the (incorrectly calculated) value significantly. The imbalance between environmental values and time savings is still a live and show stopping issue for many schemes which seek to reduce carbon.

To return to the fundamental dichotomy, it is between those who believe that every significant impact can be both *measured* and *monetised*, and those who consider the first is impossible and the latter has serious conceptual flaws. Examples are the dependence of the latter on willingness to pay and compensating losers for the greater good. Not a safe place for people interested in social equity or the environment but strangely popular with many economists^{iv}.

What was very clear even before the 1990s was that a lot of impacts were not being measured and that monetisation was not even being applied consistently. This is still very much the case. For example the value of private car travel time is based on surveyed willingness to pay values, the cost of business time on wages and salaries. The cost of a death has a moral dimension (it should not be a benefit to run over pensioners) and we are still struggling with the value of a landscape and consequently the cost of damaging it. In such circumstances ruling some items out of the social cost benefit analysis is a sensible way forward (objectives led!). But why did we create Areas of Outstanding Natural Beauty (AONBs) and Sites of Special Scientific Interest (SSSIs) and then put transport infrastructure through them? Plans for major road building through National Parks such as the Peak District are a live case in point.

The landscape example points to a way in which interventions could be assessed differently. We start by asking what do we want to achieve, not just in transport, but in life as a whole. Thus transport should fit within other policies, after all it is famously an enabler, not an end in itself^v.

Major reforms were tried in 1997, with the advent of the New Approach to Transport Appraisal (NATA). This set high level objectives through which transport schemes should be assessed, made the exploration of alternative options mandatory, and created the idea of plain English Assessment Summary Table (AST) to make the appraisals more transparent to public and decision makers alike. So everything was fine?

Sadly not. In a compromise “solution” to their perceived problem of making such a radical change, the Department for Transport (DfT) insisted that the old system of appraisal was to continue – based on social cost benefit analysis and producing those wonderful BCRs beloved by the Treasury. This system was then applied in a series of major multi-modal studies (MMS), reporting in the early noughties. The objectives had a weak impact on the final decisions, even though considerable effort was put into expressing achievement against objectives. Size of blobs and numbers of ticks were very popular but other aspects

were also missing, genuine alternatives were rare, instead slightly different and sometimes obviously poor versions of the preferred scheme were produced. A review of the MMS in 2005^{vi} made the observation:

“All of the studies achieved a reduction in carbon dioxide emissions compared to the ‘do minimum’ scenario. They therefore registered as a positive impact in the Department’s appraisal summary tables. The question however, is whether the absolute levels of carbon dioxide emissions are consistent with the Government’s commitments to reduce carbon dioxide emissions, not whether the strategies are ‘not as bad’ as they would have been. This appears to be a significant issue that remains to be addressed. Had the studies been given an objective to reduce carbon dioxide emissions then it appears likely that many would have produced different strategies to those now being considered and implemented, perhaps more along the lines of those proposed by the South and West Yorkshire and ORBIT studies.”

In 2008 a “Refresh” was proposed for NATA and resulted in very active participation from a number of practitioners and academics. Some of the key issues were set out in my 2008 MTRU report^{vii} as follows:

- 1) In NATA, schemes that go against government objectives often score best
- 2) Environmental valuations to date are hugely uncertain – they are not comparable to each other or to other valuations and should not be relied upon
- 3) NATA still does not adequately value the meeting of government objectives
- 4) NATA does not adequately assess switching between transport modes
- 5) Alternative transport schemes are poorly developed

Apart from some minor reforms the 2008 opportunity to actually implement the 1998 reforms was lost. These criticisms still largely hold today. In the next section of this paper I focus on two of the key issues arising from this failure to reform.

Why do we measure tonnes of carbon?

Emissions are usually measured in tonnes of CO₂ equivalent, and this the standard measure. The key objective, now enshrined in UK policy and across the world is to avoid a specific level of global warming, such that a catastrophic level of climate change can be avoided. The agreed critical end date is 2050. The level of warming depends, not on the tonnes emitted, but how long their warming effect lasts. A tonne emitted now will have its warming effect for 30 years, 30 times a tonne emitted in 2049.

The failure to use the correct metric has had clear results. Reducing tonnes emitted now is downplayed in the policies which are designed to address climate change, while reducing tonnes emitted later is both easier to achieve and has the appearance of being somehow as good as doing it early. The flaws in this argument were extensively discussed during 2007-2008, and led to the Committee on Climate Change devising the budget periods for emissions. This is not perfect but seeks to address this problem.

The difficulty is that it is not reflected in appraisal. The use of carbon tonne years would help to address the issue in the transport context, prioritising action now to reduce emissions rather than banking on unknown levels of reduction in the future. This is exactly what is needed to achieve the target of avoiding climate change and would change the way that demand management and active travel is treated in appraisal.

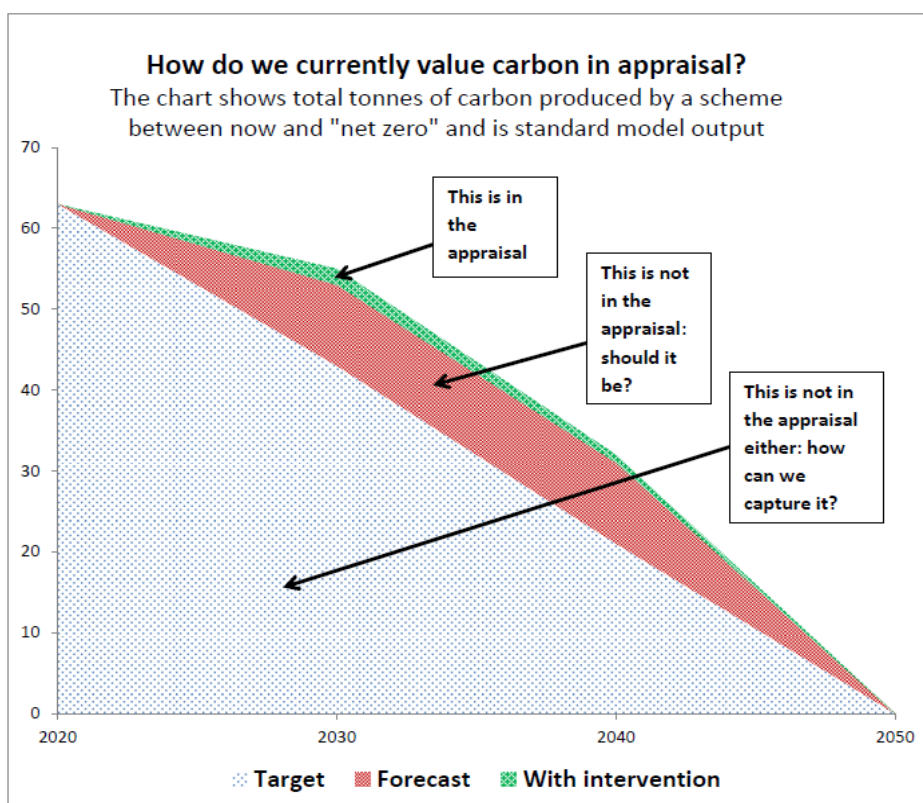
In passing it is important to deal with the argument that, if short term targets are not achieved, greater reductions can be achieved through market mechanisms. The argument goes thus. It is assumed that, as increasing amounts of carbon need to be reduced, the cost of reductions will rise (the supply of carbon reducing opportunities will be similar but demand will rise and thus the more expensive options are required to meet the target). This in turn will cause a rise in the value of carbon used in the appraisal and thus moving the balance in favour of schemes which reduce carbon.

This is clearly based on a misunderstanding of the nature of objectives and end dates. If there was an infinite amount of time, and the consequences of the lack of action were minimal in the mean time, the long term balancing idea might have merit. Unfortunately neither of those conditions hold. It may be true that this would happen in the longer term but the price would have to rise almost instantly and very quickly. In addition there may well not be enough carbon reducing opportunities in time to meet the 2050 deadline, and some of them may be socially and politically unacceptable.

The last shred of plausibility of this argument is removed by the understanding that, using the correct tonne year metric, every year of delay means a multiplier should be used for compensating carbon reductions in future years. Most of the burden of reduction should fall in the first half of the period between now and 2050, not in the 2040s.

Which carbon should be counted?

The second issue is how current appraisal allows unacceptable outcomes to be rated highly because only marginal changes in carbon costs and benefits are included. Thus a small increase or decrease in emissions is counted in a transport appraisal in the current system. This is illustrated in the chart below.



The current approach therefore ignores the complete illogicality of spending a significant amount of money to give marginal benefits to users whose continuing behaviour is at the same time a major cause of failing to meet standards or targets.

One possible way forward is to include the cost of failing to meet an objective in the disbenefits from a transport intervention. Thus a scheme which did nothing to reduce carbon would have the cost of the carbon not removed in line with the target reduction added to the cost of the scheme.

This is fairly straightforward because the appraisals of most schemes currently use forecasts for emissions and these usually predict a failure to meet carbon reduction targets. These would of course have to be refined in light of the correct carbon metric (tonne years). This the amount of carbon in excess of the target would be costed.

However, this is only part of the story. Given that huge change is required in other sectors as well as transport, excluding the carbon emitted by the beneficiaries of a transport scheme is a major omission. It may well have serious social impacts if other sectors are squeezed by transport failing to reduce carbon. Transport has consistently failed to achieve reductions in line with other sectors. In this case the cost of the carbon in the third sector of the chart needs to be included in the appraisal. For most transport schemes where the users emit large quantities of carbon, counting the reality of their emissions is easy – it is a normal modelling output . Including it would of course radically change the outcomes from most appraisals.

This approach is also highly relevant to other costs and benefits, for example health. An example would be transport schemes which encourage inactive travel. In this instance a proportion of the users would have be counted as not active, encouraged to remain so by the scheme, and their health disbenefits included in the calculation of the BCR. Including the negative effects of travel choice in appraisal would improve the performance of active travel schemes. It is interesting that, in order to create favourable results for walking and cycling schemes, the health benefits of these modes are included in the DfT toolkit. No parallel disbenefits are included in WebTAG.

Overall this approach is not without its problems, and I would very much like to hear how other practitioners would include the missing carbon. Whatever their ideas may be, the point is that it is no longer acceptable to pretend that the carbon from individual schemes, or from wider programmes, is a marginal issue. Allowing this to continue has resulted in the allocation of public money to schemes which run counter to publicly shared objectives for avoiding climate change, as well as improving air quality, health and social balance.

Of course if the current system were to be replaced with an objectives led approach which ruled out carbon inducing or inactive travel transport schemes, this might work. However, the evidence from 1998, 2008 and 2018 is that this is not sufficient. It's time we counted the real cost of transport interventions and stop spending public money on not achieving what everyone seems to agree are the desired outcomes.

Implications for policy – what next?

The change in the carbon metric and carbon appraisals would have far reaching effects but also have important implications for future policy. Some may be politically difficult, but some may address the obvious difficulties in the current approach. An example of this is the time needed to install electric infrastructure, both charging points but also generating and

locally distributing the power required. These are major obstacles and in the short to medium term, which is the critical period, gas is the most likely source for the extra electricity.

In addition, there will be major carbon costs in manufacturing the vehicles and batteries, quite apart from the environmental issues in extracting lithium for the batteries, and recycling them. These can easily amount to 4 to 5 years of current average annual driving. There are significant differences between countries of manufacture in terms of how much carbon is used in electricity supply.

This suggests that it is very important to avoid building up a new stock of petrol and diesel vehicles, while being more realistic about how many new electric vehicles are produced, bought and powered. It is also clear that the key target should be to reduce the level of use of the existing carbon emitting stock, particularly in the next decade or so. At the moment the focus seems to be on replacing that stock. Given that there are about 33 million cars on the road and few are electric, replacing it would take at least 15 years (and probably longer). At the moment we are still renewing the national vehicles fleet with cars with average carbon emissions of 124.5 gm/km. This actually rose in the latest data^{viii}.

In terms of policy this would mean:

- Much higher point of sale tax on carbon emitting vehicles introduced at once
- Further increases in fuel duty and an equivalent road user charge for electric vehicles
- Some form of revenue rebate to all households to recycle the higher fuel duty
- A carbon content tax to reflect how much carbon was used to manufacture vehicles and batteries
- Greater emphasis on reducing areas of carbon production in transport where it is practical:
 - Goods vehicles through technology and mode switch
 - Public transport vehicles
 - Shared cars and car clubs
 - Switch from long term road investment to long term behavioural change infrastructure (including broadband, car clubs, travel planning and active travel priority schemes).

Some of this is currently being pursued, some not, but the overall balance of policy will need to change to reflect the reality of carbon production between now and 2050 and how we produce practical policies to reduce its impact.

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- i TPS, 2018 *Response to the DfT's consultation on appraisal*, TPS London
- ii TPS, 2012-2019 *Annual members survey* TPS, London
- iii DfT, (2009) *NATA Refresh: Appraisal for a Sustainable Transport System*, DfT London
- iv However, this paper does not focus on the economic niceties or real world nasties of social cost benefit and the infamous Kaldor-Hicks criterion.
- v Just to be rigorous on this point it is true that some people like driving, especially through the countryside, and some like travelling on steam trains. In addition owning a car was at one stage a rite of passage for young people although this has faded with the advent of smartphones and the high cost of owning and insuring a car.
- vi Marsden, G.R. (2005) The multi modal study of transport investment plans. *Transport*, 158 (2). 75.-87. Page 85.
- vii Buchan, K (2008) *Decision-making for sustainable transport*, Green Alliance, London
- viii SMMT (2019) *New Car CO2 Report 2019*, Society of Motor Manufacturers and Traders (SMMT), London