THE TOPIC

"The vulnerability of current approaches to appraisal in light of low traffic growth and public sector austerity"

This Paper will discuss the current approach to transport appraisal which is practiced in the United Kingdom, in so doing it will give a brief overview of the approach to appraisal, the methodology behind the Appraisal Summary Table (AST) and a discussion of historic; current; and, future traffic growth.

The possible vulnerability of the current appraisal process will be investigated in light of low traffic growth which has been experienced in the 2008 recession, and public sector austerity. For the purposes of this Paper, vulnerability, from its dictionary definition, is taken to mean "open to censure or criticism; assailable".

In order to understand the 'vulnerability' of appraisal, first, the key determinants must be established. These are:

- Traffic Growth
- Value of time (VOT), specifically growth in VOT
- Appraisal period and discount rate.

The first two are linked to Gross Domestic Product (GDP) and the latter is part of the appraisal mechanism and is an attempt to appraise the 'lifetime' of a scheme. With reference to these points, issues may occur regarding the rate of traffic growth, and deviations from historic trends as well as issues of changing technologies which upset the underlying assumptions. The purpose of this Paper will be to look at the key determinants of traffic growth, and the effects these may have on appraisal outcomes.

Introduction to appraisal

In its basic form UK transport appraisal is a method of checking that the public is receiving value for money from government spending on transport projects. In doing so it provides a method of assessing different schemes over assessment or modelled periods (opening year, design year and 60 year assessment period), using a cost benefit analysis approach.

The appraisal system has evolved over time with the current system being based on the Government's New Approach To Appraisal (NATA), which was introduced in the (1998) White Paper "A New Deal for Transport".

In 2007, the Department for Transport (DfT) launched a "refresh" of NATA, both to update the approach after its initial ten year run as well as adapting it to the "Delivering a Sustainable Transport System" (DaSTS) policy goals, which were,

- To reduce transport's emissions of carbon dioxide and other greenhouse gases, with the desired outcome of tackling climate change;
- to contribute to better safety, security and health and longer life expectancy by reducing the risk of death, injury or illness arising from transport, and by promoting travel modes that are beneficial to health;
- to support national economic competitiveness and growth, by delivering reliable and efficient transport networks;

- to promote greater equality of opportunity for all citizens, with the desired outcome of achieving a fairer society; and
- to improve quality of life for transport users and non-transport users, and to promote a healthy natural environment.

Recent methods of assessment have included the use of COBA, QUADRO and latterly TUBA.

- COBA – COst Benefit Analysis gives a monetary evaluation of the costs and benefits of a road scheme.
- QUADRO – QUeues And Delays at ROad works assesses the total cost of major road maintenance works.
- TUBA- Transport User Benefits Appraisal undertakes economic appraisal for a multi-modal transport study.

The roots of appraisal are in welfare economics and cost benefit analysis. The broad theory, based on the work of Kaldor (1939) and Hicks (1939), is that a scheme is socially desirable if the beneficiaries could compensate the losers and still be better off (Pareto optimality), this being represented by the Net Present Value (NPV).

In transport, this is measured by, though not limited to, accident costs, value of time, journey time savings, carbon savings and vehicle operating costs. The UK transport appraisal system calculates and assigns such costs and benefits to a scheme, both of which are measured in discounted present values. From these a benefit to cost ratio is calculated (BCR). Currently the BCR values are categorised by DfT as follows:

- <1 – 'Poor'
- 1<1.5 – 'Low'
- 1.5<2 – 'Medium'
- >2 – 'High'
- Potential very high category of >4

The Appraisal Summary Table (AST) draws together the evidence from economic, environmental and other assessments of the impacts of a proposal. The AST is used to summarise the evidence in a succinct format, both for and against each proposal, for the decision-maker. As such, it provides a focal point for the decision making process.

NATA is a form of multi-criteria appraisal (MCA) in that the appraisal summary provides information about many of the impacts of a proposal. As such it includes the complementary assessments of impacts which are not captured within the welfare approach of monetisation yet are described qualitatively.

Once the AST has been completed it is submitted to the Assessor to determine the value for money case for the project, using judgement to decide the 'overall net value'.

The recent 'Government Comprehensive Spending Review' has indicated that there is a potential for change in the appraisal process. The DfT asked Local Authorities to resubmit their Local Major Transport Schemes, from a select pool, with their 'best and final offer'. This resulted in a gross saving of around 14% to the DfT[1].

[1] Dft, (4th February 2011)*"£45.5M Savings Give Boost To Transport Improvements"* http://nds.coi.gov.uk/clientmicrosite/Content/Detail.aspx?ClientId=202&NewsAreaId=2&ReleaseID=417803&SubjectId=36

The vulnerability of appraisal was highlighted through this process by the Thornton to Switch Island Scheme, promoted by Sefton Council where its Benefit to Cost Ratio increased from 12:1 to 35:1[2] using a revised DfT appraisal methodology which included adjustments for wider impacts, reliability, indirect tax, carbon and landscape benefits[3]. This should be considered in line with the guidance which identifies BCR categories which are much lower than even the initial 12:1 value.

As highlighted by the Thornton Switch Island Scheme, appraisal can be susceptible to changes in the variables which the models rely upon. In this case the change in indirect (fuel) tax was identified as a key factor influencing a change in the BCR. This does not however explain the general high BCR values reported across all schemes which in light of the current DfT guidance appears to represent extremely good value for money.

The next sections of this paper explore the vulnerability of transport appraisal based on underlying traffic growth, VOT, appraisal period and discount rate assumptions.

Historic Traffic Growth

Before discussing the vulnerability of appraisal to recent lower traffic growth, historic traffic growth forecasts need to be examined. Transport has seen many shifts in trends over the past Century arising from the wider availability and increasing production and ownership of the motor car in the post second world war period, to the public transport boom of the 50's and 70's,to our current position with the increasing reliance on the use of private vehicles.

Historic trends in traffic growth are published by DfT. A representation of the historic growth in vehicle use is shown in Figure 1, where it can be seen that vehicular travel has been increasing since the 1950's, with cars and taxis following a similar trend to all motor vehicles. The transport statistics show that in terms of motor vehicle traffic, in 2009 some 313.2 billion vehicle miles were travelled, which is more than 10 times the volume in 1949.

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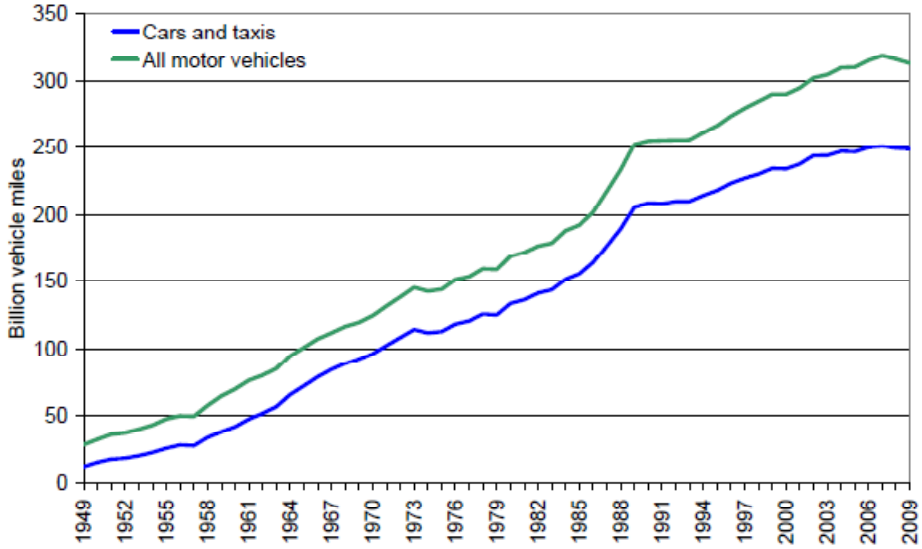
[2] LTT, (21st December 2010) *"NATA change trebles road scheme's BCR"* Issue 561
[3] DfT, (February 2011) *"Investment in Local Major Transport Schemes: Update"* http://www.dft.gov.uk/adobepdf/165237/706167/transportschemesupdate.pdf. pp13.

Figure 1 Historic Traffic Growth



Source: Transport statistics Great Britain 2010

The current recession has had an impact on the rate of growth in vehicle miles travelled as between 2008 and 2009 total estimated motor vehicle traffic fell by one percent, following on from a 0.8 percent fall between 2007 and 2008. This is the first time motor vehicle traffic levels have fallen for two consecutive years since records began in 1949. However, traffic levels in 2009 were still 7.9 per cent higher than in 1999.

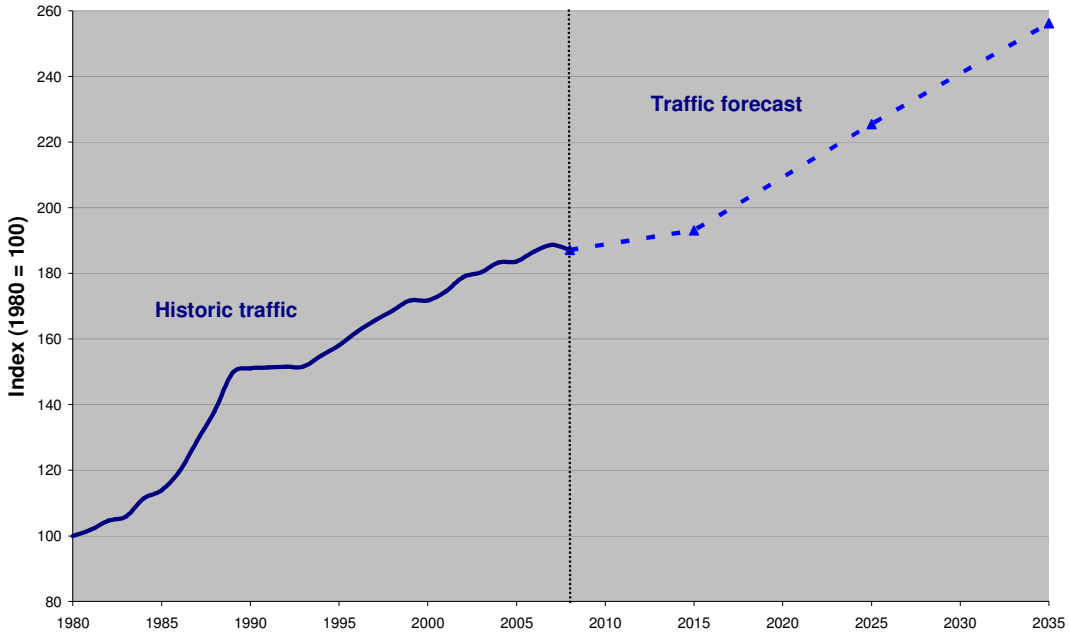
The forecasting of traffic within transport models is used to determine how patterns of demand may shift over time and space thereby reflecting exogenous factors such as growth in incomes, changes in transport prices and demographic and land-use planning.

Historically, transport professionals used the National Road Traffic Forecasts, last published in 1997, which presented a range of factors based on low, medium and high growth for different modes as well as for all traffic.

More recently, and with the movement towards 'Stated Preference Analysis', the UK has developed the National Transport Model(NTM) for which 2008 and 2009 data sets have now been released. In addition, there are also model specific guidance documents which support the NRTF and NTEM forecast methodologies.

Figure 2 shows the expected trend in total traffic growth from 1980 to 2035, based on NTM 2009 data. The Figure shows that traffic growth is predicted to increase, albeit at a decreased rate, until 2015 and then follow a similar rate of growth to that which was previously forecast and based on historic traffic data.

Figure 2: Trends in Total Traffic, 1980 – 2035, Great Britain



Source: Historic data from DfT (2009); forecasts from NTM

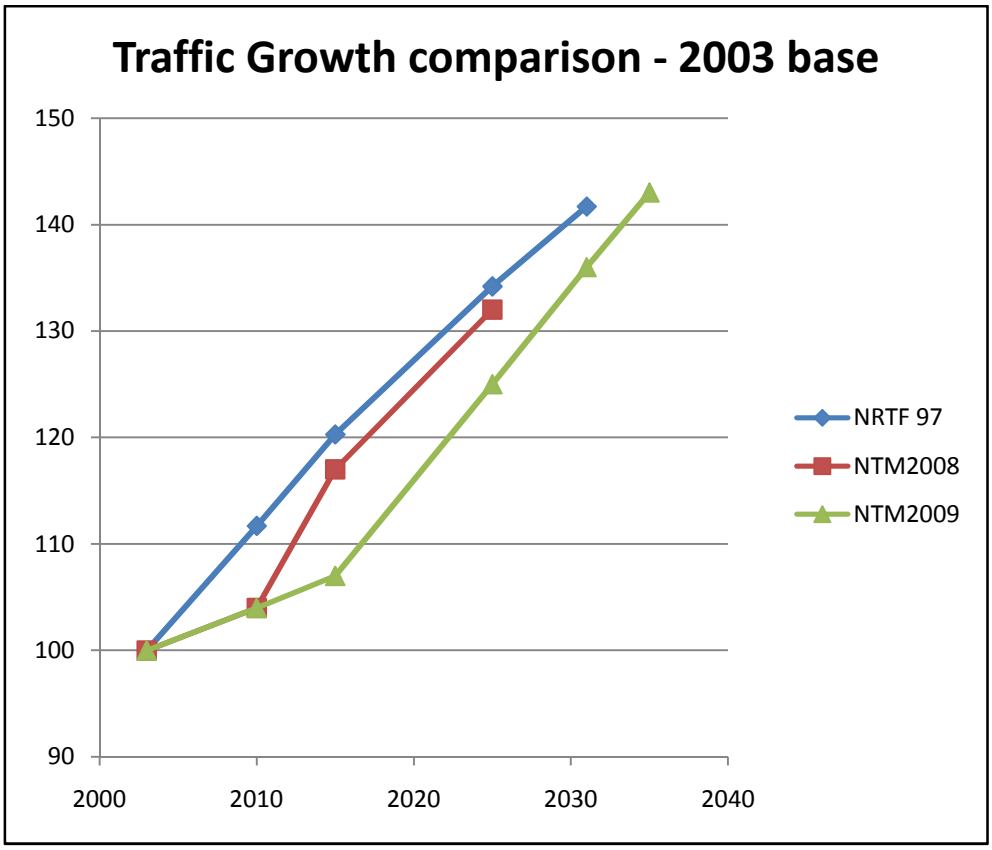
As has been seen, historically, traffic levels have increased, with a plateau in the early 1990`s recession. Whether history will repeat itself is uncertain. The post 2007 recession period has certainly caused a similar plateau in traffic growth, and as shown in Figure 2, traffic forecasts assume a 'recovery' will result in growth similar to historic rates.

The next section will discuss this forecasting of traffic growth and the trends which the data explains.

Forecast Traffic Growth

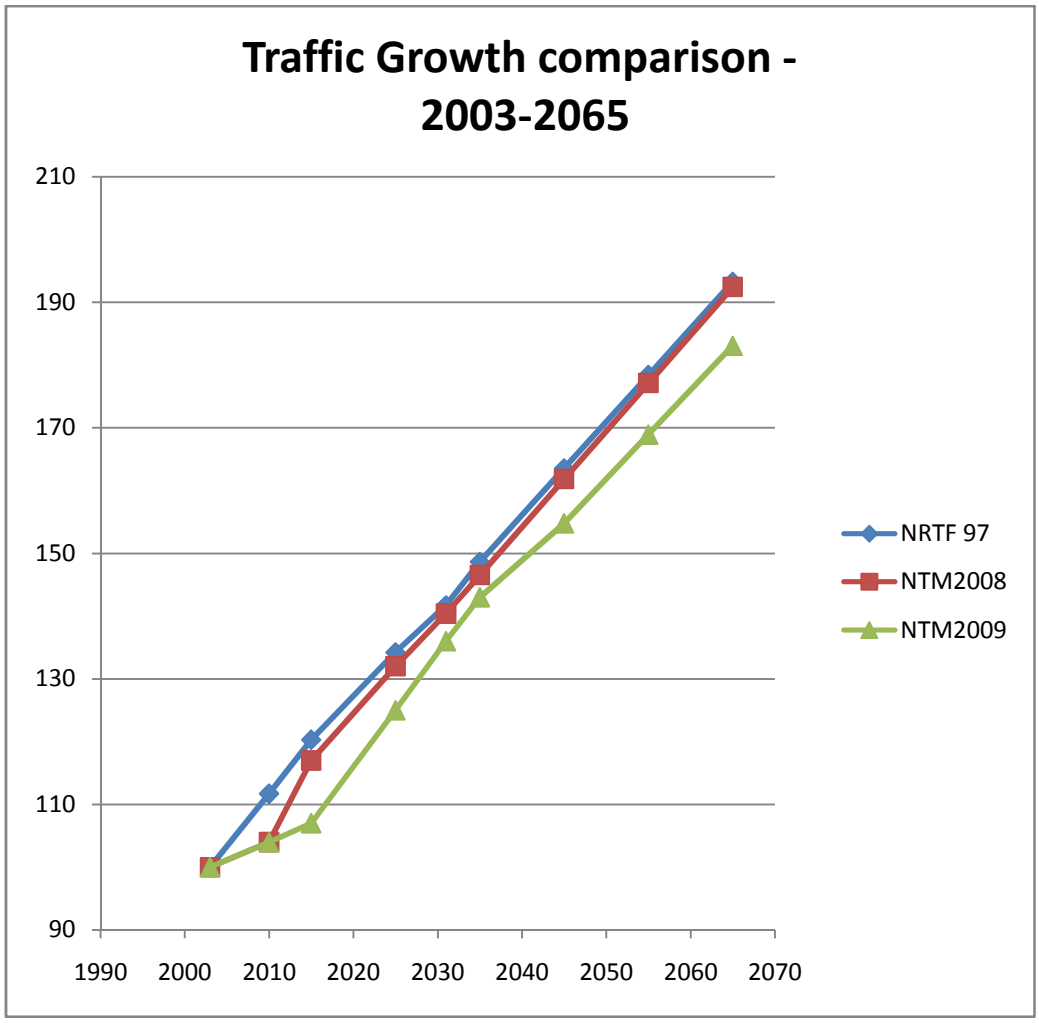
The discussion thus far has mainly involved historic data and trends; however the vulnerability of traffic growth does not lie in the existing data but in the use of that data when used to forecast future years. Figure 3 shows a comparison of three different traffic growth methodologies, all of which have been published for use within the UK appraisal system.

Figure 3 Traffic Growth Comparisons



The NTM forecasts have initially been revised down in comparison to the NRTF97 forecasts. The reports for the 2008/2009 NTM model forecasts indicate that the effects of lower GDP, oil price changes and other exogenous factors have influenced traffic growth, with the 2009 data showing a slower rate of increase over the forecast period, as shown by the divergence of the NTM 2008 (red) and NTM 2009 (green) forecasts in Figure 3.

Figure 4 Extended traffic growth comparisons



The Importance of Traffic Growth for Road Appraisal

The traffic growth comparison in Figure 4 shows an extended forecast based on the data provided by NRTF97, NTM 2008 and NTM 2009. What is interesting from this analysis is that growth based on the NRTF97 forecast and growth based on the NTM 2008 forecasts would converge around 2070. The NTM09 data shows a trend in which a revised and uniform rate of growth does not converge with previous forecasts.

This introduces an interesting question about future traffic growth forecasts. Will we see a situation where traffic growth is predicted to 'catch up' to previous forecasts and then continue on trend, or will we see a change whereby growth does not reconverge with previous estimates (as shown by the NTM09 forecast)?

Some authors, (notably Professor P. Goodwin), have even suggested the potential for a 'peak car' situation whereby a saturation point is reached (or potentially already has been reached) and car use declines from that point. David Metz, in his letter to LTT on the 9th July 2010, suggests that such a situation has already occurred in London, with a decline in the private transport share of trips since 1993.

Continuing the NTM 2009 green trend line (prior to the recession) without any "catch up" would have a major impact on traffic in a capital scheme design year and beyond. It appears that the extension of the NTM09 2003-2015 growth rate would have the same rate of growth as the NTM08 2003-2010 period. When the 2010 forecasts are released it will be then seen if a further extension of this low rate of growth has been

forecast until 2020 and beyond. Further, the assumed catch up period requires an accelerated growth rate compared to historic patterns. The evidence for this effect appears not to be justified .

As well as applying traffic growth forecasts, there is scope for schemes (or lack of them) to cause traffic levels to be higher or lower than the national figures suggest. Thus, one traffic methodology within CBA allows for fixed traffic flows, whereby it is assumed that trips remain constant for the 'with' and 'without' improvement scheme scenarios for each year (this is called a 'fixed matrix' approach).

Alternatively, there is the 'variable matrix' appraisal where traffic volumes can vary between the 'with' and 'without' scheme, for instance, in the case of induced demand for a bypass scheme. Induced traffic occurs when a scheme increases capacity or reduces the journey time over a route thereby benefiting current users and so 'inducing' them and other users to make additional or longer journeys. This has the result that the number of vehicles passing through a network within a defined period increases between the do minimum and proposed (do something) situations.

The changing traffic growth forecasts and ability to augment growth factors allows professionals a degree of flexibility in their approach to modelling. A side effect of this is that too much flexibility or change in variables could result in a weak foundation to develop the wider appraisal. It seems that a definitive long term approach which is more rigid is potentially more suitable to a comparable prioritisation of improvements over time, though this would be at the expense of the professional's discretion.

What links are there between times of austerity and traffic growth?

With the current Government spending cuts and the proposed efficiency savings, which will need to be made at a local level, it will be interesting to see what the effect will be with regard to changing transport policy. On the one hand Local Authorities may treat the motorist as a source of revenue, increasing current parking charges and increasing the scope of parking levies, such as the Nottingham Parking Levy. On the other hand savings could be made by Local Authorities reducing their spending on transport infrastructure and behavioural change initiatives.

A possible effect of more austere times is likely to be that the historic increase in car ownership will continue but at a declining rate and this may result in an ageing vehicle stock with individuals choosing to hold on to their vehicles for a longer period of time, or choosing to purchase a used vehicle instead of a new one. If indeed there is an ageing vehicle stock, then some of the future benefits of appraisal, such as the assumed future energy efficiency savings and carbon benefits will diminish or be subject to a time lag, distorting the NPV of schemes and potentially leading to an overstating of the benefits of some proposals, especially where these involve road infrastructure improvements.

One of the reasons behind the lower traffic growth predictions is lower car ownership projections within NTM09 compared to historic growth forecasts. This is potentially a short term trend which is a consequence of the recent recession, i.e. people putting off the purchase of second cars as well as people choosing to forego the cost of motoring by switching their mode of transport.

Without behavioural change, and assuming that the economy will recover to pre-recession levels, then we can assume that car ownership will increase again as our incomes increase and where new car purchases improve as individuals circumstances

change. However, a more interesting effect could be that the switch to other modes of transport causes a lasting behavioural change and people choose not to purchase a car based on factors not related to their income. This would cause a necessary change in traffic growth forecasting, which currently assumes a positive relationship between income, car ownership and traffic growth.

What are the impacts on assessment?

An effect of low traffic growth is that the BCR's of schemes will be lower, especially if scheme benefits are built on a large proportion of link transit benefits. This presents the opportunity for other schemes to come to the fore such as walking and cycling schemes.

Research by Professor Goodwin shows evidence that smarter choice behavioural change measures, at their best offer a BCR of 30:1[4]. This figure is impressive, but is the industry confident that this is truly comparable to BCR values from road schemes or public transport schemes. Further validation for such claims is needed before decision makers are likely to be converted to the seeming benefits of investment in cycling and investment in walking.

Evidence from the 'Spending Review' has indicated that the DfT is open to a new and less demanding method of appraisal The proxy values which were applied for qualitative landscape benefits being one example, albeit a potentially risky move if further proxy values were also to be included without justification. Clearly, it is potentially dangerous to apply assumptions about proxy values, without a strong evidence base, in an attempt to value non monetary factors, or variables which do not have a reflective market, or shadow price.

For example, from a review of the Investment Local Major Scheme update, the DfT footnote the Supported Pool schemes as having been adjusted for the following:

- Wider Impacts;
- Reliability;
- Indirect tax;
- Revised carbon values; and
- Landscape impacts.

The adjustments seemed to be applied as a percentage of NPV subsequently added on to the full scheme cost. With the austere period ahead there is the potential that investment in research will fall down the list of priorities and in that case we may see an expansion of this approach of attempting to value factors but by using crude and judgemental approximations. The impending release of appraisal guidance from the DfT will be watched with great interest to fully ascertain the soundness of approach which is to be adopted for future appraisals.

In terms of the scope for investment in alternative modes, transport professionals are still struggling to fully appraise benefits accrued via non car modes of transport. When considering investment in either a road scheme or a public transport scheme how can a true reflection of the associated costs and benefits be calculated? One of the main difficulties facing the coalition Government, is how to assess and measure their aspirational 'wellbeing'.

[4] LTT Issue 553 (03 Sept 2010)

This sort of a variable is often valued using Stated Preference techniques, as are other variables already within the appraisal process. However, due to the non monetary values which are placed on transport this may cause a problem. An example is the option value of a rail station, whereby individuals assign a value to the knowledge that a rail station is available even if they do not personally use it. It is an 'option' available to them. A further point is that public transport often offers the only means of travel for individuals, public transport in a rural community for instance, and as such for those who do not have access to a car the value is very high. How is this built into the appraisal process?

It seems that further research needs to be continued and encouraged, both within the transport profession and in academia, to establish the correlation between public transport improvement and its potential social and fiscal benefits with the aim of setting accountable values. A striking example of this is emphasised by research into the links between health and transport, partially championed by the DaSTS process but which now appears to have been cut from the current political arena.

Other Areas of Vulnerability

Traffic growth is one element of producing the traffic demand for an appraisal model. Another element is the 'Annualisation' of flows which is a further area of vulnerability within the modelling process and one which could potentially lead to further distorting of the appraisal process, particularly when considering extended periods of assessment.

The evaluation of the 'life period' for appraisal, being 60 years, has encountered criticism for over stating future benefits which accrue in the latter years - potentially generations away from those who are paying for the scheme being appraised. The 'rules' of public enterprise state that one of the key roles of a policy maker is to treat future generations on an equal basis to the present because of an assumed defective 'telescopic' view of the current generation when asked to make decisions which impact future generations. The impacts otherwise are clear in that we would be in a society of immediate gratification and 'short term' mentality.

The problem with traffic forecasts and such a long appraisal period is that any errors or misjudgements are compounded potentially thereby distorting the relative 'true' costs and benefits of a scheme. Traffic forecasts currently give predictions up until 2041, approximately over thirty years, which in some instances are interpolated to provide for up to sixty years of traffic growth.

Over such long periods it seems irrational, based on the recent evidence, to attempt to predict a variable such as traffic growth where a more robust methodology would be to restrict growth to an arbitrary number of years, for instance 15 years, after which it is assumed that traffic levels plateau. This method, though not perfect by any means, would give encouragement to schemes which do not rely on future time savings over the life period of appraisal and it would allow a greater degree of confidence in the traffic growth methodology on which it is based.

Annualisation is the process of converting traffic count data to data which can be used within transport appraisal tools and this usually includes producing 12 hour, 18 hour or 24 hour flows which have potentially been factored from peak hour counts. The COBA annualisation process (FTM) uses link flows as the basis of appraisal, calculating a cost on each link of the network which is then discounted to the base year to give a present value of benefits and costs.

Due to the reliance of COBA and TUBA on network costs and therefore the link transit and time savings within the network, it is vital that assigned traffic flows are both accurate and representative of different times of the day. COBA and TUBA are based on Annual Average Hourly Traffic (AAHT) and is usually calculated externally using flow groups as follows:

- Peak Hours – 522 per year
- Near Peak Hours – 522 per year
- Off Peak Hours – 2,088 hours per year
- Night Time Hours – 3,132 hours per year

COBA and TUBA use the forecast traffic flow on each link and junction to calculate the time related values and operating values for each flow group. Benefits can be positive or negative and differ from scheme costs which generally relate to investment funding. COBA and TUBA calculate these values for each link and junction of the modelled network and for each year of the appraisal period, usually 60 years.

The 'do something' costs are then subtracted from the 'do nothing' costs to estimate the total benefits of a proposed scheme and associated net present values. Thus, the appraisal is very sensitive to small changes in the total network costs for the different options considered either because of the assigned flows and/or the economic modelling process. This makes it imperative that the base assumptions in traffic assignment and network coding have been thoroughly checked and input correctly.

Annualisation adds a further consideration which increases the vulnerability of road appraisal. In a perfect world we would have full information, and traffic count data, required for a full and thorough appraisal. However the cost of collecting and processing these data is often perceived to impede the process and this may lead to too much confidence and reliance being instilled within the appraisal process. Therefore with the restraints of imperfect information, perhaps appraisal should remain as a comparative tool only, between 'do-nothing' and 'do-something' scenarios for a specific scheme rather than being used as a best fit tool which attempts to predict definitive future scenarios giving absolute data results and to a high confidence level.

Conclusion

This paper has touched upon what is a vast debate surrounding our transport appraisal system. There is a general acceptance that our current, and likely future, approaches to appraisal should be a 'best fit' designed to provide a structured and coherent platform allowing decision makers to rank and compare investment schemes.

Issues discussed have ranged from the mechanics of appraisal itself, to a wider discussion of factors influencing appraisal. It is yet to be seen what the post recession appraisal landscape will look like. If we are to use the spending review as a signal then we are potentially taking a step towards establishing appraisal as a pseudo science in which vogue measures (fashionable variables influenced by political consensus) are factored in using proxy values which have only shallow roots in economics and appraisal.

In terms of post recession traffic growth, it is to be seen whether our previous assumptions of a 'catch up' with previous forecasts which then revert to the previously forecast growth rate will occur, or whether growth will now remain more

conservative than previous forecasts. It is rational to assume that the technology in the cars we drive is likely to change vastly, as technology has a tendency to do, though there is little discussion about the impact this will have on the computation of future benefits over an appraisal period.

Finally, we have the path of appraisal. Early signs show willingness for change but there remains the question, at what cost? Are transport professionals to take a light touch using proxy values for landscape and environmental impacts potentially which may reduce the profession confidence in appraisal, or is there going to be clear and succinct guidance from the DfT that will allow appraisers to fully assess a scheme and thereby provide a comprehensive option appraisal, perhaps across modes, for decision makers?

There appears to be a trade-off between ascertaining value for money across schemes, whilst maintaining integrity and confidence within the industry.

It seems with tighter monetary constraints and the inevitable uncertainties caused by the recent recession, that the much needed research and discussion surrounding appraisal and its variables is in danger of becoming a victim of austerity. The issue of the potential vulnerability of current approaches to appraisal may be that simply, without investment in the roots of appraisal methodologies, we may be left with pseudo measures which make the scheme ranking and assessment process and its practitioners, vulnerable to even wider criticism and further cuts in resources.

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