Weighing Environmental Factors in the Appraisal of Major Highway Investments

Peter M. Townroe*

1 Introduction

The environmental impact of building even a short length of a major new highway is always significant. Or at least, so it seems to an increasingly voluble slice of public opinion, whether represented by a national pressure group or by a newly formed local coalition of NIMBYs[1]. For some opponents of a scheme complete abandonment of the proposal is the only option. For others, re-routing of the road or some form of monetary compensation or environmentally friendly offset investment will provide sufficient satisfaction. For all, there is a clear demand that their objections be heard, in public and in a democratic forum. Road builders, transport investment analysts, and their political decision-making masters, must be able to present the strongest possible case of benefits from the investment to offset against the claimed environmental damage.

All governments in what used to be called the 'Western' nations, and many among the less economically advanced nations, have wrestled with this issue: of making a case for road investments. A case is needed for public acceptance. And within available road building budgets a procedure has been needed to rank alternative potential schemes in their relative desirability in terms of overall prospective public benefit. Using a fairly standardised Cost-Effectiveness Analysis, promoted internationally by such bodies as the OECD and the World Bank, the monetary calculus of direct transport costs and benefits has provided a simple and apparently unambiguous framework for this purpose. However, once a political agreement has been reached that the environmental impacts of alternative schemes may significantly bias the rankings, or even push the available funds towards other forms of transport investment, then transport economists turn to their environmental economist colleagues for assistance.

This paper uses a discussion of recent developments in the approach taken by the British government towards these issues to highlight the analytical dilemmas that sit in behind the political furore that now so often seems to accompany the possible externality effects of major highway investments. In 1998 the new-at-that-time Blair government launched what it called *The New Approach to Appraisal* under the general brave heading of *A New Deal for Trunk Roads in England* (although it was also

*Visiting Professor, Sheffield Hallam University, Sheffield, Great Britain.

[1] "Not In My Back Yard".

meant to apply to the rest of the United Kingdom as well). In fact the *Approach* was not so new, and the *New Deal* has not been noticeable in its impact; but the supporting developments in analytical approaches and in the presentation of the appraisals of alternative schemes have served to further clarify what are the seemingly inevitable local complexities of each scheme. These complexities include the environmental impacts. The paper considers the options currently available in the weighing and evaluating of these impacts.

The next section of the paper counter-poses, in summary only, the case for further major highway investments in the United Kingdom with the arguments against, both in general and in relation to specific localities. Then, when once a scheme has been accepted in principle, it faces further design problems. Any builder of trunk roads in those regions of Europe with high levels of residential density faces a routing problem, normally around rather than through urban areas. In addition, most parts of most of those regions are characterised by valued environmental qualities, natural and man-made.

Section 3 of the paper outlines, again briefly, the evolution of the standard Cost-Benefit Analysis (COBA) as used by the British government to appraise road schemes for more than three decades, against increasing criticism that it was too simple and too uni-dimensional. This leads to Section 4 which outlines the *New Approach to Appraisal* and its application to a tranche of British motorway and trunk road improvement schemes.

A review of the outstanding issues in both evaluating environmental impacts and in Cost Benefit Analysis for road schemes is the basis of the discussion in Section 5. This goes through the familiar territories of approaches taken to gain monetary values, and approaches to reflect those impacts which do not have monetary values. The final section of the paper is then a brief discussion of the role of analysts and of decision makers in a pluralistic democratic environment in reaching major decisions on transport investments.

2 Requirements and Restraints

In a population of 57 million Great Britain has approximately 24 million cars and 5 million goods vehicles and buses. Although the number of cars per head of population is lower than in France, Italy or Germany, the annual mileage per vehicle is greater. The intensity of use on major trunk roads is very high. Travel by car accounts for 85% of total passenger mileage, and road freight takes 65% of the tonne kilometre total in all forms of land transport. In the particular case of Britain the intensity of road use has been exacerbated by the urban form of housing developments throughout the twentieth century. This has been dominated by the suburban detached or semi-detached house with a garden, with a consequential relatively low urban density and therefore difficult economics for public transport and a premium on the convenience of the household motorcar (or cars). The related forms of retailing and wholesaling have encouraged logistics systems dominated by road rather than rail, further encouragement coming from the relatively short inter-urban distances between the major concentrations of population. This contributes to the intensity of use of both local roads and the inter-

urban routes.

At the same time, by the standards of other major EU nations, the proportion of the UK public expenditure invested in all forms of transport has been low throughout the past fifty years. This may be seen in the miles of motorway standard highway per 1,000 sq km (under half that of Germany for example, and less than one quarter of The Netherlands), or in the present poor state of the rail infrastructure. The motorways and major trunk roads account for 4% of the road mileage but take 36% of the traffic. Arguably more effort has been put into road traffic management than into building new roads.

The result of these trends has been growing road congestion, as found elsewhere in the EU. This congestion is systematic on many key routes and is allowed for by many drivers in planning their journey times. It is also unsystematic, due to accidents, road works or one-off events held at particular locations, and therefore more difficult to allow for, leading to disruption of schedules and both drivers and passengers counting the value of their time spent unexpectedly sitting in a vehicle. With rising real incomes, this travel time has a rising premium. A special issue also arises in those settlements without a bypass that are reliant on a local road form that has a long history but which now carries an important through route. Congestion here also has been rising, with a consequential adverse environmental impact for local residents.

Pressure to build more roads in the United Kingdom is therefore a political reality, from industry and commerce, from frustrated longer distance commuters, from leisure time visitors to extended family and friends, and from the residents of the non-by-passed settlements. The economic development councils and the industrial and urban regeneration agencies are also part of this chourus[2]. But ranged against this loose coalition is a politically voluble phalanx of opposition.

If the United Kingdom "lost" Scotland north of the Clyde-Forth Valley and most of Central Wales, it would be one of the most densely populated nations in Europe. Already the North West region of England has a residential density greater than The Netherlands, the nation often held up as the most densely populated member state in the EU. The South East region outside of London and the West Midlands region are not far behind[3]. Many parts of these and the other regions have stretches of very beautiful countryside, and love of the countryside rather than the town is a deeply embedded trait of the British (and especially the English) character. There is an almost instinctive reaction to resist any form of development in open countryside. New roads are typically portrayed as "scars on the landscape". Bodies such as the Campaign for the Protection of Rural England (the CPRE), the National Trust[4], and the Royal Society for the Protection of Birds (the RSPB)[5] have very large memberships and considerable financial resources to fight road proposals thought to be inappropriate.

Blanket opposition to road proposals also comes from smaller but very voluble and

[2]Although the apparent certainty of the contribution of major road investments to local economic regeneration is not well supported by economic research.

[3]In 1998 The Netherlands 464 persons per sq km, North West England 486, South East region 419, and West Midlands region 410.

[4]The National Trust has 2.7 million members, and exercises stewardship over 200 properties and 345,000 hectares.

[5]The RSPB has over one million members and owns 168 bird reserves, covering 115,000 hectares.

pro-active 'green' groups. They are against any further road building on grounds that range from fears of global warming to localised carcinogenic effects of vehicle emissions, as well as loss of trees, landscape, animal habitats etc. Local NIMBY protesters, worried about impacts on property values, on the growth of subsequent 'urban' facilities at junctions, and the significance of noise etc., frequently find themselves as unlikely allies of the fiercer green protesters.

Blanket protest to a road scheme requires a political response. In contrast perhaps, local protests about one route as opposed to another or about the design details of a scheme will require an analytical basis for the eventual political decision, a basis that can portray the cost factors and the various impact factors of the options[6]. An analytical basis is also required by the road builder in choosing routes around or through areas of land or through buildings that are protected, by law or by convention.

In the UK some 560,000 buildings are "listed". They are therefore protected by law for their architectural and/or historical significance. There are also 31,000 protected Scheduled Monuments. And large areas of countryside have varying degrees of statutory protection against development: 6,755 Sites of Special Scientific Interest, 392 National Nature Reserves, 759 Local Nature Reserves, 11 National Parks and 40 Areas of Outstanding Natural Beauty (AONB)[7]; plus 44 Ramsar Wetlands, 19 Environmentally Sensitive Areas, 17 Forest Parks, 200 Country Parks and 13 Biosphere Reserves; and 765 Special Areas of Conservation covering 33,000 hetares. The total is over 60,000 sq km. In addition, non-statutory but land use planning protection is given to National Trust land, reserves of the RSPB, the Woodland Trust and the local (county based) naturalist trusts, to Heritage Coasts, and to land owned by the Wildfowl and Wetlands Trust and the Field Studies Council. In many parts of the country there are also significant revealed and recorded archeological sites. These date from the Iron and Bronze Ages, the Roman occupation, the Saxon and Viking centuries, the Medieval Era after 1066, through to the more recent Industrial Age. These sites are lost reluctantly[8]. In addition, there are 550,000 hectares of 'Common Land', and 'Green Belts' around the major British cities. These and other local land use designations exercise further constraints. There are over 10,000 Conservation Areas for example. These are localities within towns and cities of special architectural or historic interest designated by local governments. All of these elements present a challenge to a cost-benefit or multi-criteria analyst advising on alternative routes.

3 The COBA Approach

The Department of Transport of the British government has used a form of cost-benefit analysis to appraise major highway schemes since the mid- nineteen sixties. The successive editions of what became a computerised package were known as 'COBA'. This takes a "time-saving plus" approach. It comes out of a "predict-and-provide" tradition

[6]In the UK the Highways Agency, the body responsible for building and maintaining major highways, normally puts forward three routes for public consultation and review at a public inquiry.

[7]Between them National Parks and AONBs cover 23% of the land area of England.

[8]Road builders are also required to allow 'rapid' archeological recording of remains discovered in earth moving operations.

of investment decision making for roads, albeit always against severe public sector budget constraints. The costs of construction and of maintenance and servicing a new road are balanced in a benefit-cost ratio against the time saving benefits to traffic flows forecast over a 30-year period against the use that would be made of that traffic on the existing network. Changes in vehicle operating costs, as a user cost, and accident savings are also allowed for, and, as the computer models have improved, full network effects and allowance for traffic generation have been incorporated. Discounting to net present values was (and is) achieved with a standard public sector test discount rate.

Criticisms of COBA have come at three levels: the sweeping dismissal that it was too reductionist to put everything (time, human life) into monetary terms; or the economic differences of opinion that the key parameters were inappropriate (the choice of discount rate, the length of the life span, the posited vehicle mix, the seasonality assumptions, the path of future land-use planning strategies in the local area etc); or the systems criticism that the technology of the modelling for the required forecasts and traffic assignments was too crude and uncertain. Demand was to be met by supply, without allowance for traffic restraint policies or possible changes in attitude to or the cost of motoring. The analysis, critics claimed, too often seemed to be based on a statistical base that was already out of date by the time the decision came to be taken, let alone when construction would begin or the road would open. And there was a fear that it seemed to take decisions away from the political arena into the black box of the specialist analyst. This was perhaps most forcefully expressed in relation to schemes where environmental damage loomed large.

COBA has an inter-urban focus. From the late seventies it has been complemented by URECA, a procedure of intra-urban schemes. COBA does not value environmental impacts. Originally these were left to a generalised statement for discussion at the public inquiry, and then since the mid- eighties put into the form of an Environmental Impact Appraisal and Statement. COBA also does not place a value on the quality of life benefit of a by-pass road to the residents of the settlement that is by-passed (unless the residents use the new road and get counted into the time savings).

Early protests at the narrowness of the COBA assessments, the seemingly too simple engineering focused reduction to a cost-benefit ratio, led the Department of Transport to commission a review of its procedures. This was published as the *Leitch Report* (Leitch, 1977). This report argued for a more balanced appraisal process and for greater openness in the assumptions and in the uncertainties. The government's response was guided by the 1979 report of its independent Standing Advisory Committee on Trunk Road Assessment (SACTRA). The forecasting methodology improved, especially in the assignment modelling and in model validation checks which included sensitivity tests. SACTRA has produced further reports, *Urban Road Appraisal* in 1986, *Assessing the Environmental Impact of Road Schemes* in 1992, *Trunk Roads and the Generation of Traffic* in 1994, *Transport Investment, Transport Intensity and Economic Growth* in 1996, in response to public criticisms of the Department[9].

Politically, by the mid-nineties it was recognised by analysts and politicians alike that the appraisal of highway schemes in the United Kingdom not only had to draw

[9]The current *COBA Manual* was published by the Department of Transport in 1996.

in consideration of environmental impacts more centrally, but that appraisal also had to link trends and investments in private road transport to trends and investments in public road transport and the use of highways by cyclists and pedestrians, as well as to trends and investments in rail. By the time the Blair government came to power in 1997 the stage was set for the claims of a new approach to highway appraisal, one that was both socially and environmentally aware and multi-modal.

4 The New Approach to Appraisal

One year after it was elected the Blair government was ready to allow the ministers and the supporting civil servants in the Department of Transport to publicly admit the following:

1. That plans for each individual major highway scheme must be able to demonstrate that it is set into an overall national transport strategy, in order to defend the long held position that the public inquiry for a scheme is there to consider the routing of the new road, not the requirement.
2. That the appraisal of each such scheme must incorporate consideration of the impact of the investment on other modes of transport, on both the local and the wider environment, and on regeneration and community severance.
3. That the COBA methodology needs further refining, and needs to be drawn into consistency with the cost benefit analyses used to appraise investment using public funds in other modes of transport.
4. That greater attempts to find monetary values for environmental impacts using a Contingent Valuation technique are worth pursuing (see Bateman, et al., (2002), the guide sponsored by the Department of Transport).
5. That non-CBA methodologies (such as Multi-Criteria Analysis) may be useful in contributing to decision-making (see DETR, 2000a).

Items 1 and 2 above have been taken the furthest. Following a 'Roads Review', re-appraising nearly 100 schemes in-the-pipeline in England[10], in July 1998 the government published *A New Deal for Trunk Roads in England* (DETR, 1998a) with two supporting documents: *Understanding the New Approach to Appraisal* (DETR, 1998b) and *Guidance on the New Approach to Appraisal* (DETR, 1998c). The new approach was applied to each of the schemes. A ten-year 2010 *Transport Plan* followed (DETR, 2000b). This Plan projects an expenditure of £21.3bn (at 2000 prices) on 30 trunk road by-passes, on relief at 80 major bottlenecks, and on widening 5% of the key network; as well as even greater expenditure on both road and rail public transport investments. Further expenditures, mostly on motorway widening schemes, were announced in 2003.

Items 3, 4 and 5, after four years, are still within a research agenda. And thinking aloud about congestion charging and trunk road pricing is expressed with great political caution and sensitivity to voter reaction. A congestion charge cordon (of £5

[10]Scotland, Wales and Northern Ireland take decisions on road investments through their own agencies and representative bodies.

per vehicle) has been introduced in London under a new freedom granted to towns and cities to introduce traffic restraint policies under their 'Local Transport Plans'. This has suprised many commentators in the success of the technology used and in the degree of public acceptance. And the first major toll motorway in Britain, the privately financed Birmingham Northern Relief Road, is due to open in 2004. Experiments have been conducted for some time into the feasibility of directly tolling existing motorways with number plate reading equipment[11]. More recently a longer range programme of research has been launched into operating a road pricing system on all roads using a vehicle-mounted GPS aerial. It has been publicly recognised by the government that it is politically unacceptable to further raise the tax on petrol as a traffic restraint policy.

The *New Approach to Appraisal* is more presentationally new than it is analytically new, but the development in presentation has pushed forward the analytic debate. The *New Deal* document sets out five over-arching objectives for transport:

- to protect and enhance the built and natural *environment*;
- to improve *safety* for all travellers;
- to contribute to an efficient *economy*, and to support economic growth in appropriate locations;
- to promote *accessibility* to everyday facilities for all, especially those without a car; and
- to promote the *integration* of all forms of transport and land use planning, leading to a better, more efficient transport system.

These five objectives are expressed as criteria to be applied to each major highway scheme, with sub-criteria:

- Environmental impact
  - Noise
  - Local Air Quality
  - Landscape
  - Biodiversity
  - Heritage
  - Water
- Safety
- Economy
  - Journey Times and Vehicle Operating Costs
  - Journey Time Reliability
  - Scheme Costs
  - Regeneration
- Accessibility
  - Access to Public Transport
  - Community Severance
  - Pedestrians and Others
- Integration

[11] As used in London.

The impacts each of these in any given scheme are portrayed on an *Appraisal Summary Table (AST)*, qualitatively, quantitatively and as a summary assessment. Where quantitative data is not available a seven point scale is used: large, moderate or small negative, neutral, and slight, moderate or large positive. Occasionally 'very large negative' is used where the environmental impacts are deemed to be exceptionally severe.

Portraying the environmental impacts in a consistent manner between schemes is clearly a difficult issue. The environmental sub-criteria broadly reflect the structure of the Environmental Impact Assessment used for trunk road schemes in the past fifteen years, as required under EC Directive 85/337. Taking these in turn:

Noise: data on the number of properties that would experience significant increases or decreases in noise levels (±3dB(A)) in the design year if the road was built.

Local Air Quality: also using the number of properties affected, positively and negatively, weighted by distance from the road, using NO2 and PM10 at the National Air Quality Strategy standards. An estimate is also given for the net change in the level of Carbon Dioxide as a reflection of the impact on global emissions.

For landscape, biodiversity and heritage the concept of Environmental Capital has been used, applying the seven point scale, with features appraised against indicators of scale, importance, rarity, substitutability and impact; and, in certain cases, possible mitigation.

Landscape: the impact of the scheme is scaled against the national classification of landscape in terms of the following features: pattern, tranquillity, cultural features, and land cover by different uses.

Biodiversity: an assessment in terms of a nature conservation evaluation of species and habitats, or of natural features affected and the ecological impact of the proposed scheme.

Heritage: the impact on the built historic environment of the scheme uses a standard national classification in terms of: the physical form of the site, the survival of original fabric, the condition of the site, the complexity of the elements, the contextual setting of the site within its immediate surroundings.

Water: the scaling is applied to the impact on water quality and on land drainage and flood defence on the basis of a risk-based approach to the sensitivity of the receiving environment, allowing for mitigation.

Further details of the approach taken to these environmental criteria and to the other indicators included in the ASTs are set out in the *Guidance* document (DETR, 1998c).

The AST is clearly a considerable aid to the decision maker choosing between schemes from a limited budget; and it allows members of the general public, both supporters and opponents of a scheme, to compare their scheme with others and to judge specific areas of strength or weakness in making their case to the media, to their elected representatives, or to the public inquiry. Its design has been a response to environmental protests as much as a desire to widen the transport implications away from just road traffic flow. It could be said to reflect an objective of reducing use of the motor car; while analytically it may be said to resemble the first steps of a Multi-Criteria Analysis. However it does have its limitations, as discussed in the next section.

5 Outstanding Issues

The AST is primarily a political tool. It is recognised that it would ideally be desirable to have a weighting between the criteria used. However, that runs into the issue of whether the weights should be those of the (ill-informed?) public, or of the technical (blinkered?) specialists, or of the (sagacious?) politicians. And weights would yield implicit valuations for each criteria. The judgements reached on major highway schemes are essentially for the long term and they are non-reversible. It is the interests of society, today and tomorrow, that are to be served. The same weighting dilemma applies within the environmental criteria to its sub-criteria.

The danger without weights is that a single sub-criteria could be deemed to be all-important in turning down a scheme, without acceptance of the principle of trade-offs. For some members of the public (and one suspects for some politicians) the sanctity of a Site of Special Scientific Interest or of land held by the National Trust is absolute, with the implication of an infinite value. The same attitude is sometimes put forward towards the habitats of rare species, or to what is claimed to be a 'unique' landscape. A recent partial response to this stance is reflected in a declared willingness to place an upgraded stretch of the A303 trunk road into a very expensive tunnel as it passes close to the historic site of Stonehenge in Wiltshire.

The AST retains avoidance of any approved attempt to place monetary values on environmental impacts of new roads in Britain. This is in spite of the fact that two of the sub-criteria apply property-based information, and differences in property values have a wide acceptance as proxies for environmental values. Other proxy approaches, such as the Clawson travel budget approach are less applicable. Confidence in Contingent Valuation as a consistent technique is increasing, as lessons are learnt in the formulation of the Willingness-to-Pay and the Willingness-to-Accept questions to sample populations; but small variations in survey responses can amount to very large financial numbers over the lifetime of a road scheme, even with discounting (See Bateman et al., 2002).

Inevitably there is concern about the appropriateness of the definitions used in the environmental sub-criteria. Two examples illustrate the point. Should the particulate measure of local air quality be based on PM4 rather than PM10? There is dispute over which is the more carcinogenic. And why 3dB(A) for the noise contour, and with no recognition of possible variations in the nature and duration of the noise? There is a difference between output of noise and the behavioural response to it. Also, ideally, a full picture would require an assessment of the environmental changes expected on other roads or through changes in the use of other modes of transport as a result of building the given scheme. It is important that the seven point scale is verbal and not numerical, without implied multiples in the scale.

Among the non-environmental criteria in the AST there is also a definitional issue for 'Reliability', measured by an indicator of 'road stress'. This reflects changes in the relationship between the traffic flows and the capacity of a road, either through junctions or on links. And while this criteria has a quantitative base, the criteria of 'Regeneration' is strictly qualitative. Awkwardly this criteria is currently set to reflect two rather different aspects of regeneration: whether the new road may be deemed

to be potentially beneficial for designated regeneration areas, or whether there are significant developments within or adjacent to the regeneration area which are likely to be dependent upon the road investment going ahead. Further, there is a sense of double counting here, with the regeneration advantages already reflected in the forecasts of use and time savings of the new road.

Issues also remain within the COBA procedure. The concerns noted in paragraph 16 above will always be there, but some of those concerns and some new ones open up when consideration is given to the desirability of consistency in CBA for road investments with CBA applied to other public expenditures in the transport arena. The assessment of four areas of such expenditure in addition to trunk road investments have recently been reconsidered on behalf of the British government: route subsidies paid to loss making bus[12] and train operators[13], investment subsidies paid to rail infrastructure, freight and passenger providers (now in the private sector in the UK), investment subsidies given to light rail and guided bus urban passenger transport investments[14], and in relation to support given to harbour authorities for port developments (DTLR, 2002).

There are also a number of issues which arise in striving to have the methodologies used for different types of public sector transport appraisals being mutually consistent. Section 56 agreements for example require a 'restricted CBA' in order to demonstrate that the level of investment grant (to urban light rail or guided busways) be no greater than the portion of the benefits of the scheme to arise for *non-users* (eg road users on the less congested roads which result from the improvement in public transport). Assessment is also needed for the subsidies that are paid to support private sector train operating companies on the railway system for what are deemed to be non-commercial passenger services (see Mills and Howe, 2000). The issues now have a new relevance in relation to the current round of "Multi-Modal Studies", which are considering proposals for packages of projects with a full or partial public sector financial contribution (road and rail infrastructure improvements, traffic management, public transport service upgrades) along key congested inter-urban transport corridors and at key nodes.

A general point in an AST type of presentation of an appraisal, where there are items that are not measured as monetary costs and benefits, is the need to be clear as to whether these are *additional* costs and benefits, or whether they are *redescriptions* of costs and benefits included elsewhere (many of the regeneration impacts might be an example).

More fundamentally is the question as to whether the CBA that is to be used is drawn up as a *calculus of willingness-to-pay* or as a *calculus of social costs and benefits*. These should be equivalent in total but the latter is based on real resource costs or benefits, while the former is based on a summing of the net welfare changes for each individual that is brought about by the project being considered. In this summing there might well be items that are benefits to one person while being a cost to another.

[12]Through the Transport Grants for 'Local Transport Plans', paid through County Councils.

[13]Through OFRAF, the Office of Passenger Rail Franchising. The Strategic Rail Authority, concerned with supporting investments in new rail infrastructure, also undertakes CBA.

[14]Through Section 56 Agreements with sponsors of the investment.

These are transfer payments or pecuniary externalities, commonly found with environmental impacts. The principle advantage of the WTP approach is that it allows the preparation of a balance sheet with the net social benefit of a project disaggregated into impacts upon different social groups. Financial and non- financial impacts can be distinguished (important where private firms are involved). The difference in the two concepts lies in presentation.

The two concepts present a unit of account issue: a resource view would measure at *factor cost*, net of indirect taxes, while a WTP approach would be at *market prices*. Therefore, for consistency an indirect tax correction factor should be applied. This is a particular issue in assessing vehicle operating costs in road schemes, where different rates of VAT and petrol or diesel duty apply to different categories of vehicle. COBA uses the factor cost unit of account. In contrast the OFRAF methodology does not take account of differences in indirect taxes. Sugden argues that it is appropriate that the public decision maker should be aware of the impact of the proposed project on indirect tax revenues, just as he should be aware of the differences between user benefits and non-user benefits (Sugden, 2002, Sections 5 and 6).

Further issues in transport CBA include the distinction between *behavioural* and *equity* values of non-working time, and between *perceived* and *unperceived* private costs. It is the behavioural values and the perceived costs that are used for forecasting changes in travel patterns. The COBA treatment of accident risks as unperceived costs of travel, similar to the non- fuel costs of car trips, means that accident rates play no part in forecasting travel patterns or modal choice. All accidents are treated as negative externalities of travelling, whereas, it may be argued, they are an element in WTP.

Such considerations lead to a wider issue in the presentation of highway and other transport appraisals. This is the general desirability of disaggregation, in three directions, each of which has relevance to the consideration of environmental impacts. The *first* is disaggregation by the *recipient* of the benefit or cost, the distributional impact of the project. The final incidence of a project may be very different from the initial incidence. The *second* disaggregation is by *source* of the benefit or cost, by the activity of the impact, important in distinguishing between user and non-user benefits. The *third* disaggregation is by the *nature* of the benefit or cost, the proportions of benefit for example that come as time savings, price reductions, frequency improvements etc. These disaggregations can be applied conceptually to the environmental impacts, even if the absence of monetary valuation keeps the appraisal of these impacts outside the CBA. It is an open question as to how worthwhile this is for any but the largest, most costly and contentious schemes.

6 The Democratic Process

> *"The decision on any scheme will always be an exercise in political judgement in the end, but the quality of that decision is critically dependent upon the quantity, quality, and accuracy of the material on which it is based".*

The last sentence of the 1992 SACTRA Report perhaps is based on optimism for

the contribution of the analyst in a democratic environment to come up with a 'best' answer in relation to a single highway project or in relation to ranking a portfolio of highway and non-highway transport projects.

While in the interests of transparency it is good that the AST used by the British government is not too complicated or sophisticated, many might argue that the AST 'single page' summary is an inadequate basis for making choices committing millions of pounds of public expenditure. This is a question for the detail of the decision making process. One criticism is that the AST does not reflect any parameters of risk and uncertainty for the scheme as a whole: there are no alternative scenarios or sensitivity analyses supporting the view taken on each criteria, especially the COBA estimates of PVB and PVC.

The AST reflects considerable uncertainty in the social choice process as to how to disentangle and value the desirability to commerce and industry of having access to an uncongested trunk road system in the interests of economic efficiency, while rising real incomes increase the attractiveness of the use of that same system by private motorists. A system of differential road pricing is probably the only answer to that dilemma. Acceptance of this solution is slowly gaining ground in British public opinion[15].

The AST approach also gives a prominence to environmental impacts that many would argue is undue in relation to what road users would actually be willing to pay for. This reflects a present political reality in a pluralistic democracy, where elected representatives shy away from leadership and the unpopular longer term view in the face of a critical media and voluble pressure groups. Arguably it is exacerbated by a current regime of inadequate compensation paid to households and environmental bodies and low levels of expenditure on mitigation for the adverse effects of new highway schemes.

References

Bateman, I. J., Carson, R. T., Day, B., Hanemann, M., Haley, N., Hett, T., Jones-Lee, M., Loomes, G., Mourato, S., Özdemiroglu, E., Pearce, D. W., Sugden, R., Swanson, J. (2002) Economic valuation with stated preference techniques: A manual. Edward Elgar, Cheltenham

DETR (1998a) A new deal for trunk roads in England. Department of the Environment, Transport and the Regions, London

DETR (1998b) A new deal for trunk roads in England: Understanding the new approach to appraisal. Department of the Environment, Transport and the Regions, London

[15]It is a sign of greater political willingness to confront the issue of direct charging for the use of major roads that the British govenment issued a Discussion Paper in 2003: Managing Our Roads (Department of Transport, 2003) and has invested in a major feasibility study.

DETR (1998c) A new deal for trunk roads in England: Guidance on the new approach to appraisal. Department of the Environment, Transport and the Regions, London

DETR (2000a) Multi-criteria analysis: A manual. Department of the Environment, Transport and the Regions, London

DETR (2000b) Transport Plan 2010. Department of the Environment, Transport and the Regions, London

DoT (1996) COBA 9 Manual. Department of Transport and HMSO, London

DoT (2003). Managing our roads. Discussion paper, Department of Transportation, London http://www.dft.gov.uk/stellent/groups/dft_about/documents/pdf/dft_about_pdf_022865.pdf

DTLR (2002) A project appraisal framework for ports: A consultation document. Department for Transport, Local Government and the Regions, London

Leitch, G. (1977) Report of the advisory committe on trunk road assessment. HMSO, London

Mills, G., Howe, M. (2000) Appraisal of non-commercial passenger rail services in Britain. Journal of Transport Economics and Policy 43(1): 113-130

SACTRA (1986) Urban road appraisal. Standing Advisory Committee on Trunk Road Assessment, Department of Transport, London

SATRA (1992) Assessing the environmental impact of road schemes. Standing Advisory Committee on Trunk Road Assessment, Department of Transport, London

SACTRA (1994) Trunk roads and the generation of traffic. Standing Advisory Committee on Trunk Road Assessment, Department of Transport, London

SACTRA (1996) Transport investment, transport intensity and economic growth. Standing Advisory Committee on Trunk Road Assessment, Department of Transport, London

Sugden, R. (2002) Developing a consistent cost-benefit framework for multi-modal transport appraisal investment,. Department for Transport, Local Government and the Regions, London