

'in consultation' TAG Unit 3.6.1 The Option Values Sub-Objective

## **The Option Values Sub-Objective**

### **TAG Unit 3.6.1**

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Department for Transport

Transport Analysis Guidance (TAG)

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## **1 The Option Values and Non-Use Values Sub-Objective**

### **1.1 Introduction**

1.1.1 Option and non-use values are often associated with rail services but in principle are equally applicable to other public transport modes (bus, coach, LRT, underground, air), road infrastructure and to freight facilities (if option values exist for car ownership, they are already internalised in the car ownership decision). Within scheme appraisal, it will be particularly important to consider option and non-use values if the strategies or plans which are being appraised include measures which will substantially change the availability of transport services within the study area (e.g. the opening or closure of a rail service, or the introduction or withdrawal of buses serving a particular rural area).

1.1.2 An option value is the willingness-to-pay to preserve the option of using a transport service for trips not yet anticipated or currently undertaken by other modes, over and above the expected value of any such future use. The idea underlying option values can be explained using the following example. Consider a strategy or plan which includes the re-opening of a closed railway line linking a series of rural towns and villages to a major town or city that already has a railway service. Even if a particular individual living in one of the villages along the route does not intend to use the rail service, they may still value having the option to use the service if they choose. For example, a car-owner may value the ability to use the service when for whatever reason they cannot drive or their car is unavailable. A non-car-owning resident who generally does not travel beyond the village may value the knowledge that, should they need to reach the town or city, the facilities exist for them to do so, at reasonable cost and with a reasonable level of convenience. Whilst a full analysis of user benefits will include the expected value of any such occasional use, theory suggests that in circumstances where the lack of the transport facility would cause inconvenience, people may be willing to pay a premium over and above their expected use value to ensure that the service exists for unplanned trips.

1.1.3 From this example, it can be seen that:

- option values are associated with uncertainty about use of the transport facility
- option values may exist even if the option of using the transport service is never taken up;
- option values are related to the individual's attitude to uncertainty

1.1.4 Non-use values on the other hand differ from use values and option values in that a value may be placed on the continued existence of a good regardless of any possibility of future use by the individual in question.. The motivation for the desire for the good to continue to exist may, however, vary from one circumstance to another. For example, individuals may value a good for altruistic reasons, reasons of indirect use or because the good has some existence, bequest or intrinsic value. Examples of situations where non-use values may exist in a transport environment include:

- A resident in a village deriving benefit from the knowledge that the elderly can use public transport to access the facilities they need ;
- A householder living on a busy road experiencing less noise, and a car commuter experiencing less congestion as a consequence of other commuters using a rail service;
- Where the vitality of a community may depend on the transport link – for example where a substantial proportion of the economic activity in the community stems from either passing trade or from business associated with the provision of transport services.
- Where the cultural heritage value of transport infrastructure is large.

1.1.5 The literature also identifies a concept referred to as quasi option value, which represents the value of maintaining a facility until better knowledge is available as to its future demand. This may be particularly relevant to decisions as to whether to dispose of the trackbed of closed railways. Its estimation involves estimating the probability distribution of future demand and how this may change in future with better information; it may change in future with better information; it is not considered further in this note, although to the extent that such a benefit exists at the individual level, it may be indistinguishable from option values as defined here.

1.1.6 Clearly there may be other context specific circumstances in which non-use values may exist. Table 1 categorises these circumstances between users and non-users of the transport system and between option values and non-use values.

**Table 1 Motives for willingness-to-pay for the provision of transport services**

	Use value	Option value	Non-use value
User	Expected value of future actual use.	Value of preserving the option of using it in the future for trips not yet anticipated or currently undertaken by other modes over and above expected value of future use.	Use by other members of the household; Use by friends, family; Concern for other people in society in general; Concern for particular groups, poor, elderly, children; Concern for future generations; Reduced congestion; Reduced environmental problems; Cohesion effects, link to larger communities
Non-user	N/A	As user.	The same as above

1.1.7 In the context of a scheme appraisal the option value is always additional to user benefits and environmental and safety externalities. Non-use values on the other hand may double count some elements of benefit already included in an appraisal. Primarily it is only non-use values that arise from altruistic motives that do not result in double counting. For example, non-use values of a new rail line stemming from road noise reduction are already included in the appraisal as a noise benefit. In contrast a non-use value that a resident may hold because the elderly can access facilities is additional.

1.1.8 It is important to note that two substantial contributors to non-use values represent a double counting of benefits. The first is that associated with land values and the second is that associated with the profitability of businesses. Changes in land values generally represent a capitalisation of the benefits already in the appraisal so their inclusion would be double counting. If business profitability is expected to be materially affected by the new transport infrastructure this should be included in the appraisal under the wider economic impact sub-objective.

## 1.2 Approach to be Taken

1.2.1 Appraisal of option and non-use values should be undertaken for all types of transport scheme that involve the introduction of a new transport mode or the loss of an existing mode. Appraisal of option and non-use values should also occur when a step-change in the level of service offered within a mode occurs – for example when new commuting opportunities become available or are lost. Such an

appraisal should include an assessment regarding which transport service or group of transport services within a particular strategy will give rise to the option and non-use value, the nature of the change in service and the sign of the change. Additionally, the number of households affected by the change should be identified.

1.2.2 The field of valuing transport option and non-use values is far from developed, and there is therefore uncertainty as to the values that can be ascribed to them. To date all applications of the option and non-use value concepts in the transport field are related to the removal of local bus or rail services on households. Given this limited evidence monetisation should be restricted to the opening or closure of local rail stations and the introduction or loss of good quality local bus services (see Section 1.4 for more details). Furthermore when monetisation occurs the NPV and other summary economic indicators of the scheme should be reported excluding option and non-use values as the central estimate of the economic impact of the project. The present value of the change in option and non-use values should be used to examine whether or not the ranking of the options under consideration is affected by their inclusion.

1.2.3 The following sections set out the detail of the methods that should be employed for the inclusion of option and non-use values in an appraisal.

### **1.3 Methodology for Plans and Strategies – Calculation of Scale of Impact**

1.3.1 For all schemes for which option and non-use values are relevant it is necessary to calculate the number of households that will be affected by the proposals and to qualitatively score that impact. Whilst much of the discussion below focuses on rail proposals the underlying principles are applicable to all modes of transport to which it is considered option and non-use values might be applicable.

1.3.2 The inclusion of option and non-use values in appraisal is clearly very sensitive to the size of the population affected by the proposals. At this moment in time there is no evidence on how values vary with distance from access/egress points to the infrastructure/service (stations, bus stops, etc.). It does however seem reasonable to expect the population who hold an option and non-use value for a transport service to have a similar geographic spread to those who hold use values for the same service. Thus in the absence of further research catchment areas are considered to give a reasonable approximation to the size of population affected.

1.3.3 The *Passenger Demand Forecasting Handbook (PDFH)* (ATOC) offers the following indicative guidance on rail station catchment areas:

- That a catchment of 2km is appropriate for minor stations;

- That a larger catchment should be used for 'free-standing' towns; and
- That for 'reasonably main stations' in the South East, a catchment of 5km is appropriate.

1.3.4 Within this indicative guidance it is of course worth acknowledging that station catchment will often differ from one scheme or location to another as a consequence of more specific factors, including frequency of trains, location (rural, suburban, urban), type of railway (mainline, branch line), and accessibility of the station. Ideally an appraisal should be based on detailed local knowledge of the likely catchment area and the size of the population within it.

1.3.5 We should also note that if two or more stations are in close proximity, then their respective catchments might overlap. For residents falling within this overlap, the option value should be regarded as present as long as at least one of the stations is available; only the closure of both would result in its loss. The population affected by the opening and closure of a line can be calculated by summing the population affected of each of the stations along the line.

1.3.6 Furthermore for branch lines/services providing access to large conurbations values are only ascribed to those living in the catchment of the line outside the conurbation (e.g. near local stations). The rationale for this is that the provision of an additional service or loss of a service to those living in the conurbation will not materially affect their access to employment and services – this is particularly true for those living near a city centre and within the catchment of a mainline station which may also act as the terminus of a branch line/service.

1.3.7 The previous discussion has focussed on the segment of the population who live in close proximity to the proposed transport infrastructure or service. In addition to those households it seems quite conceivable that individuals may also place an option value and non-use value for stations and services that are far from their place of residence. Such stations would act as potential destinations. There is however no evidence on what the size of this value is, however, we expect it to be small - unless the destination is a major employment or service centre or the route is of particular tourist or enthusiast value (e.g. the West Highland Line or the Settle-Carlisle line).. This is because in the main we expect option and non-use values to be significant where the person may reasonably be placed in a position where they might be heavily dependent on the service in question.

1.3.8 There is also a practical difficulty associated with giving option and non-use values to stations as destinations as one would need to identify the proportion of the population that would consider the station as a destination. In order to make the analysis manageable - at least at the present time – it is recommended to restrict the

measurement of option and non-use values to stations proximate to individuals' place of residence, and to consider more distant stations only in particular demonstrable circumstances. For example, stations that carry a relatively small resident origin population, but serve as important points of destination for commuting or leisure activities. This should perhaps be supported by a bespoke survey in order to elicit measurement of the associated option and non-use values and size of population that would consider the station as a destination.

- 1.3.9 Once the number of households considered to hold an option and non-use value to the proposals under consideration have been identified a qualitative score should be assigned. Box 1 sets out the scoring procedure that should be used.

<b>Box 1</b>		
<b>Qualitative procedure for assessing option and non-use values</b>		
Qualitative scores should relate to the size of the resident community given options to travel by the strategy, according to the following scale:		
Size of Community		
(in opening/closure year)	Service Withdrawn	Service Added
>1000 households	Large adverse	Large beneficial
250-999 households	Moderate adverse	Moderate beneficial
1-249 households	Slight adverse	Slight beneficial
0 households	Neutral	Neutral
Where more than one community is affected the total number of resident individuals should be added together (with a negative sign attached to communities losing their service).		
'Ghost' services not providing reasonable opportunities for return travel on all days of the week should not be treated as services for these purposes. Withdrawal of rail services replaced by bus should be counted as a withdrawal of service, given the lower level of accessibility offered to significant groups of users, unless the bus service is demonstrably of comparable quality to rail.		

- 1.3.10 The impact of changes to public transport on businesses (e.g. bringing visitors to an area or transporting freight to/from an area) will need to be assessed under the wider economic impacts sub-objective within an appraisal (see TAG unit 3.5.8).

## **1.4 Methodology for Plans and Strategies – Valuation of Option and Non-Use Values**

- 1.4.1 Due to the limited evidence base (as discussed below) monetary values should only be included in an appraisal for schemes that consider changes in local bus and rail services linking suburbs/outlying towns to a major employment and service centre. Furthermore, the exploratory nature of the available option and non-use value evidence means that, as yet, such values are only included in an appraisal as a secondary analysis.

- 1.4.2 To date only six exploratory studies have attempted to measure the value of option and non-use values with the results from five of them publicly available. Additionally only two of the empirical studies have attempted to separate option values from consumer surplus and non-use benefit categories. All applications of the option value and non-use value concepts in the transport field are related to the removal of bus or rail services. To date, studies are lacking on other transport modes or facilities, freight transport, values that firms may place on transport infrastructure or services and values for new infrastructure. Also, existing studies have not included potential users from other parts of the country. Although residents in outlying areas outside the service area of the rail links are generally unlikely to use the train under any circumstances, a small proportion (possibly with an option value) may be possible future visitors to the case study areas or have other non use values.
- 1.4.3 Whilst the studies are exploratory and some have small samples it is considered that the ranking of the absolute size of the sum of the option value and non-use values, between the studies, can be qualitatively rationalised through a consideration of the definitions of users and non-users, a consideration of mode, quality of service and whether the values represent individual or household valuations.
- 1.4.4 In terms of recommending appropriate values for use in appraisal the evidence base is too small and the studies too exploratory to be able to give recommendations for values that vary by type of train service, bus service, community or proportion of users and non-users in the community. Instead a figure derived from Humphreys' and Fowkes' (2006) research for train services and a figure derived from Bristow et al.'s (1991) research for bus services is recommended (see Table 2). These figures represent an aggregation of both option and non-use values and are an average of users' and non-users' values. It should be noted that these values relate to small communities and local bus and rail services. They do not relate to communities adjacent to mainline stations or stations that serve a pre-dominantly long distance market. Additionally, these values represent household values for personal travel only and do not reflect the values that businesses may hold.
- 1.4.5 Clearly services of a different quality to those surveyed by Humphreys and Fowkes and Bristow et al. may have different option and non-use values to those recommended above. In particular we would expect that low frequency services which have departure times that make commuting impossible might be expected to have radically lower values, as might services which do not serve major employment centres. However, the evidence base on how such values will vary is too small to make any recommendations regarding variations in service quality. The recommended values are therefore relatively broadbrush. Additionally, the recommended values relate to scenarios where there is no public transport alternative to the bus

or train. Thus where a rail service is replaced by a bus, it is the difference in option values of the two services that is relevant.

- 1.4.6 Whilst the values presented above have been adjusted using data from Humphreys and Fowkes research to prevent double counting with other benefits in a transport appraisal, it is still possible that the non-use value element may still include some elements of benefit that are double counted. There is uncertainty regarding the split between option and non-use value with Humphreys and Fowkes suggesting a low value and Geurs (2006) suggesting a much higher value. However, on the basis that the non-use component of the aggregate value may comprise 40% and this component may reflect substantial elements of double counting, we therefore recommend sensitivity testing the appraisal to values set at 60% of those recommended above (see Table 2).

**Table 2 Option and non-use values (2002 prices and values)**

Mode / Package	Value per household per annum		
	Option value and non-use value	Sensitivity tests	
		Excluding non-use value	Value of mixed mode package
Train	£170	£102	---
Bus	£90	£54	---
Train and bus	£170	£102	£260

- 1.4.7 The values set out above reflect the absolute level of option value and non-use value of a particular mode and level of service. Transport appraisal on the other hand is concerned with incremental changes in service provision. Therefore it is the difference between the option and non-use values before and after the transport policy has been implemented that is important to an appraisal. Thus if a station along a high quality train service route, with an OV and NUV of £170 per household, was closed and replaced with a high quality bus service (4 services an hour and an acceptable travel time) with an option value of £90, the loss in welfare per household would be £80 per household per annum (2002 prices).

#### *Assigning Monetary Values*

- 1.4.8 As set out above monetary values should only be included in an appraisal for schemes that consider changes in local bus and rail services linking suburbs/outlying towns to a major employment and service centre. Additionally, and importantly, only one value for bus services and one value for rail services are available from the evidence base (Table 2). Both values stem from studies of services that provide good access from suburbs/outlying towns into a major employment and service centre. In fact we would expect that low

frequency services which have departure times that make commuting impossible might be expected to have much lower values, as might services which do not serve major employment centres. Some pragmatic assumptions are therefore necessary when trying to assign monetary values to different combinations of services. The broad principles set out below should therefore be adopted when assigning monetary values.

- Monetary values are assigned to households in the Do Minimum and the Do Something for each of the years in the appraisal. The values need to reflect the level of service provision in each of those scenarios.
- If the service/infrastructure facilitates commuting then an option and non-use value can be ascribed to households within the catchment of that service. Otherwise an option and non-use value of zero is assumed. Whilst services that allow return trips for non-commuting purposes (e.g. shopping or access to healthcare) may hold an option and non-use value there is no evidence as to what this value is and as we would expect it to be substantially lower than the values set out in Table 2 such values should not be attributed to such services. As such a qualitative appraisal as set out in Box 1 is recommended for services that do not facilitate commuting but provide access to other services.
- The same value is ascribed to services that offer different levels of service – providing that they both offer commuting opportunities. That is an hourly service has the same value as a half hourly service. Related to this the same value is ascribed to a 'package' of different train services or a package of different bus services as would be ascribed to single good quality service. Ultimately both the single service and the package of services provide accessibility to employment and service centres.
- For similar reasons the same value is ascribed to a package of train and bus services as is ascribed to the train service in isolation. The limited evidence on the value of packages of bus and train measures suggests that the presence of the bus service does not influence the value of the package significantly (if a train service is also part of the package). This assumption should however be sensitivity tested.

1.4.9 Clearly the above principles need to be interpreted on a case by case basis and departures may be necessary. It is therefore important for transparency and clarity that all assumptions in assigning monetary values should be set out.

### *Sensitivity Tests*

1.4.10 Using the sensitivity test values set out in Table 2 the sensitivity of the results should be examined to:

- Reflect potential double counting in the non-use value with other aspects of benefit already included in a transport appraisal; and
- Reflect the uncertainty associated with the value of a 'package' of public transport measures.

1.4.11 Switching value analysis to determine the scale of the option and non-use value needed to alter the ranking of options should also be undertaken.

### *Changes During The Appraisal Period*

1.4.12 An important component in an appraisal is the treatment of the impacts of the transport proposals and the values attached to those impacts over time. The key influences for option and non-use values are changes in the number of households and changes in the values per household over time.

1.4.13 Forecasts of changes in the number of households should be consistent with those used in other parts of the appraisal, notably the modelling. They can be gleaned from local authorities' Unitary Development Plans, which include projections of additional domestic units by locality, or at a more strategic level from TEMPRO – the Department for Transport's trip end projection model that includes forecasts of population and households up until 2036. Where there are plans for significant infrastructure, appraisal of option and non-use values should be subject to rigorous forecasting and sensitivity analysis.

1.4.14 Values for option and non-use values are assumed to grow in line with real GDP per household<sup>1</sup>. This in turn is affected by real GDP/capita growth and changes in household occupancy. The final column of Table 3 gives the annual growth which should be applied<sup>2</sup>. In the longer term, from 2032 onwards, the forecast growth in real GDP is adjusted downward in proportion to the reduction in the discount rate, following Treasury advice. This is reflected in the value growth adjustment column<sup>3</sup>. This advice is the same as the advice concerning the treatment of other impacts that are valued at the household level over time – namely noise (see WebTAG 3.3.2).

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<sup>1</sup> Note that this is similar although not identical to the practice for values of working time savings (TAG Unit 3.5.6), since option values are expressed per household, whilst values of time are expressed per person.

<sup>2</sup> Note that these growth factors are shown to 4 decimal places to indicate that, given the data in the previous three columns, they can be calculated to more than two decimal places. The number of decimal places used in these factors may affect the PVB result.

<sup>3</sup> see HM Treasury (2003), p25, footnote 8.

1.4.15 Where information for each of the 60 years of the appraisal period is not available, option and non-use values should be estimated for a number of modelled years and interpolation and extrapolation techniques used to extend estimates of the change in the number of households affected by the transport service proposals. Cost Benefit Analysis (TAG Unit 3.5.4) describes the factors that should be considered when interpolating between modelled years and extrapolating beyond the last modelled year. It is important that the assumptions used to extrapolate and interpolate the number of households affected are consistent with those used for other economic benefits (e.g. changes in user benefits or noise).

**Table 3 Growth in values over time**

Range of years	Real GDP/capita growth, % per annum	Household growth, % per annum	Value growth 'adjustment factor'	Growth in values %per annum
2002-2003	2.25	0.75	1.0000	1.4888
2003-2004	2.50	0.75	1.0000	1.7370
2004-2005	3.50	0.75	1.0000	2.7295
2005-2006	3.25	0.75	1.0000	2.4814
2006-2007	2.75	0.76	1.0000	1.9750
2007-2011	2.50	0.76	1.0000	1.7269
2011-2021	2.25	0.67	1.0000	1.5695
2021-2031	1.75	0.33	1.0000	1.4153
2031-2032	2.00	0.17	1.0000	1.8269
2032-2036	2.00	0.17	0.8571	1.5417
2036-2051	2.00	0.00	0.8571	1.7143
2051-2061	1.75	0.00	0.8571	1.5000
2061 onwards	2.00	0.00	0.8571	1.7143

## 1.5 Assessment and Reporting Requirements

1.5.1 The following describes the information that should be recorded and presented in the Appraisal Summary Table (AST).

### *Overall Assessment Score*

1.5.2 The entry in the Overall Assessment column of the AST should give the net present value of the total change in option and non-use values between the 'with scheme' and 'without scheme' scenarios if monetary values have been calculated. For consistency with other sub-objectives, this monetary total should be expressed as a present value, discounted over the whole appraisal period. If scheme

rankings are sensitive to the inclusion of option and non-use values a note to this effect should also be included.

- 1.5.3 If monetary values are not used the column should contain the qualitative 7 point score (strong adverse to neutral to strong beneficial) as set out in Box 1.

#### *Quantitative Measure*

- 1.5.4 The Quantitative column should be used to indicate the number of households affected and the nature of the analysis used to determine the number of households affected.

#### *Qualitative Comment*

- 1.5.5 This part of the AST should be used to identify which group of transport services within a particular strategy (or option) are the source of any additional (or reduced) option and non-use value, the nature of the change in service and the sign of the change (i.e. option and non-use value gained or lost). Some indication of the alternatives available to households in the absence of the scheme under consideration should be given.

#### *Analysis of Monetised Costs and Benefits (AMCB) Table*

- 1.5.6 The NPV and other summary economic indicators of the scheme reported in the Analysis of Monetised Costs and Benefits (AMCB) table (see *Transport Appraisal and the New Green Book*, TAG Unit 2.7.1, and *Guidance on Rail Appraisal*, TAG Unit 3.13.1) should exclude option and non-use values as the central estimate of the economic impact of the project. However, a secondary analysis using option and non-use values should be undertaken to examine whether or not the ranking of the options under consideration is affected by their inclusion.

## **2 Application of TAG to Highway Schemes**

- 2.1.1 Highway schemes should also be assessed against this sub-objective using the advice given above. Notwithstanding that there is no quantitative evidence on option and non-use values for highway schemes it is expected that a significant step change in the quality of service offered by the road is required for the option and non-use value of the new road to be significantly different from that of the old road. Such a step-change might be associated for example with the creation of opportunities for commuting over routes where it was previously impractical.

### 3 Further Information

The following documents provide information that follows on directly from the key topics covered in this Unit.

For information on:	See:	TAG Unit number:
Interpolation and Extrapolation	Cost Benefit Analysis	<a href="#">3.5.4</a>
Assessing impacts on business and community vitality	Wider economic impacts	<a href="#">3.5.8</a>

### 4 References

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## **5 Document Provenance**

This Transport Analysis Guidance (TAG) Unit is based on Chapter 7 Section 2 of Guidance on the Methodology for Multi-Modal Studies Volume 2 (DETR, 2000) and the June 2003 TAG Unit. The guidance was updated in January 2007 to include advice on the inclusion of non-use values in addition to option values and more detailed advice on the calculation of monetary valuation for changes in option and non-use values.

Technical queries and comments on this Unit should be referred to:

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