

STAG Technical Database

Section 12

Cost to Government

April 2009

Transport Scotland

## Version History

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## 12. Cost to Government

At the Part 2 Appraisal, it is essential to assess the net cost of an option from a public spending perspective. This cost can then be compared with the total benefits of the option in terms of the STAG Criteria. This allows an overall value for money assessment to be made.

### 12.1 Introduction

This section provides guidance on how to assess the net cost of an option from the public sector's perspective. This cost can then be compared with the total benefits of the option in terms of the Environment, Safety, Economy, Integration, and Accessibility and Social Inclusion in order to assess overall value for money. It is important that practitioners adhere to the guidance given in this section and in section 13 for Risk and Uncertainty. This will ensure that costs are presented robustly and consistently across Scotland.

Cost to Government refers to all costs incurred by the public sector as a whole, net of any revenues. The total net cost consists of investment costs, operating and maintenance costs, grant/subsidy payments, revenues, and taxation impacts. All investment costs presented should be adjusted for Optimism Bias.

Costs and revenues to private sector operators should be separately identified. If there is any ambiguity about whether a cost should be allocated to the public or the private sector (e.g. in the case of public-private partnerships), advice should be sought from the Scottish Government and/or its agency Transport Scotland.

Investment and maintenance costs are most likely to be relevant in the case of road-related options, e.g. new roads and bus lanes. Costs and benefits incurred by the private sector should be covered under "Economy" rather than Cost to Government.

However, in many cases the revenues of private sector public transport operators are unlikely to cover the investment and operating costs of an option. As a result, some form of grant or subsidy may be required, and any such payments represent a cost to the Government.

Revenues are most likely to be relevant in the context of road user charging and parking strategies.

Some options, particularly those aimed at promoting modal shift, could have a significant impact on indirect tax receipts. These impacts represent costs to the Government and, where appropriate, the appraisal should assess the expected change in indirect tax revenue attributable to changes in the transport sector.

All costs and benefits should be adjusted for Optimism Bias and Risk (see Section 13). In the AST, all impacts should be expressed both in terms of Present Values and in terms of annual costs at current prices – see Section 9 for more details. As the unit of account for the AST is market prices, it may be necessary to adjust costs to reflect indirect taxes.

## 12.2 Investment Costs

Investment costs (often referred to as capital costs) should be distinguished clearly from operating costs.

These should include all infrastructure and other capital costs incurred by public sector operators which are additional to those incurred in the do-minimum scenario. Given that most public transport services are provided by the private sector, this category of public sector cost will usually only be relevant in the case of new or improved roads and car parks. Grants to private sector operators are separately identified – see section 12.4.

In addition to construction costs, fees, design, land acquisition and other preliminary works should be included. Land and property costs should also include the implicit costs of any resource that is acquired without financial payment such as 'land gift', including that from the local authority. Table 12.1 lists the components of investment costs. Costs should be entered into the AST as negative amounts.

**Table 12.1: Examples of Investment Costs Components**

Base Investment Costs	Roads	Railways	Public Transport
Construction Costs	<p>i) Main works contract (including preliminaries, structures, road works general, earthworks, main carriageway, interchanges, side roads, signs, etc.).</p> <p>ii) Ancillary work contracts (including provision of maintenance compounds, lighting, motorway communications, landscaping, noise insulation, etc.).</p> <p>iii) Work by other authorities (including Network Rail, local authorities' works, statutory undertakers' works).</p> <p>iv) On site Supervision and Testing.</p>	Stations, Route Infrastructure Enabling and Advance Works, Communications, Rolling Stock, Track, Power and Signalling or Passenger facilities. Possession costs for train operators.	For Buses: Providing or upgrading vehicle fleet, New System of Ticketing and Passenger Information, New Stops and shelters, Bus Priority Measures on the highway and passenger information.
Land and Property Costs	Acquisition cost, Legal transaction costs, Property management costs, Compensation etc.		
Preparation and Administration Costs	Project Management, Consulting engineers' fees, agent authorities' fees, actual costs of pursuing alternative routes (if any) in the early stages of the scheme, Design costs, Public Consultation, Public Inquiry, gaining statutory powers or other licences and consents, compensation, the cost of any surveys carried out during scheme preparation, the costs associated with obtaining statutory orders, and on site Supervision and Testing.	Generally as for roads. e.g. the costs associated with obtaining statutory orders.	Generally as for roads. e.g. the costs associated with obtaining statutory orders.
Traffic Related Maintenance Costs	Reconstruction, resurfacing, surface dressing etc.	-	-

**Source WebTAG 3.5.9**

As the costs considered for a scheme should be those which will be incurred subsequent to economic appraisal and the decision to go ahead, "sunk" costs, which represent expenditure which is incurred prior to the scheme appraisal *and* which cannot be retrieved, should not be included.

Further information on sunk costs and the treatment of land and property costs can be found in Annex A of WebTAG Unit 3.5.9.

### 12.3 Operating & Maintenance Costs

Operating and maintenance costs should include the annually recurring costs incurred by the public sector in running and maintaining the option considered. Again, this is most likely to be a significant issue in the case of roads projects rather than public transport projects. Where new road capacity is provided, provision must be made for the additional maintenance costs of the infrastructure in comparison to the do-minimum scenario.

Public sector operating costs will not always be confined to roads options, however. For example, road user charging can involve significant operating and collection costs. Also, where options (e.g. new parking policies, road user charging, and bus lanes) include significant changes in the level of enforcement, these should be taken into account.

In the SPT area and, to a lesser extent, other areas, the public sector may also be directly responsible for providing passenger information and other services and facilities, e.g. car parks. In such cases, additional costs will fall under public sector operating costs. However, these costs may be excluded from the appraisal if changes in costs are likely to be insignificant.

As for investment costs, operating costs should be recorded in the AST as negative amounts.

#### 12.3.1 Operating Costs

The appraisal should include realistic and comprehensive operating and non-traffic related maintenance cost estimates, identifying the main components. Operating cost and renewals estimates should include an assessment of real growth over time.

Operating costs may be incurred by private or public sector providers and are recorded in different places in the standard Departmental tables, i.e. TEE and PA tables. Examples of operating costs are provided in Table 12.2.

**Table 12.2: Examples of Operating Costs Components**

Element of Base Costs	Roads	Railways	Public Transport
<b>Operating Costs</b>	Non traffic related maintenance costs (e.g. drainage, street lighting, fencing, grass cutting, repainting lines etc.).	Train and station operating costs (e.g. payroll, fuel and traction and track access and station lease charges). Train leasing charges- which normally includes light and heavy maintenance of rolling stock.	Buses: i) Enforcement of bus lane ii) Maintenance of stops; iii) Fuel; iv) Payroll.

Staff costs should include allowances for holidays, sickness, shift working, training and overtime. Note that wage rates may increase faster than GDP growth. Additional costs may include management costs for park and ride sites and rates for premises used as depots. Where possible, operating costs from similar existing systems should be used as a reference before adjustments are made for real cost changes.

Bus-based schemes may include operating costs falling to the highway authority owing to use of the road network, (e.g. maintenance of bus lane) although in general any effects would be expected to be marginal. Bus-based schemes may also include enforcement costs and maintenance of stops.

For public transport schemes it is expected that a whole life cost appraisal is used to establish the total cost of ownership, i.e. the total cost of delivering, operating and maintaining a project. Schemes where the project life can be determined from the limited life of its component assets, i.e. has a finite life, will have a planned or contracted life. The total cost of ownership will depend on the quality required over the life of the scheme, for example, constant or increasing patronage, service frequency, and so on, and the trade-off between maintenance and renewal. Residual values can be estimated for projects with finite lives and should be included in the appraisal of projects. Residual values should not however, be included in the appraisal of projects with indefinite lives where the appraisal period should end 60 years after the scheme opening year.

Investment in new transport infrastructure may provide savings in replacing existing infrastructure. These avoided renewals can be treated as a maintenance cost saving in the 'with scheme' case. This is the approach recommended by Transport Scotland and used within TUBA, NESA and COBA.

### 12.3.2 Forecasting Operating Costs

Operating and maintenance costs must be forecast for the whole of the appraisal period. In forecasting future operating, maintenance and renewal costs, analysts should consider:

- The impact of increasing usage or patronage; and
- The potential for cost increases in excess of general cost inflation.

In order to gauge the profile of operating costs over time and allow the cumulative effects of the scheme to be assessed, it is recommended that estimates should be prepared for three separate forecast years (although this may vary with project type). Analysts will need to use their judgement to choose the number and timing of years to be considered. Interpolation and extrapolation should then be used to cover the whole appraisal period.

The appraisal period is the period up to 60 years after the scheme opening year. Section 9.5.1 provides further information on the appraisal period. The extension in the appraisal period from 30 years to 60 years requires streams of costs and benefits to be estimated over a longer period than has been the case in the past. In most cases, this can only be achieved by extrapolation and assumption. More detailed analysis for later periods is unlikely to be feasible or worthwhile. However, analysts should take care to ensure that their work is as robust as possible, and based on whatever evidence is available. All assumptions and supporting evidence should be fully documented.

For projects with long lives, the extension of the appraisal period from 30 to 60 years after opening may bring additional elements of major structural maintenance and/or renewal within the appraisal period. For example, road pavements and drainage may require renewal, as may rail track and rolling stock. Wherever possible, the timing, cost and duration of these major elements of cost should be estimated explicitly. Where this is not possible, these costs may be included in annual maintenance rates, though care must be taken to avoid underestimation.

For roads, useful information has been developed by the Highways Agency as part of its work on whole life costing methods. Typical maintenance profiles, cost, and durations for new roads are given in the QUADRO Manual (DfT, 2004). This information for new roads is provided for a 60 year period. For other modes, maintenance profiles, costs and durations should be forecast as discussed above and disaggregated to show the main determinants of cost.

The need for periodic major maintenance and renewal means that the maintenance costs profile over time is likely to be 'spiky' whereas the operating costs profile is more likely to be fairly constant over time.

## 12.4 Grant and Subsidy Payments

Should private sector operators revenues not cover the investment and operating costs, some form of grant or subsidy may be required for the delivery of an option by private sector operators. Any such grant or subsidy represents a cost to the Government.

At the appraisal stage, funding agencies are unlikely to be able to give commitments or to be precise about the amounts of support likely to be available. However, the deficit arising from private sector provision without the benefit of grant or subsidy will be indicative of the level of support likely to be required to deliver the option (although the private sector is likely to require an additional profit margin/return on capital). However, consideration should also be given to whether the level of grant or subsidy would be likely to meet the relevant decision criteria published by funding agencies.

In some cases, there may be a need to disaggregate the market into different operators in order to assess overall subsidy requirements. For example, a rail enhancement may lead to a loss of bus revenue but there will generally be no requirement to compensate the bus operator (though this should still be recorded as a disbenefit to bus operators).

Grant and subsidy payments are transfer payments, and hence the assumed level of subsidy provision should not affect the overall net present value (NPV) of an option – it simply affects the distribution of costs and benefits between different parties. The figure recorded under Cost to Government should be equal, but of opposite sign to, the figure recorded in the Grant/Subsidy section of Private Sector Operator Impacts in the Transport Economic Efficiency section of the appraisal.

However, the level of required subsidy will affect the Benefit:Cost to Government ratio. As the option progresses, it should be possible to refine assumptions about the required level of subsidy (e.g. based on actual tenders for providing the required service).

In some cases, it may be possible to identify potential developer contributions. In effect, these are 'negative grants'. These contributions also represent transfer payments and should be recorded both as a benefit to the public sector and a cost to the private sector (see Section 9).

### 12.5 Revenues

Public sector revenues are most likely to be relevant in the case of road user charging and where an option would impact on parking revenues. Revenues are related to user charges, as user charges represent monetary transfers from users to the Government, although in many cases the revenues are subsequently re-reinvested in the transport system.

## 12.6 Indirect Tax Revenue

Options which substantially promote public transport can lead to reductions in HM Revenue and Customs' indirect tax receipts by shifting expenditure from cars and car fuel, which are heavily taxed, to public transport services on which the indirect tax rate is relatively low. Similarly, a saving in fuel costs for drivers (e.g. due to a road improvement) will lead to loss of tax revenue to the Government.

These impacts represent costs to the Government, and it may therefore be necessary to assess the expected change in indirect tax revenue to the Government due to changes in the transport sector.

There is an obvious issue, within Scotland, that indirect tax revenues accrue to HM Treasury but that transport is a devolved power and subject to the Scottish Budget. For reasons of consistency with HM Treasury Green Book, this issue is not tackled directly in this section but in Section 12.7 which deals with the presentation of results.

## 12.7 Headline indicators in STAG

A Scottish Transport Appraisal Guidance (STAG) Appraisal consists of 5 components – Economy, Environment, Safety, Integration and Accessibility and Social Inclusion. The reporting of these criteria is a mix of quantitative and qualitative information.

The Economy component comprises a Transport Economic Efficiency analysis (TEE) , which captures the benefit, measured in terms of Economic Welfare, to the economy as a whole, of a project and an Economic Activity and Location Impact study (EALI) which, broadly speaking, measures the distributional effect of the project, in terms of employment and income.

The TEE results are reported in terms of a Net Private Benefit (NPB) figure, which is the discounted sum of the benefits and costs to the private sector, which is used in conjunction with the net cost of the project to the public sector (PSC) and monetised safety and environmental benefits, to calculate a Net Present Value. On the other hand the EALI results, whilst containing quantitative aspects, are not generally summarised in terms of a single number.

To clarify, the Net Present Value of a project (NPV) is the discounted sum of all future benefits less the discounted sum of all future costs over the appraisal period. In a world with no constraint on investment funds, there would be a strong case for taking forward all projects with a positive NPV.

Suppose that a policy maker is faced with two projects both of which have a NPV of £50m. The difference is that one project (Project A) costs £10m and the other (Project B) costs £100m. It is fairly obvious that, all other things being equal, Project A is a “better” project. The BCR is a way of presenting this intuitive concept in a formal manner.

The Benefit/Cost Ratio (BCR), as arising from the Transport Economic Efficiency (TEE), monetised safety and environmental benefits, and Public Sector Cost (PSC) components of a STAG Appraisal, is currently defined as:

$$BCR = \frac{NPV + \textit{Present Value of Costs}}{\textit{Present Value of Costs}}$$

where the Present Value of Costs (PVC) is the Public Sector Costs measured 60 years and then discounted. The BCR, as defined here, is an estimate of the value of the benefit for every £1 of public expenditure on a project/scheme and is therefore a strong indication of the value for money of different options within a scheme. Thus, a BCR greater than 1 represents “value for money” to the public sector. In terms of the example above, project A has a BCR of  $(50+10)/10 = 6$  and project B has a BCR of  $(50+100)/100 = 1.5$ . Project A is “better” value for money, in pure economic terms.

It is important to reiterate that as currently calculated and as presented above, the BCR represents the benefit of every £1 of net public expenditure on a project. The BCR as calculated in this manner could be termed the BCR<sub>G</sub>. This is in contrast to the BCR figure calculated under previous (pre-2003) guidance that was given by the ratio of the future sum of all the future costs and benefits except investment costs to the discounted sum of investment costs and represented the benefit to society of (society as a whole) spending £1 on a project.

The cause of this change is, primarily, the shift to Willingness To Pay calculus introduced in NATA and the resultant distinction of net costs to government. The basic principle of the willingness to pay (WTP) approach, introduced following the Sugden report of 1999,

is to arrive at a money measure of the net welfare change for each individual that is affected by the project under consideration and to add these changes up.

As an example, suppose the government pays a subsidy to a rail operator and this subsidy increases under an option being appraised. This increased subsidy is a benefit to the operator within this option but an increased cost to the Government. By counting the subsidy as both a benefit and a cost, the impact, in the CBA, of the change in the level of the subsidy is neutral overall. Quite correctly, it does not alter the NPV of the project as it is simply a transfer of money from one part of the economy to another.

The former system used a calculus of social costs and benefits. The principle of this system is to seek to measure the value of the resources used by and benefits created from a project. Transfer payments, such as the subsidy above, are excluded at the outset.

The two approaches, in theory, give exactly the same result in terms of NPV but the WTP approach has the advantage that it provides more information, as the outcomes of a project are disaggregated into impacts on different economic groups. The difference between the two methods, per se, is simply a matter of presentation.

However, this change in presentation has had an impact in that it was the main force behind the switch to using the BCR to government measure rather than BCR to society that was used previously. It is worth noting that these two measures are distinct from each other and that there is no clear relationship between the two.

The BCR should also take account, in principle, of the distortionary impacts of general taxation on the economy. This principle, known as the Social Opportunity Cost of Exchequer Funds or SOCEF, or more generally as the Marginal Social Cost of Public Funds (MSCPF), might imply a 30% uplift to expenditure costs. Applying the SOCEF criteria would mean that any projects or expenditure with a BCR of less than 1.3 would not be value for money. The current Green Book does not however require the SOCEF to be applied, so any expenditure with a BCR over 1 might be considered as worthwhile pursuing.

Additionally, the calculation of Wider Economic Benefits (WEBs) may be included as a sensitivity. An additional NPV and BCR figure (NPV web and BCR web) may be reported.

The BCR is however, only an indication. In the context of the STAG Appraisal, the Economic Activity and Local Impacts (EALI) measures and Wider Economic Benefit (WEB) measures, where appropriate, need to be considered within the Economy criteria, as well as the impacts of the project in terms of Safety, Integration, Accessibility and Social Inclusion and the Environment. At present these impacts are not monetised and must be considered separately. It should be noted that previously the Accidents sub-criterion was monetised and included in the TEE analysis in terms of reductions (or increases) in accidents; this is no longer the case.

Following the move towards monetisation of other impacts, the decision has been made to collate monetised impacts across criteria into a single figure, which will be the BCR. This represents a continuation of previous guidance which included monetised values for Safety as part of the BCR.

The BCR of an option summarises the overall impact of its monetised elements and compares them to the option costs. Individual Monetary Impact Ratios (MIRs) should be calculated for Economy, Safety and the Environment, and used to inform the BCR.

As well as being presented under the relevant criterion in the Part 2 ASTs, the monetary value of safety, environmental, and economic benefits should be used to calculate

Monetary Impact Ratios, and included in the Cost to Government AST, using the following formulae:

$$MIR_{ECON} = \frac{Net\ Private\ Benefits}{PV\ Costs}$$

$$MIR_S = \frac{PV\ Accident\ Benefits}{PV\ Costs}$$

$$MIR_{ENV} = \frac{PV\ Environment\ benefits}{PV\ Costs}$$

Where PV stands for present value and indicates that values have been discounted over a 60 year period, and PV Costs is the present value of the cost of the option overall, not just those costs associated with safety or environmental, or economic improvements. Further guidance on how to calculate present values is given in Section 9.5 – Appraisal Parameters.

Note that the environmental benefits should include all monetised benefits reported against the Environment Criterion, that is, benefits associated with Physical Fitness as well as monetised carbon benefits.

From the definition of the MIRs, it follows that the BCR can also be calculated as:

$$BCR = MIR_{ECON} + MIR_S + MIR_{ENV}$$

Practitioners may use either method to calculate the BCR in the AST. However, as described below, the BCR and the individual MIRs should be presented together in the Option Summary Tables.

Following the inclusion of WEBs (See 9.4), a secondary MIR,  $MIR_{WEB}$ , may be calculated that incorporates these impacts.

$$MIR_{WEB} = \frac{Net\ Private\ Benefits + WEB}{PV\ Costs}$$

Where a  $MIR_{WEB}$  is reported, it is sensible to report the option's new BCR:

$$BCR_{WEB} = MIR_{WEB} + MIR_S + MIR_{ENV}$$

or 
$$BCR_{WEB} = \frac{NPV + WEB + PV\ Costs}{PV\ Costs}$$

A direct comparison of only the BCR of different projects is not a particularly useful exercise. A higher BCR, for example 5.75 as opposed to 4.59, does indicate that the 5.75 project is higher value for money to government in pure economic terms but does not take into account the other, non-economic objectives which may vary significantly between projects.

Additionally, WebTAG guidance explicitly states that the BCR to government is “of limited value when projects (road user charging for example), result in significant revenues accruing to public accounts”.

The Department for Transport (DfT) categorise a calculated BCR into one of four value for money (VfM) categories and allow non-monetised factors to shift an option between categories. This is primarily done for the purpose of reporting results to Ministers. It should be noted that this way of presenting information has been discussed in Scotland and the approach rejected.

The issue raised in Section 12.6 over the impact of indirect taxation may be mitigated by the definition of an additional measure – the Benefit Cost-Ratio to funding agency,  $BCR_{FA}$ . This measure is defined as:

$$BCR_{FA} = \frac{NPV + \text{Cost to Funding Agency}}{\text{Cost to Funding Agency}}$$

where the cost to funding agency is relatively self explanatory but in this particular case would be calculated as the cost to government excluding any indirect taxation raised. It should be noted that the use of this measure is still consistent with the Green Book.

**Table 12.3:**

	Calculation within table	Explanation
User benefits (TOTAL)	A	Comprises time savings, vehicle operating costs etc.
Capital costs Raw	B	
Optimism Bias	C	Level of applied optimism bias uplift
Capital costs (+OB/Con)	$D=B(1+C)$	
Operating costs		Private sector operating costs
New project	E	
Bus	F	
Revenues		Private sector revenues
Bus	G	
Rail	H	
OSP	I	
Grant/Subsidy	$J (=P+R)$	Any subsidy from local and/or central government
NET	$K=D+E+F+G+H+I+J$	Net private sector (non-user) impacts
Net Private Benefits (TEE)	$L=A+K$	
Monetised value of safety benefits	M	
Monetised value of environmental benefits	N	
Present Value of Benefits	$O=L+M+N$	
Costs to government		
Local Government		
Grant/Subsidy payments	P	
Revenues	Q	
Central Government		
Grant/Subsidy payments	R	
Indirect Tax	S	
Revenues	T	
PVC	$U=P+Q+R+S+T$	Total cost to government
NPV	$V=O+U$	Net present value
MIR (Economy)	$L/U$	Economic benefit to cost ratio
MIR (Safety)	$M/U$	Monetised safety benefits
MIR (Environment)	$N/U$	Monetised emissions benefits
BCR	$(V+U)/U$	Total monetised impact
Cost to Funding Agency	$W=U-S$	Cost to Funding Agency
BCR (Funding Agency)	$(V+W)/W$	Benefit cost ratio to funding agency
WEB	Y	Wider Economic Benefits (See 9.3.6)
MIR (WEB)	$(L+Y)/U$	Benefit cost ratio including wider economic benefits
BCR (WEB)	$(O+Y)/U$	Total monetised impact including wider economic benefits

Thus there are 8 headline indicators:

- NPV
- BCR
- $MIR_S$
- $MIR_{ENV}$
- $MIR_{ECON}$
- $MIR_{WEB}$
- $BCR_{WEB}$
- $BCR_{FA}$

All of these measures should be reported (where appropriate). However, the BCR and the NPV are considered to be the key indicators and are the only measures that should be reported in isolation.

To take account of the new indicators, which are quite numerous and therefore could result in a confusing presentation, a Option Summary Table (OST) should be produced for each of the options which completes the Part 2 Appraisal, and be presented in the main report as opposed to the appendices. This should briefly describe the option and use the Government seven point scale to rank the performance of the option against:

- The STAG criteria; and
- The Transport Planning Objectives,

A descriptive assessment of the scheme's contribution toward the Government's Strategic Objectives for Scotland should also be provided. However, due to the degree of overlap between the STAG criteria and the Strategic Objectives, the seven point scale should not be used, as this will lead to unnecessary duplication of information.

A suggested template for an OST is given in Section 16, the STAG Report.

### 12.8 Participation and Consultation

It will be useful to engage with stakeholders and specialists during the early stages of the transport planning process through to the STAG Part 2 Appraisal to accurately identify public sector costs. If practitioners are uncertain about whether specific costs are public or private, then advice should be sought from the Scottish Government and/or Transport Scotland.

### 12.9 Reporting

At this stage in the STAG Report, there must be a clear statement of the likely net cost of the option/s under consideration. This should include all costs incurred by the public sector as a whole, net of any revenues.

If possible, costs should be broken down further with potential funding partners and procurement routes identified. Although desirable, it is acknowledged that this may only be possible for options that are at an advanced stage of development.