Chapter 14

Transport appraisal

Contributed by Tom Rye

Learning Outcomes:

On reading this chapter, you will:

- Understand why we appraise
- Understand the main methods used in transport appraisal today
- Have an appreciation of how these methods vary across Europe
- Be able to critique some of the key assumptions on which appraisal is based.

INTRODUCTION

The topic of this chapter is appraisal – the way in which decisions on when and where to undertake public investment in transport are made. The chapter in some ways builds upon Chapter 2 and first explains the theory underlying appraisal by making direct links to the economic theory outlined elsewhere in the book, before comparing different types of appraisal. It then goes into some detail about the use and drawbacks of one of the most common appraisal techniques, social cost-benefit analysis, and illustrates these points by reference to a case study of one of the first uses of SCBA in UK transport appraisal, the Victoria tube line in London (Foster and Beesley, 1963). Finally, it briefly compares appraisal techniques used in the UK with those from other European countries.

WHAT IS TRANSPORT APPRAISAL AND WHY DO WE DO IT?

Transport involves the expenditure of resources on a combination of investment in capital items (e.g. stations, track, roads) and/or in operations (e.g. subsidy). As we saw at the very beginning of this book, society in general and private investors in particular have limited amounts of resources. Both therefore seek to maximise the return that they obtain from the investment of those resources. The best way to do this is to ensure that they choose to spend their resources on those projects that maximise their return. As we saw in Chapter 3 on the market for transport services, this is called maximising utility.

To briefly recap, utility is the usefulness or enjoyment that individuals get from expending a resource. For example, for many people who like to drink, then the first drink of the day is particularly useful or enjoyable. The next drink is perhaps a little more or a little less so; the next drink, probably less so again. At some point the enjoyment or usefulness that the person gets out of their next drink is worth less to them than the money that they are using to buy it; at this point, the rational person would stop drinking: it is the point at which they have maximised their utility from that particular resource. The basis of economic rationality is therefore that individuals will adjust the amount of money that they spend on different items such that they could not derive any more utility from that expenditure. An identical argument can also be applied to organisations, and indeed that public authorities should act in a similar manner to maximise the utility from the perspective of the whole of society.

Looking at the same issue in a more informal way, you can imagine that you yourself may go through a similar process when trying to decide on large purchases. Think about the following, for example:

- When considering whether to invest in (i.e. purchase) a new vehicle, what are the advantages and disadvantages of different models of car? This information is an appraisal which will guide your purchase decision.
- With a limited budget (and your own house or flat), you may not be able to immediately afford all the home improvements you would like. You may think about those which provide the maximum return on your investment. However, this can become quite complicated as you start to think about long-term versus short-term benefits, and things which add value to the house but also have benefits or costs which you cannot put a money value on.

Appraisal, therefore, is a way of predicting how much utility we as a society will derive from the expenditure of resources on one thing compared to another, by predicting the utility that will arise from each – how much utility would we get from spending £20 million on a new motorway compared to a new railway, for example? In theory we are aiming to expend our societal resources in such a way as to maximise our utility right across the whole society. Why this arises is because of externalities in transport markets, which is an issue first introduced in Chapter 6. It therefore falls upon public authorities to invest in transport facilities as they are the only body in a position to base decisions on maximising the benefit to society as a whole.

It is fundamental to realise that, inherent in appraisal, there is some kind of prediction or forecasting required. Because we have not built a project yet but are only considering whether or not it will be worthwhile, we have to try to forecast the future – sometimes quite far into the future. As we have seen in the previous chapter, this is a very uncertain process, yet one that is crucial to the results of the appraisal. In transport, two main techniques can be used to forecast the effects of future projects:

- Looking at the performance of similar, existing projects
- Using predictive models.

Both options have major drawbacks – principally, the uncertainty that surrounds their results. Predictive models can also be very costly to construct and so are only really justified for the appraisal of larger projects – over £1 million or so. In spite of these uncertainties, appraisal is even more problematic if we do not try to predict the future in some way, and so these methods are used. It is wise always to be circumspect about the results of future predictions, whatever the method used, and consequently circumspect about the results of appraisals; it is the case however that modelling can be a very useful tool to give an indication of which of two or more options performs better compared to the other(s).

It is also important to realise that, in transport investment in Britain, resources have traditionally come from government; government and society are virtually synonymous in this context. Increasingly, however, investment in transport projects involves the private sector as well. This can complicate matters, as utility is perceived differently by society and by private sector companies. The former are driven largely by a need to maximise profits: that is their utility. Society's utility is more widely defined; it may wish to maximise revenue, or environmental benefits, or the number of people who are employed, or increase road safety, or any combination of these and many other factors. This focus on factors other than profit may lead to difficulties when public and private sectors try to use the results of appraisals.

Appraisal therefore is a way of thinking about all the costs and benefits of different spending projects in a systematic manner so that, in theory at least, different projects can be compared and investments made in those which are going to provide the maximum possible return on the investment. This process is illustrated in Figure 14.1.

TRANSPORT APPRAISAL THEORY AND PRACTICE

The theory underlying appraisal has been outlined above – you can read more about it in any number of books on appraisal, including the Treasury Green Book (HM Treasury, 2007; available online at www.hm-treasury.gov.uk/d/green_book_complete.pdf). However, there are reasons that you have probably already started to realise why the theory of appraisal is slightly different from the reality. Firstly, the theory of maximising society's utility is one that would be very hard to put into practice since we do not have complete ('perfect') knowledge of all the benefits or costs that could accrue as a result of every single possible project. Secondly, in the public sector, at least, money to invest in projects is not allocated in a theoretically perfect manner. Rather than all projects – from a new hospital to a new jet fighter – being compared together, money tends to be controlled by different government departments. Appraisal is carried out within departments, but much less between them (although in the UK large projects are reviewed at a governmental level

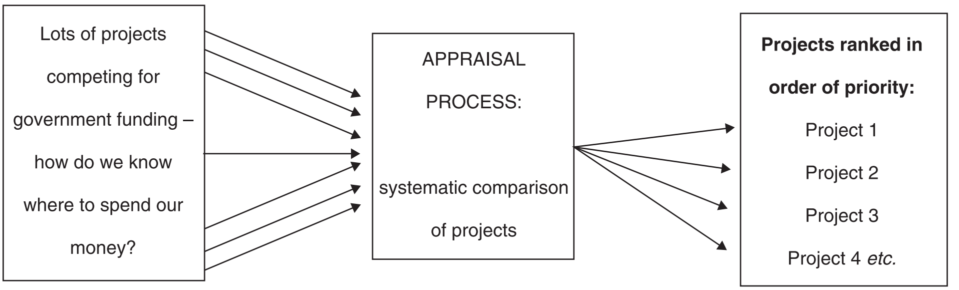

Figure 14.1 *The appraisal process*

by the Treasury). Thus, from the point of view of theoretical economics, utility may be maximised within departments, but not between them.

Thirdly, it is extremely difficult to find a common unit in which to measure and express all costs and benefits. Thus each appraisal will have uncertainties and imperfections within it, making it more difficult to compare with the results of appraisals of other projects. Finally, and perhaps most importantly, appraisal is not the only basis on which projects are selected for funding: politics often play a major role. Politicians may have 'non-rational' reasons for wanting or not wanting projects, and these may have little to do with the results of appraisals. A good example is the Jubilee Line Extension on the London Underground, which opened in 2000 at a final cost of £3.5 billion. Even on initial cost estimates, the ratio of benefits to costs was very small, and other schemes were judged to have greater potential to deliver benefits. Nonetheless, the scheme went ahead because the then Minister of the Environment, Michael Heseltine, wanted it to open up the London Docklands. The EU research project EVATREN (2008) looked at 9 transport case studies mainly from Western Europe and found that appraisal had been carried out in all bar one case, but frequently after the decision to build the project had been taken – it was not an ex ante investigation of whether the project fulfilled its objectives, but rather an ex post justification of a political decision already taken. Appraisal provides, therefore, only advice on whether a project is worthy of funding, and this advice may often be ignored by politicians. As we have seen before in this text, whilst economists can advise on projects through, for example, appraisal methods, it is politicians who take the ultimate decision as to which transport projects to support and which ones to not. Nevertheless, where funding for a project is sought from a higher level of government or an international body, such as the World Bank, appraisal may be critical to successfully obtaining the money.

Conclusion to this section

This section has reviewed the basis of appraisal in transport. It has summarised why we carry out appraisal in theory and in practice, and hinted at some of the problems that appraisal of projects can encounter. Now we go on to consider different forms of appraisal in a little more detail.

THE EVOLUTION OF APPRAISAL FROM BENEFIT COST APPRAISAL (BCA) THROUGH TO MULTI-CRITERIA ANALYSIS

Introduction

In the previous section, we considered the basic aim of appraisal: that is, to be able to compare investments with one another to decide which provides the most return for the available resources (or which maximises society's utility). In this section, we go on to look at practical approaches to this problem in more detail, as a way of explaining how and why transport appraisal practice has evolved over the past few years. As such, what we will be considering are the actual methodologies that are employed in the appraisal of transport projects.

Cost-benefit analysis appraisal methodology

Cost-Benefit Analysis (CBA) estimates and totals up the equivalent money value of the benefits and costs to the community of projects to establish whether they are worthwhile. These projects may be dams and highways or can be training programmes and health care systems, in other words basically any public project. The result of a cost-benefit analysis is a number: this shows the ratio of benefits to costs for the scheme. If it is less than 1 (i.e. costs exceed benefits) then the rational government or organisation would be expected to be unlikely to fund the scheme. On the other hand, values above 1 would indicate that the scheme will be of overall benefit to society and the higher the ratio the higher the net benefit, thus the more likely that the scheme would be funded in preference to other proposed projects.

The basis of cost-benefit analysis therefore is that a monetary value needs to be allocated to all benefits and costs associated with a given project. This then allows these to be added together and the total costs subtracted from the total benefits in order to obtain a net value upon which to advise on the final decision as to whether to invest or not. In reality however the monetisation of these costs and benefits will fall into a number of categories. Some costs and benefits can easily be expressed in money terms, such as the price of tickets, the cost of building roads or operating trains; some that can probably be expressed in some kind of money terms (e.g. accidents); some that can be quantified but are more difficult to monetise (e.g. noise); and finally some that are extremely difficult to quantify at all (e.g. change in the quality of the landscape). This is a fundamental difficulty with cost-benefit analysis approaches with which economists have grappled since the approach was first developed in the late 1950s.

For the private sector organisation that is conducting a cost-benefit analysis, the problem is relatively straightforward: these organisations are interested mainly in the costs and benefits that can be bought and sold in a market – for example, fare revenue, maintenance or construction costs. Since they can be bought and sold, they have a direct monetary value and are therefore easily added up to derive the overall ratio of benefit to cost for a project. This is called financial cost-benefit analysis.

In the public sector, however, cost-benefit analysis considers a wider range of costs and benefits. Ideally, it should include them all – since all are of importance to society. In practice, it does not, due to the difficulty and uncertainty of expressing some costs and benefits in monetary terms. The challenge for the appraiser is therefore to decide which costs and benefits to include and which to exclude.

In UK transport practice, public sector cost-benefit analysis in transport typically includes:

- Costs: capital and operating costs (e.g. maintenance, electricity for trams, bus drivers' wages).
- Benefits: time savings, accident reductions, revenues and reductions in operating costs (e.g. decreased petrol costs for drivers who switch to a new tram). There is an increasing tendency also to monetise reductions in noise and certain air pollutants, health benefits, and greenhouse gas emissions (GHGs).

You will note from this list that there are some factors – particularly time and accident savings – that you cannot buy on the open market. You cannot go into a shop and ask to buy an hour's worth of time, nor can you pay directly for a reduction in accident (risk). Nonetheless, public sector cost-benefit analysis normally includes time (indeed, as we will see for many transport projects the largest benefit is often the time saving). Because this type of cost-benefit analysis includes factors without a direct market value but with a social value, it is often known as social cost-benefit analysis (SCBA) and this is the term that will be used here.

There is no fixed rule as to which factors should be monetised and included in SCBA and which should not. In the UK, until recently, changes in air quality or noise were not included in SCBA, whereas in many other northern European countries these factors are included. It is a reasonable assumption that, whichever factors are included in a monetised cost-benefit analysis, there will always be some that are left out. Yet there are strong arguments for including them all, somehow, in the appraisal of your project(s). The main question is: how to do this? There is a subsidiary issue, which is that those factors that are left out of the cost-benefit analysis may well be viewed as being less important than those that are included. As the EU EVATREN project (2008) noted in its review of case studies of transport SCBA from across the EU, most environmental factors were not incorporated and therefore there was no consideration given to the possibility of fundamentally changing the schemes evaluated, or abandoning them, even if environmental costs were seen to be large. This is because somehow they sat 'outside' the SCBA, which was seen as the main arbiter of whether or not to proceed with the scheme.

These difficulties could be solved, at least in theory, by monetising all impacts and incorporating them all into a SCBA. Even if this were possible, however, a more fundamental issue would still remain: that the result of the SCBA shows only how the scheme performs in terms of the factors included in the analysis – but not necessarily how it performs in relation to the objectives set for the scheme.

The lack of a direct clear relationship in SCBA between outputs and objectives is perhaps the key reason why transport appraisal in the UK has changed recently, from one dominated by SCBA to one that considers transport schemes in relation to transport policy objectives. This is called objectives-based appraisal although it is very similar to another technique called multi-criteria analysis. This change is summarised in Figure 14.2.

Good objectives-based appraisal needs clear objectives. These should be specific, measurable, agreed, realistic and time-dependent, otherwise known as SMART objectives. It is sometimes useful to classify objectives according to their level. For example, the Treasury Green Book distinguishes between ultimate, intermediate and immediate objectives, but it is particularly useful to distinguish between ultimate and immediate ones.

Ultimate objectives are usually framed in terms of strategic or higher-level variables, such as the level of economic growth, social cohesion or sustainable development. These objectives may be stated in White Papers, or in Departmental or Agency plans or in annual reports.

Immediate objectives are those which can be directly linked with the outputs of a particular policy, programme, or project. Consideration of a proposed option needs to concentrate on those criteria which contribute to the immediate, and hence to the ultimate, objectives.

In the UK, central Governments have chosen five key objectives against which to assess transport projects. These are:

- Economy
- Environment

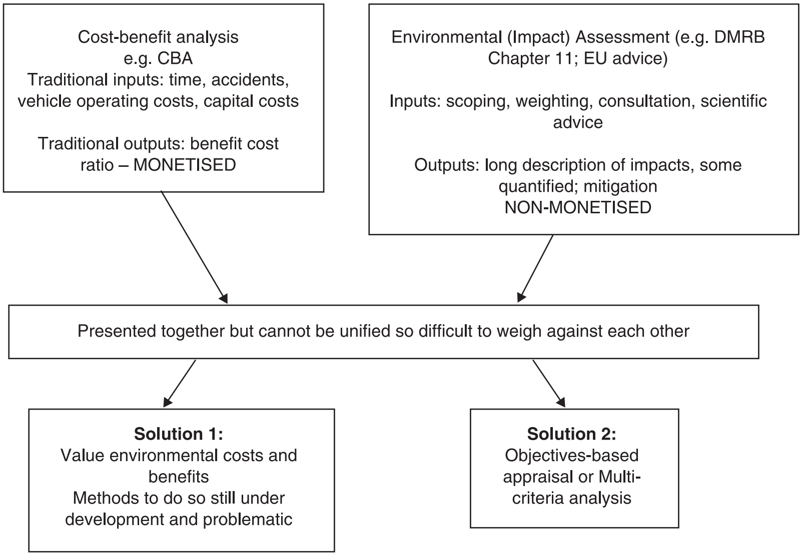

Figure 14.2 *Comparison of appraisal methodologies: a summary*

- Safety
- Integration
- Accessibility and social inclusion.

This choice of objectives is not necessarily ideal and there exists some overlap in definitions between them. This leads to a loss of clarity in the appraisal process and increases the risk of double counting of benefits and costs as they are assessed against various objectives. This risk may be compounded by the addition of local transport objectives as additional elements of the appraisal process. It is also worth remembering that one person's top priority transport policy objective may be at the bottom of someone else's list. For example if you were to spend 5 minutes to come up with your own list of objectives for transport policy and appraisal, who do you think might not be in support of your objectives? What this clearly shows is the level of divergence that can and does exist in the setting of objectives for transport projects. This element of political controversy in objectives-based appraisal can be reduced by consulting carefully on possible objectives before using them; however, SCBA approaches avoid this altogether – it is very difficult to argue against a project that appears to be good value for money, whereas it is quite easy to argue against a project that performs well against an objective with which you do not agree.

Quantification or not?

The difference between objectives-based appraisal and multi-criteria analysis is that the latter will normally attach numerical weightings to the achievement of objectives, allowing a score for each scheme to be derived and compared with other schemes. Objectives-based appraisal does not: the achievement of each objective may be assessed in money terms, quantitative terms or qualitatively, making it impossible to 'score' the scheme or investment overall.

Table 14.1 *Objectives-based appraisal matrix – toasters*

Options	*Price*	*Reheat setting*	*Warming rack*	*Adjustable slot width*	*Evenness of toasting*	*Number of drawbacks*
Boots 2-slice	£18				☆	3
Kenwood TT350	£27	✓	✓	✓	☆	3
Marks & Spencer 2235	£25	✓	✓		★	3
Morphy Richards Coolstyle	£22				☆	2
Philips HD4807	£22	✓			★	2
Kenwood TT825	£30				☆	2
Tefal Thick'n'Thin 8780	£20	✓		✓	★	5

A tick indicates the presence of a feature.

Source: Which?, November 1995, cited in Dodgson, Spackman, Pearman and Phillips (1999), p 14.

The example below is taken from Dodgson, Spackman, Pearman and Phillips' (1999) *Multi-Criteria Analysis: A Manual* (full citation given in references section), although they based it on an article in *Which?* magazine. As you will see, it has nothing to do with transport! Nonetheless, the matrix conforms to the basic principles of objectives-based appraisal: the objectives are listed across the top and the 'schemes' or options listed down the left hand side.

To try and gain some appreciation of the problems surrounding the use of objectives-based criteria in transport investment appraisal, consider the matrix in Table 14.1 and, on the basis of the information presented, try to decide which toaster you would buy. Does this cause any difficulties? Would it be more difficult if there were more objectives and they were more different from one another? What we are actually working with here is a very crude form of objectives-based appraisal, and hence the problems encountered will only be multiplied in a more complex example, such as any typical transport project appraisal.

That however is not the only problem with objectives-based appraisal, as these 'objectives' need to be combined to derive an overall view to allow us to rank each toaster accordingly from 'worst' to 'best'. Therefore, we need to try to develop a methodology that will allow us to derive an overall score for each toaster. To do this, obviously we will need to score each toaster's performance against each objective, and then add the scores together. But you may think that certain features – or objectives – are less important than others (after all, what is a warming rack? And just how vital is 'adjustable slot width'?). How would we take that into account in our appraisal? What we would have to eventually develop is what is called a multi-criteria analysis, hence you should consider the relevant weight to attach to each attribute and the score to give each of the ratings.

The final element to consider in this example is the further objectives that maybe should be included in the matrix. How would we go about determining this or has *Which?* got it right?

Whilst obviously quite subjective in the assignment of scores to each option, the form of multi-criteria analysis (MCA) that we developed in this example – weights for each attribute and scores for each toaster's performance in relation to that attribute – has the advantage of making both scoring and weighting of objectives transparent, and so is of greater use to the decision maker than the simple presentation of results such as those for the toasters, shown in Table 14.1. One drawback of MCA comes if the comparison of very different scales or types of projects is attempted – for example, if a new railway line is compared with a regional cycle network, it is very difficult to capture the relative contribution of each scheme to the achievement of objectives within the confines of an MCA score. This is akin to attempting to compare apples with oranges. If you are interested in reading more about MCA then you should read the UK Government publication *Multi-criteria Analysis* by Dodgson, Pearson, Spackman and Phillips (1999).

Currently in the UK transport appraisal uses a form of objectives-based appraisal with five overall objectives (see www.webtag.org.uk), although SCBA is used to calculate a project's performance against the economy objective. This objective is also weighted more highly than the others; all the rest should, according to guidance, receive the same weighting. The rationale for the higher weight applied to the economy objective is justified by the Treasury (UK Finance Ministry) on the basis that this shows whether a project gives 'true' value for money. The objectives-based appraisal is summarised for presentation in something known as an appraisal summary table (AST), an example of which, for a road improvement, can be found at www.highways.gov.uk/roads/projects/15950.aspx, or simply type 'appraisal summary table' into any web search engine.

In this section we have looked at the differences between a SCBA-centred approach to appraisal, and objectives-based appraisal. Now the chapter goes on to consider the operation of SCBA in much more detail, as it remains a key input to objectives-based appraisal in transport across the world.

The principles upon which cost-benefit analysis is based

It is very important to understand the principles on which cost-benefit analysis is based. This is because, even though many countries have adopted a multi-criteria-based approach to the appraisal of transport projects, SCBA still forms a fundamental part of such appraisals – it remains one of the key criteria on which transport projects are assessed. For example all professionals that work in the transport planning field will undoubtedly have had to deal with some form of SCBA, hence it is very important to understand how it works.

Origins of cost-benefit analysis

Cost-benefit analysis originated in the USA in work immediately before and after WW2. Initially it was applied to flood-prevention schemes and to military investment and was concerned with injecting some intellectual rigour into the informal objective of 'getting most bang for a buck'.

The first use of SCBA in the UK was in its application to the assessment of the M1 motorway in 1960 and, as we shall see later, to the Victoria Line on London's underground in 1967. At this time, SCBA also became more widely accepted – or required – in Government, initially in the nationalised industries, where it became possible to appraise projects not only against the financial income that they generated, but also in relation to the non-market benefits that they might also realise. Since 1967, SCBA has become a key aspect of UK appraisal techniques.

How does CBA work?

The purpose of cost-benefit analysis (CBA) is to weigh up the costs and benefits of a project to see whether the benefits are greater than the costs and, if so, by how much. For example in Gothenburg, Sweden, the local traffic authority recently built a bypass. This is a rather unusual bypass, because it is for trams: the tram network has become congested in the city centre, so a bypass is being built around it in order to provide faster journey times across town and to provide new journey opportunities.

In order to assess whether or not this scheme was worth building, the traffic authority is likely to have gone through some of the following steps:

- Choose one or more alternative options against which to assess the tram bypass scheme. The base option (let's call it Option B) would have been to build nothing, or make only minor improvements to the existing network. We can call the tram bypass Option A.
- Choose a length of time – probably several decades – over which to assess the costs and benefits of the scheme.
- Use a predictive model to calculate the likely ridership during the whole evaluation period on the tram network in Options A, B and any other possible options that were subject to evaluation. From this, calculate likely revenue.
- Use the same predictive model to calculate total journey times on the different options over the whole evaluation period.
- For Option A, calculate the journey time savings likely to result from the project by taking away the total journey time for all passengers on Option A from the total journey time for all passengers on Option B (or possibly restricting this part of the analysis to total journey time to those passengers who would use Option A *or* Option B, and not to include the passengers who are attracted to the tram because the network is improved).
- In a similar way, calculate journey time savings on the road network resulting from the tram bypass, if people are predicted to transfer from car and/or bus to tram.
- Calculate construction, maintenance and operating costs of the different options.
- Take away the benefits (revenue plus journey time savings) from the costs for Option A to find out whether benefits exceed costs and, if so, by how much.

This is all summarised in Figure 14.3.

It follows from the discussion above that there are some key elements to any SCBA. These include:

- Project appraisal period
  A transport project such as a new road produces benefits in the year that it is built and over the years into the future. The CBA must decide how many of these future years will be taken into account; conventionally, in the UK, projects were until recently assessed over a 30 year period but this is quite an arbitrary number, related to accounting conventions, the discount rate and to the accuracy of predictive modelling. In 2006 the Department for Transport in the UK increased the appraisal period to 60 years. As we will see later, however, the length of time chosen for the CBA can have a critical impact on the end result.

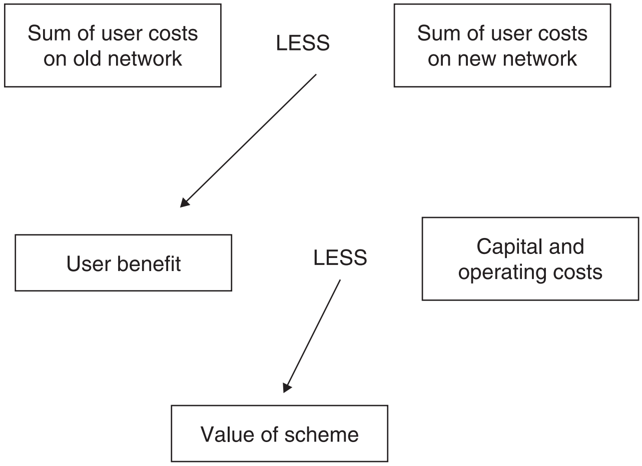

Figure 14.3 *Principles of SCBA*

- The benefits that are assessed
  These normally include changes in the costs to users of the transport network as a result of a new project. For example, a new road or rail line can often be expected to relieve congestion on existing routes. This is a change in user costs – the journey time (a user cost) would normally be expected to fall, at least in the short to medium term.
  The user costs that are most typically included in SCBA are:

  - travel time (and variants of it, e.g. parking search time)
  - revenues (e.g. fares, parking charges, road user charges)
  - vehicle operating costs (e.g. fuel)
  - accident costs
  - (increasingly), noise and air pollution.

  All these costs are expressed in monetary values, e.g. £, Euros, \$. The presumption of a SCBA is that user costs on the transport network as a whole will fall as a result of the investment. Thus the user costs on the new network (e.g. the network that includes the new investment) must be compared to those on the old network (that without the new investment). This reduction in user costs on the new network compared to the old is the benefit measured by the SCBA. The capital (e.g. construction) and revenue (e.g. operating, maintenance) costs must be weighed against the measured benefit.
- Forecasting and modelling
  It is clear that a pre-requisite for a SCBA is a model that will predict travel on the transport network – and hence user costs – for the life of the scheme. As discussed in the first section of this chapter, modelling outputs should be treated as indicative only.
  The most significant example of forecasting assumptions affecting the outcome of appraisals is that which existed in UK trunk road assessment up until 1994. Prior to this time, it was assumed that the amount of traffic that would use do-something road network would be the same as that which would use the do-minimum network; that is, no account

was taken of what is known as induced traffic. It is possible that an appraisal that does not take account of induced traffic may overestimate the benefits of a new road – since the induced traffic can increase congestion, thus increasing network travel time and total user costs to a greater degree than was predicted by the modelling. On the other hand, if the amount of induced traffic is less than that which would cause congestion, but more than that which would be predicted by a fixed trip matrix approach, the benefits of the road will be underestimated by the latter approach. Unfortunately, the prediction of the amount of induced traffic remains an extremely difficult science, and one that lies outwith the scope of this chapter, but if you are particularly interested in it you should read the SACTRA report (Department for Transport, 1994).

- Present value
  If the project is assessed over a number of years, then the predictive model used will normally calculate the benefits and costs for each year of the project. However, consider the following situation: your model gives a predicted benefit for the year 2010 of £25,000 and for 2015, also £25,000. Disregarding any inflation that might exist, can you simply add these values together along with the other benefits for all the other years of the appraisal in order to derive the total benefit? The answer is an unequivocal no. This is because even if you could buy the same amount of goods with £25,000 in 2015 as in 2010, the two sums would be worth different amounts from the point of view of the present. This is because you would have to wait longer before you would enjoy the benefit arising from the investment in 2015, consequently there is a cost involved of having to wait that additional time before deriving the benefit. Don't worry if you do not entirely grasp this idea now, as we will return to it later in this chapter, but take it as read for now that before costs and benefits that are predicted to arise in different years are added together, they must be subject to a process that converts them to a common unit known in SCBA as their (Net) Present Value (NPV). Benefits will sometimes be expressed as Net Present Benefit (NPB) and costs as Net Present Cost (NPC).
- Values of time
  Time savings are normally the most significant benefit in SCBA of transport schemes (with the possible exception of safety improvements), and so the value of time used is absolutely critical to the final outcome of the evaluation. The normal procedure used is to take the total time saving predicted for each group of users (e.g. car drivers travelling on works' business; pedestrians going shopping) for each year of the evaluation. This is then multiplied by the relevant value of time for that user group to derive an overall value of time for the scheme.

  You should be aware that, often, the total time saving for the scheme is the result of multiplying very small individual journey time savings by a very large number of users over a long period. Think, for example, of a 5 km bypass of a small town; the average time saving per vehicle may be of the order of only two or three minutes, but with much traffic on the road, these small time savings multiplied many times aggregate to one large – and valuable – time saving.

  The values of time that are used in SCBA are standard for the UK – but different from those in many other parts of Europe. These values are derived from stated preference surveys, which ask people about hypothetical travel choices from which these monetary values are then calculated. They can also sometimes be more reliably derived from observing people's actual behaviour where they can choose between paying for a shorter journey or taking a longer route to avoid paying a toll. For example, before 2008 the Kincardine Bridge across the west end of the Forth estuary in Scotland had no toll, whereas there was a toll on the Forth Bridge. Studying driver route choice in such cases can help us to understand how drivers trade off cost against time, and hence to derive values of time. Similar studies have been undertaken of crossings of the Severn from Bristol to Wales, and the opening of the M6 Toll motorway around Birmingham in 2005 also presents similar opportunities.

Different values of time apply to those people deemed to be travelling in working time and in non-working time. Examples of trips that are made in working time include lorry drivers at work; bus drivers at work; and people who are travelling to meetings, or sales representatives, who are travelling in time during which they are being paid by their employer. All other trips, including trips made to and from work where the traveller is not being paid by their employer, are deemed to be made in non-work time. However, in UK transport appraisal practice, a recent innovation made in 2006 was to separate non-working time into two categories: time for commuting trips, and time spent travelling for all other types of trip. As shown in the EU research project EVATREN (2008), there are wide variations across the EU in the way that time is valued in SCBA (categories into which it is divided such as work and non-work, as well as the actual values that are applied).

The value of trips made in non-work time is less than those made in work time. This is because there is no market for work time – it cannot be bought and sold. Values of non-work time represent the opportunity cost of the time involved, meaning the value that people attach to time because of what they could do with it instead of travelling. (This of course is related, indirectly, to wage rates and to the proportion of people who are employed.) In contrast, there is a market for working time – employers buy it and employees sell it all the time – and so the values used for people travelling in working time approximate to average wage rates paid to these groups of people. Within the UK, data from the on-going National Travel Survey (see for example DfT (2007) in the references section for further details) are used to derive the average pay rates of the average person making the average trip on works business by car, bus and other modes. You can see the effect of this in Table 2/1 of the DfT's *Transport Economics Note* (see below). If you are particularly interested in this topic, you should read Mackie *et al.* (2001).

A number of assumptions normally support the use of standard values of working time in SCBA of transport schemes. Without these assumptions it becomes more difficult to justify the use of averaged wage rates as proxies for the value of working time for appraisal purposes. These assumptions are:

- That time spent travelling cannot be used for working, therefore the time saved thanks to any investment in a transport scheme increases the amount of productive work that a person can do. As a consequence this increases output per employee and/or saves the employer money. With the advent of laptop computers and mobile phones this assumption is increasingly open to challenge but for the moment it remains in place.

- That time saved due to the investment in a transport scheme is used by an employee to do more productive work – not to, for example, have a longer lunch break or to get home earlier because you can fit in all your business meetings in a shorter time!

Given that there is a relationship, either direct or indirect, between values of time and wage rates, you may be asking yourself why UK transport appraisal practice currently uses standard values of time right across the country, when wage rates differ markedly on a regional basis. From the point of view of economic theory, it is actually nonsensical to use averaged values of time: theory dictates that the value of time savings is greater in those areas where values of time are higher, and therefore investment in a scheme with similar time savings would be of greater value in an area of high wage rates than lower wage rates.

Other countries have less standardised values of time than used in the UK – in Sweden, for example, different values of time are used for rail passengers travelling first class and standard class (Bristow and Nellthorp, 2000).

- Accident valuation
The costs of an accident are several:

  - The costs of policing the accident and clearing up the mess
  - The loss of economic production from the victims who are injured or killed
  - The costs of medical treatment
  - The pain and suffering inflicted on the victim and those close to them
  - The general feeling of a less safe travel environment for all those who travel by the mode of transport in general (and therefore people's willingness to pay for safety improvements).

In the UK, all these various factors are taken into account in deriving values of a standard life used for calculating the cost of road accidents. This means that the UK has one of the highest values for accident savings used in Europe. Portugal and Greece have very low rates, reflecting in part their lower rates of pay and hence lower willingness to pay for safety improvements, but mostly because their accident valuations are based largely on insurance costs. These countries also have some of the highest rates of traffic accidents in the European Union, perhaps partly because the low value of accident savings makes it less attractive to invest in safety improvement schemes than in countries with higher valuations for accidents.

In the UK, different valuations are used for accidents on railways and the underground. This is justified on the basis of willingness to pay studies, which have discovered that, because people feel less in control while travelling on these modes of transport compared to driving, they are willing to pay more for safety improvements. Furthermore, any accidents on these systems also tend to have far wider impacts on the general society, as for example evidenced by the Southall and Ladbroke Grove rail accidents in 1997 and 1999 respectively. Recent research however has cast doubt on the higher accident values used on the railways but, up to now, they have been used to justify greater spending on safety measures per passenger km than on the roads.

As part of a SCBA it is necessary to predict the number of accidents that will occur on the new network. On road schemes, this is largely a function of traffic speed, road type and junction layout. There is a massive amount of historic data about actual accidents that has been collected in the UK over the years. Using regression techniques, engineers are able to fairly confidently predict the number of accidents that will take place on new roads into the future, and to input this to SCBA appraisal. For other modes, predictions of future accidents must be made on a more ad-hoc basis and are far more problematic due to the unpredictable nature of the extent of the accident, as these can range from relatively minor derailments to major catastrophes, such as Ladbroke Grove, which involve heavy loss of life.

- Operating costs

  Operating cost savings are likely to accrue from investment in a transport scheme. For example, if a bus lane increases average bus speeds then the bus company will be able to operate more services with a given number of buses and drivers, or the same service with fewer, and hence save money. By raising average speeds and reducing congestion, a new road is likely to reduce operating costs for all road users.

  On the other hand, many transport schemes may also lead to an increase in operating costs. For example, running additional buses or new trams will have an operating cost associated with it. A new road will have operating (i.e. maintenance) costs. Remember that at all times the operating costs that are included in the appraisal must be net – for example, a new tram scheme will lead to an increase in operating costs, but these may in part be offset by a reduction in bus operating costs if the tram substitutes for some bus services.

- Revenue

  Viewed simply, the net effect of revenue in a SCBA is neutral, since it is a cost to users (fares or parking charges) but it reduces the operating costs of the scheme; it is thus a simple transfer of funds from one group to another. However, it is increasingly useful to set out this flow of money in a SCBA because it may be from one sector of society – normally consumers – to another, perhaps government, or private companies, as these groups may have differing marginal utility rates of money, i.e. £1 or one Euro is effectively worth more to one group than the other.

  There is a more complex but also more accurate way of viewing revenue in a scheme. A new tram, for example, will (if it is properly designed) reduce journey times for travellers compared to a previous bus service. Let us imagine that the previous bus service carried 2,000 passengers a day, each paying £1. The tram carries 2,500, each paying £1. Let us consider only the 500 'new' passengers. If all of them are rational economic actors, then the value of the travel time saving brought about by the tram to the 500th passenger (the marginal passenger) is exactly £1. However, if we assume that the demand curve for the tram is a normal shape, then many of the other new passengers would have been willing to pay more, or enjoy less of a time saving compared to the bus, and who will still travel on the new tram. Effectively the benefit to them of using the tram is *more* than £1, so this means that the revenue gathered is not equal to the benefit that the tram delivers. You should recall from Chapters 7 and 8 that this is known as the area of consumer surplus, and what is being considered here is the change in the area of consumer surplus as a result of an improved quality of service. In simple terms, if the additional revenue raised is used as a measure of the value that 'new' consumers attach to the improvement, this will considerably underestimate the actual benefit being accrued. This is because what is actually required is the change in the area of consumer surplus, not the change in revenue, as it is that which will measure the

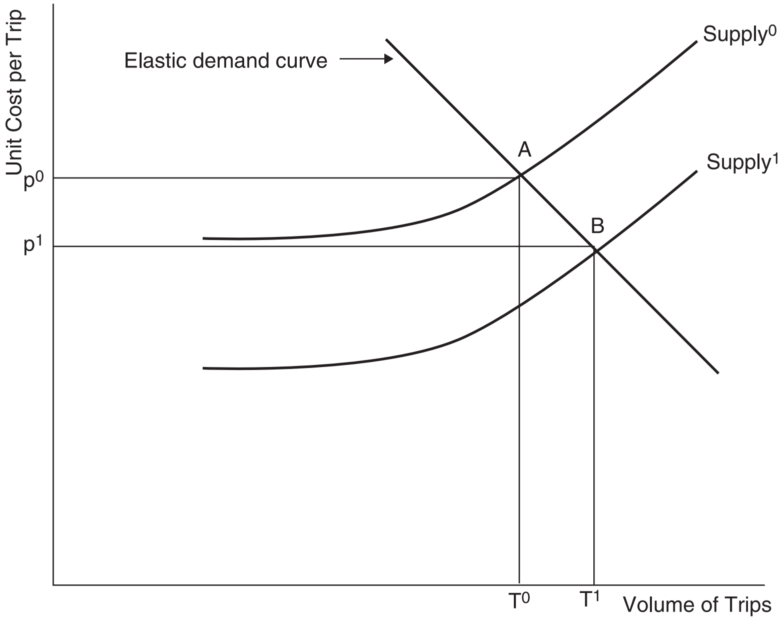

Figure 14.4 *Change in consumer surplus and the rule of a half*

total benefit being derived. In order to estimate this change, the 'rule of half' is employed. This is a set formula that allows this to be calculated, and found by multiplying the change in demand by half of the maximum benefit enjoyed. This can be seen in Figure 14.4. The change in consumer surplus is represented by the area P^0P^1AB; it is halved to derive the additional benefit to consumers resulting from the scheme.

- Discounting
  An SCBA calculates benefits and costs for each year of the life of the scheme. As argued earlier, however, these cannot simply be added up to give the total costs and benefits of the scheme, since a benefit of £1 is worth less to us if we have to wait ten years before we receive it. Put another way, if you took £10 now and invested it in a fixed-rate savings account at 6 per cent interest, in 10 years it would be worth £17.90 (i.e. £10 $\times$ 1.06^{10}). This could therefore be used as an approximation for the 'cost' of having to wait ten years for that £10. Therefore, if you had £10 to invest in a project that realised benefits in year 10, you would want to know that the predicted benefit in year 10 would be more than £17.90, i.e. was 'worth' waiting for, otherwise there would be no point in you putting the money into the project and having to wait ten years to realise the benefit. Furthermore, there is an associated risk that it might not actually realise even that 'minimum' value.

In SCBA, therefore, a process called discounting is used to transform all costs and benefits to a common value – that is, their value in a common year, known as the price base year. A standard discount rate is also used, and is related to the general rate of return on money invested in banks and government bonds. At the current time in the UK the discount rate is 3.5 per cent and the price base year is 2002. As you will understand when you do the exercise at the end of the chapter, it is important that all projects are appraised using a common discount rate and price base year, as well as a common length of time over which they are appraised.

The formula for discounting a benefit received in year *n* (Bn) to its value in the price base year 2002 (B_{2002}) is as follows:

$$B_{2002} = Bn/(1 + r)^n$$

In using this equation you should remember that for 2002 $n = 0$ and $r = 0.035$.

To calculate the total benefits from a project, the predicted benefit for each year is discounted and then added together. Costs are also not always incurred in year one of a project – indeed, operating costs occur throughout a project's life – and so these too must be discounted.

The total summed discounted costs and benefits are called Net Present Cost (NPC) and Net Present Benefit (NPB) because they give the current value of the total costs and benefits from the project. Subtracting the NPC from the NPB gives the Net Present Value (NPV) of the scheme, which will normally be positive. NPC, NPB and NPV are the key terms in SCBA.

The price base year currently changes approximately once every 4–5 years. The previous price base year used in UK transport appraisal was 1998. The Treasury sets the discount rate for public sector SCBA project appraisal, and they have recently lowered it from 6 per cent to 3.5 per cent, in order to encourage investment in projects that realise benefits over a long timescale. Their argument is also that the 'risk' element of the discount rate should be dealt with much more systematically by sensitivity testing and other techniques and so they have removed this element from the discount rate – the 3.5 per cent is supposed only to reflect the fact that future benefits are lower because we have to wait for them.

It is important not to confuse inflation with discounting. The streams of costs and benefits in appraisal are measured in real pounds sterling, that is, £s with the same buying power regardless of the year that the cost or benefit occurs. However, after the NPB, NPC and NPV are calculated for the price base year, it is possible to adjust these figures for the effects of inflation – that is, to express them in today's money – by carrying out a simple multiplication. Thus for example a project evaluated using 1998 as the base year can be given a current net present value by:

$$\text{NPV (or NPB or NPC)}_{\text{Present Day}} = \text{NPV}_{1998} \times (\text{Retail price index at present day}/\text{Retail price index 1998})$$

The Retail price index (RPI) is readily available in Government statistical publications.

Criticisms of and problems with SCBA

There are several criticisms that can be levelled at SCBA and it is these that have in part led to the UK Government nominally reducing its overall importance in transport project appraisal – although it still retains a key role.

Valuing time savings

We have already discussed the theoretical problems with using average values of time right across the country when in fact values of time vary. However, there are other difficulties with the assumptions that underlie the valuation of time savings in SCBA.

The first is that very small time savings are valued proportionally the same as large time savings: the value of an hour in standard SCBA is simply 120 times the value of 30 seconds. You may wish to test the validity of this assumption yourself. Think about the way that you normally get to work or to go shopping: how large a time saving would have to be delivered by a new project before you would notice the time saving as part of that regular journey? Fifteen seconds? Thirty seconds? Probably not. For most of us, a saving of at least three to five minutes would be needed before we would even start to register it. Yet for SCBA, there is, proportionally, no difference, and as long as the total of all the fifteen second time savings is enough to outweigh the costs of the project over the life of the appraisal, then the project is deemed worthwhile. Thus for example a project with a large number of very small time savings may be valued far higher than a project with a much smaller number of very large time savings. As a consequence, the first, a project that in reality makes very little difference to a lot of people, would be preferred over the second, one that makes a very large difference to a small number of people. There are, however, immense difficulties in trying to decide on a 'cut-off' time saving, less than which would not be included in a SCBA.

The second key difficulty with the valuation of time savings in SCBA in transport appraisal is what we actually do with the time saved. Since there has been a lot of money invested in transport projects in the UK over the past 30 years, and given that the justification for many of these projects is that they reduced journey times, one might expect that people would now be spending less time travelling than they did 30 years ago. In fact, the opposite is the case: we spend about 25 per cent more time travelling, and we travel twice as far per person per year (again see the National Travel Survey, available on the web). Thus the effect of reducing travel times appears to be that, in the medium to long term at least, we change our behaviour and re-invest travel time saved from new transport schemes into travelling longer distances.

A typical example of this might be an improved road from Edinburgh to Dunbar, which lies approximately 30 miles to the east of Edinburgh. Initially, for all those people who used to travel on the old slow road, the new road provides a time saving. But because it is now quicker to travel from Edinburgh to Dunbar and vice-versa, some of those people may make the journey more often than they used to. Some other people, who spend half an hour travelling to and from work by bus within Edinburgh, may realise that the new road would allow them to live in Dunbar and spend 35 minutes travelling by car to and from work every day. In the longer term therefore, the road leads to people travelling further and perhaps spending a little more time travelling than they did before. This is not to say that there is no benefit to the person who decides to move to Dunbar, nor to the person who can travel more often between Dunbar and Edinburgh; but rather the validity of the measurement of this benefit in terms of the net journey time saving may be highly questionable. Some other measure, such as the change in property values, might be a more appropriate proxy but this is not yet accepted practice in SCBA.

What to value?

Many costs and benefits of transport investment are currently left out of SCBA, largely because it is methodologically too difficult to derive monetary values for many impacts of a scheme. Theoretical economists advocate further work on valuation in order to get round this problem; pragmatists prefer multi-criteria analysis. Therefore what purports to be an 'objective' valuation of a scheme's net benefit or cost can become a subjective assessment based upon the costs and benefits that are included and those that are not.

Discount rate and length of time of project appraisal

From the Exercise 14.2 on discounting, you should hopefully work out that a lower discount rate makes a project seem more attractive, because future benefits have a higher present value than if a higher discount rate is used. Thus choice of discount rate can be critical to a project's feasibility when assessed using SCBA. Similarly, a longer appraisal period will generally make a project appear more attractive, especially where the bulk of the costs are expended early in the project's life time. This is one reason why, as explained earlier, the UK increased its project appraisal period from 30 to 60 years.

The choice of discount rate and appraisal period is to an extent arbitrary, yet can spell the difference between negative and positive NPV. The critical aspects in appraising different transport projects is to ensure that discount rates and appraisal periods are the same for all the projects being considered to ensure that they are being assessed on a 'level playing field'.

What does NPV show us?

This point was discussed in the previous section, but is one that is worth reiterating here. Simply because a project or scheme has a high NPV when assessed using SCBA, this does not necessarily mean that it will help us to achieve transport objectives. For example, one of our objectives may be to enhance road safety, so we may decide to have a blanket 20 mph speed limit. Another might be to bring about mode shift from car to bus for congestion reduction and environmental reasons. If assessed using a SCBA, such schemes would be likely to have a poor NPV because they involve increasing some people's travel time. This would remain a problem for SCBA even if it included all possible costs and benefits.

Equity and distributional effects

From the point of view of economic theory, aggregate increases in utility represent a benefit, regardless of how many people, or to whom, they accrue. Consider the following examples: each pair would be considered to have equal value in a SCBA:

- Sixty people each saving one minute's travel time, or one person saving 60 minutes' travel time.
- Vehicle operating cost savings arising from a new road scheme built in a wealthy area, or equal vehicle operating cost savings arising from a road scheme built in a poor area.

- A scheme that increased total travel car drivers' journey costs by £900 but reduced bus users' journey costs by £1,000 would have equal benefit to one which increased bus users' costs by £900 and reduced car drivers' costs by £1,000.

It is obvious, however, that some of these options would be more politically acceptable than others, or might accord more with policy objectives than others. At the present time, for example, nominal government policy is to assist bus users, particularly those from poor ('socially excluded') areas. Also, few nominally democratic governments would often choose the scheme that benefited one person rather than sixty, unless there were other important reasons for choosing that scheme. For example, in Scotland or Norway, transport schemes in small island communities are funded because there is a general presumption that to support such communities is a desirable societal objective – even though very few people will benefit directly from the investment. But the SCBA would have provided the decision maker with no guidance on any of these choices; it would classify all pairs as equal. This can be summarised by saying that SCBA does not take into account equity or distributional effects. Out of all of the criticisms cited here, given what SCBA purports to do, i.e. estimate the benefit of a particular scheme to society, this is probably its greatest shortcoming.

Project pricing – optimism and inaccuracy

For many large transport projects, forecast NPV is not high, and the ratio of benefits to costs is normally in the range 1.2:1 to 3:1 for large schemes. Thus the appraisal is highly sensitive to increases in project construction and operating costs.

It has become increasingly obvious to the HM Treasury that there is what is known as 'optimism pricing bias' in transport scheme appraisal – that is, construction and operating cost estimates are priced optimistically in order to make the scheme look more appealing than it is. This deliberate under-pricing is compounded by a simple lack of knowledge about the true costs, due to engineering uncertainties and because modern transport investment involves many different parties, each of whom has their own pricing structure and need to make profit. Thus costs escalate massively; research by the UK Treasury (Mott MacDonald, 2002; HM Treasury, 2003) indicates that for transport projects, actual outturn costs are on average 44 per cent greater than the costs included in appraisals, and sometimes much higher. This is confirmed by work in the EU EVATREN (2008) and HEATCO (2005) projects.

Case study 14.1 The Victoria Line in London

The Victoria underground line in London was opened in 1969 and 1970, and was one of the first transport projects in the UK to which SCBA was applied as a technique for making the case for the line (Foster and Beesley, 1963). It forms a useful illustration of many of the points made earlier in this chapter, particularly since it was studied in detail by Mann *et al.* (1996), who compared the SCBA techniques used in 1963 to those in use by London Transport three decades later.

Foster and Beesley were pioneers in the field and thus had few precedents on which to base their methodology. In addition, they did not have powerful computer models at their disposal to predict the likely use of the proposed line, and so had to make many assumptions. They put a monetary value on the following factors:

- Travel time savings for all modes (but, with regard to road traffic, these were modelled only in the corridor paralleling the Victoria Line)
- Improvements in comfort and convenience for passengers
- Operating cost savings for buses and underground
- Operating cost savings for motorists
- Fares savings for travellers who switched to the new line, travelled less far and consequently (at that time, due to distance-based fares) paid less
- A 'catch-all' benefit of half the other user benefits again, to capture benefits that could not be modelled.

In addition, they used a 6 per cent discount rate and a 50 year appraisal period, and assumed that wages were a benefit (by reducing unemployment). This resulted in a benefit-cost ratio (BCR) of 1.03:1. It is notable that this BCR is so marginal that today it would be unlikely to have been accepted – particularly because it was based on a cost that ultimately proved to be a massive underestimate of the final out-turn.

Mann *et al.* (1996) then re-ran the appraisal using mid-1990s modelling and assumptions – notably an 8 per cent discount rate and 30 year appraisal period, but also much improved modelling techniques and better knowledge about actual patronage on the line, which Foster and Beesley under-predicted. These factors changed the BCR to 1.07:1. Finally, by changing the appraisal period and discount rate to 50 years and 6 per cent respectively, the authors secured a BCR of 1.77:1; and by including a key Foster and Beesley assumption on the operating cost savings to buses and underground, they managed to achieve 1.94:1. This very clearly demonstrates how sensitive the results of an SCBA are to the inputs but particularly to the assumptions used; and that we owe the Victoria Line's existence largely to decisions made about discount rates and appraisal periods.

APPRAISAL TECHNIQUES COMPARED: THE APPROACHES OF DIFFERENT COUNTRIES

It is instructive to end the chapter with a brief comparison of transport appraisal techniques across Europe, if only to demonstrate that there is no single correct way to carry out appraisals. The European research project EVATREN (2008) sought to develop a common appraisal methodology for transport projects (although, without European Union competence in the area and legislation to back it up, it would be very difficult to ensure that it was used across the EU for anything except projects receiving some or all of their funding from the EU). The starting point for this work was to consider the methods currently in use by member states. This work found that there was a pattern of appraisal common to most of the member states considered, which was SCBA alongside some form of MCA and/or Environmental Impact Assessment. However, within this, significant variations were found in the following parameters:

- The factors included in the SCBA. Whilst the UK is typical in its selection of criteria to monetise and include in the SCBA, other countries often include other factors, such as greenhouse gases, local air pollution, noise and also (in Germany in particular) local economic development. In Spain, employment is still included as a benefit rather than a cost, because it is assumed that the labour force needed will reduce the cost to society of unemployment (as per Foster and Beesley's 1963 appraisal of the Victoria Line).
- Values of time. These varied from as low as 1 Euro per hour in Spain to 65 Euros per hour in Denmark, related to the nature of the traveller and the type of trip being taken.
- The ways in which values of time are disaggregated. For example, there is no distinction in Spain between working and non-working time. In other countries, such as Sweden, different values of time are used for different classes of train passenger.
- The length of project appraisal period. Some countries used a value as low as 20 years (Czech Republic), but others as long as 75 years (Spain), or infinity (Switzerland). The review found a tendency in many countries to use different appraisal periods depending on the nature of the project in question, and related to its likely lifetime. Thus rail vehicles would be assessed over a shorter period than rail infrastructure.
- The discount rate. In north western Europe this appeared, in 2005 (HEATCO), to be around 4 per cent, but averaged 6 per cent in southern and eastern Europe, reaching as high as 12 per cent in Cyprus.

EVATREN also looked at 9 transport case studies mainly from Western Europe and found that in all cases there were cost over-runs and revenue forecasts were over-optimistic. Nonetheless, only a minority of countries include either sensitivity analysis, or optimism bias, in their project appraisals. From the case studies examined in HEATCO, where alternatives to the reference project were considered, they tended very much to be route variations rather than totally different modes or fundamentally different ways of addressing project objectives. This is possibly also because project objectives were often confused, changed during the project, and/or were not agreed between the different stakeholders concerned; and/or because, as noted above, the decision to build the project had already been taken.

CHAPTER SUMMARY AND REFLECTION

This chapter has given an overview of appraisal techniques and how they are currently used in Europe, with a particular focus on social cost-benefit analysis. It has demonstrated the links between appraisal and the wider field of transport economics, and has tried to highlight the methodological problems with appraisal as it is used today. In spite of these problems, there is no doubt that appraisal will remain an important element of transport planning in the future, particularly for projects for which external funding is sought, and thus how it works and the key drawbacks of the methodology remain critical elements in transport appraisal.

CHAPTER 14 EXERCISES

Exercise 14.1 The value of time

Read Section 1.2 of the Department for Transport publication WebTAG Chapter 3.5.6 on values of time and operating costs, available at http://www.webtag.org.uk/webdocuments/3_Expert/5_Economy_Objective/3.5.6.htm. Decide which values of time you should use for a person who is travelling by underground train on works' business; and for a person who is travelling to work by bus. Why do you think that values of time when travelling in working time are highest for travellers on the underground and lowest for those on the bus?

Exercise 14.2 The effect of the discounting rate and project time period

First, discount the following stream of benefits from a project and derive a total NPB for price base year 2002. Use a discount rate of 3.5 per cent.

Table 14.2

Year	*Benefit (undiscounted) (£)*
2003	35,000
2006	60,000
2008	100,000
2010	25,000
2014	40,000
2017	70,000

Secondly, do the exercise again but use a discount rate of 2 per cent. What effect does this have on the NPB?

Thirdly, if the majority of a project's costs were incurred in its first few years, but benefits continued to accrue for many years afterwards, over how many years would you wish to appraise the project if you were trying to get it approved for funding? Can you think of any reasons why in the UK the appraisal period changed in 2006, along with the discount rate, from 30 years to 60 years and from 6 per cent to 3.5 per cent, respectively?

Exercise 14.3 Using an appraisal summary table (AST)

Using a search engine, find a current AST summarising the appraisal of a project. The Highways Agency website www.highways.gov.uk is a good place to look. Consider how easy you think it would be for a decision maker to decide, from the information in the AST, whether to recommend construction of the scheme or not.