Government Intervention

Annex

Introduction

1 This Annex discusses the rationale for government intervention, whether via a new or changed policy, a programme or a project. It is essentially twofold:

- The achievement of economic objectives by addressing inefficiencies in the operation of markets and institutions; and,
- The achievement of an equity objective, such as local or regional regeneration.

Economic efficiency

2 Economic efficiency is achieved when nobody can be made better off without someone else being made worse off. Such efficiency enhances prosperity by ensuring that resources are allocated and used in the most productive manner possible. One potential cause of inefficiency is where circumstances mean that the private returns which an individual or firm receives from carrying out a particular action differ from the returns to society as a whole. Market failure is a description of a situation where, for one reason or other, the market mechanism alone cannot achieve economic efficiency. This can occur for a number of reasons, which are briefly discussed below.

Public Goods

3 The market may have difficulty supplying and allocating certain types of products and services, such as 'public goods'. Public goods are those that are 'non-rival' or 'non-excludable' when used or consumed.

- 'Non-rival' means that the consumption of the good by one person does not prevent someone else using or consuming that good. Clean air is an example of a non-rival good.
- 'Non-excludable' means that if a public good is made available to one consumer, it is effectively made available to everyone. National defence is an example of a non-excludable good.

4 Non-excludability can give rise to a problem known as 'free-riding'. This is when some consumers fail to pay for the provision of the public good because they expect others will do so. This implies that the returns to potential suppliers will be less than society as a whole would be willing to pay collectively. So a market solution would imply too little public goods being produced to be socially optimal.

Externalities

5 'Externalities' result when a particular activity produces benefits or costs for other activities that are not directly priced into the market. Externalities are associated with, for example, research and development spill-overs, and environmental impacts, such as pollution. A firm might keep down its own costs by not investing in water pollution controls, but in so doing would raise the costs of those firms and individuals relying on using clean water. As a result the polluter has imposed an external cost on other users, or alternatively, a reduction in pollution confers an external benefit upon these other users.

Imperfect Information

6 Information is needed for a market to operate efficiently. Buyers need to know the quality of the good or service to judge the value of the benefit it can provide. Sellers, lenders and investors need to know the reliability of a buyer, borrower or entrepreneur.

7 This information must be available fully to both sides of the market, and where it is not, market failure may result. This is known as 'asymmetry of information' and can arise in situations where, for example, sellers have information that buyers don't (or vice versa) about some aspect of product or service quality. Information asymmetry can restrict the quality of the good traded, resulting in 'adverse selection'. Another possible situation is where a contract or relationship places incentives upon one party to take (or not take) unobservable steps that are prejudicial to another party. This is known as 'moral hazard', an example of which is the tendency of people with insurance to reduce the care they take to avoid or reduce insured losses.

Market Power

8 Market power can arise as a result of insufficient actual or potential competition to ensure that the market continues to operate efficiently.

9 High start up costs can deter entry by competitors in the first place, and therefore create market power. This situation may be exacerbated through organisations acting strategically to protect their position in the market. Examples of this are when an organisation invests in any excess capacity available in the market, or engages in a practice known as 'predatory pricing' where prices are set low (e.g. below the marginal cost of production) to drive out competitors and then raised once they have left.

EQUITY

10 The other important rationale for government intervention is the achievement of equity objectives. Before acting, an assessment should be made of the extent of the inequality to be redressed, and the reasons it exists.

11 Further detail on the treatment of equality in project appraisal is provided in Annex 5.

ADDITIONALITY

12 The success of government intervention in terms of increasing output or employment in a given target area is usually assessed in terms of its 'additionality'. This is its net, rather than its gross, impact after making allowances for what would have happened in the absence of the intervention. Additionality can also be referred to as a 'supply side' or 'structural' impact, which operates by altering the productive capacity of the economy. This can occur either because of a change in the size of the workforce or a change in the productivity of the workforce. Examples of interventions that promote supply-side benefits include improving the working of markets and economic institutions, strengthening capabilities, and facilitating greater participation in the workforce. The extent to which a proposal may produce a supply side benefit is an important component of an appraisal.

13 If there are no grounds for expecting a proposal to have a supply side effect, any increase in government expenditure would result in a matching decrease in private expenditure, (known as 'crowding out'). If, however, the supply-side impact of a proposal is expected to be positive, the net additional impact on economic welfare will need to be measured. This may consist of additional employment or output, and constitutes a real net benefit which the appraisal should take into account.

14 Estimating this type of additionality will normally require an analysis of the product, labour, and in some cases, capital markets affected by the intervention. For example, when assessing the level of displacement of an employment creation programme or the impact of recruitment and redundancy decisions on a particular local area, it is necessary to examine the characteristics of the jobs created, or protected, in relation to the characteristics of the local labour market. They must then be compared with similar jobs in other local areas that are not subject to the policy. Such a comparison establishes the 'do nothing' case: what would have happened if the intervention had not gone ahead.

15 In some cases, the best source of information for assessing additionality may be from those who clearly have an interest in the outcome of the decision. In these circumstances, the information and forecasts should be confirmed by an independent source. For example, the implied growth in demand for services might be compared to other forecasts for the same region, and contrasted with past performance. Sensitivity analysis should also be carried out, using alternative values for the key variables.

16 After developing the 'do nothing' case, the next step is to assess the net impact or benefit of these different options. This net benefit is the 'additionality' of the option. Additionality must, however, be calculated with consideration of 'leakage', 'deadweight', 'displacement' and 'substitution' effects. These are explained below.

- ❑ 'Leakage' effects benefit those outside of the spatial area or group which the intervention is intended to benefit.
- ❑ 'Deadweight' refers to outcomes which would have occurred without intervention. Its scale can be estimated by assessing what would have happened in the 'do minimum' case, ensuring that due allowance is made for the other impacts which impact on net additionality.
- ❑ 'Displacement' and 'substitution' impacts are closely related. They measure the extent to which the benefits of a project are offset by reductions of output or employment elsewhere.

17 For example, a project may attract scarce skills, or investment, which would otherwise have gone to other parts of the country; or, if the policy involves support for local businesses, these may compete for resources and / or market share with non-assisted businesses.

18 The appropriate area for analysis of displacement effects will depend on the type of project. In the case of employment displacement, the area considered should usually approximate the local labour market.[1]

[1] Detailed guidance on methodologies for assessing displacement effects is available from the DTI Central Evaluation Team web site at http://www.dti.gov.uk. The recent DTI/ SBS evaluation of 'Smart', available on the same web site, provides an applied example. Also useful is research undertaken for DTI by the University of Durham (http://www.dur.ac.uk) and DWP's Travel to Work Areas.

19 The effect on net employment and net output is likely to be much smaller than the direct employment and output effects of the project. Evidence should support the assessment of the scale and importance of any net employment and net output benefits, taking account of multiplier effects. A multiplier measures the further economic activity, (whether output or jobs), resulting from the creation of additional local economic activity. Where it is considered appropriate to calculate multipliers, guidance is available from English Partnerships and the Regional Development Agencies.[2]

> The net benefit of an intervention equals the gross benefits less the benefits that would have occurred in the absence of intervention (the 'deadweight') less the negative impacts elsewhere (including 'displacement' of activity), plus multiplier effects.

20 If there is no improvement in national economic efficiency, local employment and output effects, net of any local displacement effects, may be considered in parts of the appraisal where the project has a strong distributional rationale. For example, a policy may aim to reduce the rate of unemployment in a particular deprived area, as opposed to reducing the rate of unemployment overall.

21 Where potentially large changes to employment, (either as a result of employment creation, protection or redundancy) are concerned, assessment will normally require a thorough analysis of the local labour market. This should cover the age, skills and experience of those whose jobs are at stake, and how these compare with the characteristics of the unemployed and those who have recently found employment. The analysis might also assess the likelihood of new investment in the region in the event that these job losses occurred.

REGENERATION

22 Specific issues arise in the appraisal and evaluation of regeneration projects that have a rationale defined both in terms of their impact on efficiency and equity. In many cases, these projects are aimed at the regeneration of local areas, although some are targeted at entire regions.[3]

Regeneration Issues

23 When considering a regeneration proposal the following issues should be addressed:

- The rationale

  This needs to make clear:

  - Who the intended beneficiaries of the project are;
  - What are the mechanisms which will extend the benefits to them;

[2] For example, see 'Additionality: A Full Guide' (English Partnerships, 2001)

[3] More detail is provided in 'A Framework for the Evaluation of Regeneration Projects and Programmes', (EGRUP) available from HM Treasury, 1995 (currently under revision).

- What structural benefits are expected as a result of the project; and,
- The means by which these will be achieved.

- The objectives

  The objectives of regeneration programmes are likely to include improvements in one or more of the following:

  - Labour supply and skills;
  - Quality of life;
  - Physical environment; and,
  - Local business opportunities.

- Outcomes

  These should be identified with respect to the relevant intermediate objectives. Regeneration outcomes might include:

  - Reductions in crime;
  - Improvements in the capacity of community organisations; or,
  - Increases in local incomes and employment.

- Partnerships

  Partnerships between the local community, business and government are important for the sustainability of regeneration projects and the well being of local communities. Most local regeneration projects involve partnerships, and are likely to have some effect on existing institutional relationships. An appraisal should include a description of the partnership and, where possible, its expected impact on the area.

Employment Impacts and Regeneration

24 Government intervention in the economy is sometimes undertaken with an employment objective in mind. In other cases, although employment is often retained as a principal objective, the justification for intervention is more far-reaching and the objectives tend to be more broadly cast. This is typical of regeneration projects.

25 Where programmes have multiple objectives, such as environmental improvements, these other additional benefits (and any associated costs) should be covered in the appraisal, together with employment impacts. The geographical focus of regeneration projects means that it is particularly important to assess displacement effects at both the local and national levels, particularly if the programme or project is substantial.

State aids

26 State aids are transfers of state resources which provide selective support to particular companies. When the state confers even a limited advantage on an undertaking, there is usually a distortion, or risk of distortion, of competition. To protect competition across the EU, the European Commission provides a complex body of treaty-based legislation, frameworks and case law to establish which aid is, and is not allowable.

27 Aid is payable through a large variety of measures and instruments, including tax relief, soft loans and provisions to help prepare an undertaking for privatisation as well as grants and subsidies. As such, it is important that the state aid rules are considered from the onset of any proposal to ensure that proposed measures will be compatible with EU competition rules.

28 Further detail is available from the DTI and the European Commission.[4]

[4] See the DTI website (State Aid Policy Unit): http://www.dti.gov.uk and the European Commission's website on competition http://www.europa.eu.int.

Valuing Non-market Impacts

Annex 2

Introduction

1 The valuation of non-market impacts is a challenging but important element of appraisal, and should be attempted wherever feasible. This Annex outlines techniques on how to value non-market impacts, and some typical applications such as time-savings, health benefits, prevented fatality, design quality, and the environment. These approaches can be complex but are equally as important as market impacts.

Valuing Non-market Impacts

2 Where market values are not available for an identified cost or benefit, there are a number of approaches to attributing a value for inclusion in an appraisal, the most commonly used of which are outlined below.

Willingness to Pay and Willingness to Accept

3 The preferred method of valuation is to simulate the market by estimating the 'willingness to pay' (WTP) or 'willingness to accept' (WTA) a project's outputs or outcomes. Willingness to pay for a little more of a service is a reflection of the value placed by consumers on an increment of that service. The amount consumers are willing to pay depends to a large extent on the levels of income available to them, so valuations are usually obtained by averaging across income groups.

4 The quantification of potential social, health or environmental impacts normally requires an alternative approach to valuation. Techniques to establish money values for this type of non-market impact generally involve the inference of a price, through either a revealed preference or stated preference approach.

5 Revealed preference techniques involve inferring an implicit price revealed indirectly by examining consumers' behaviour in a similar or related market. Hedonic pricing is an example of this approach.[1] For example, the relationship between house prices and levels of environmental amenity, such as peace and quiet, may be analysed in order to assign a monetary value to the environmental benefit. Other examples are travel cost models (for recreational values) and random utility models (to value individual features of a site).

6 Stated preferences are normally obtained by specially constructed questionnaires and interviews designed to elicit estimates of the willingness to pay (WTP) for, or willingness to accept (WTA), a particular outcome.[2] When using stated preferences the main choice is between contingent valuation and choice modelling (CM). Contingent valuation studies elicit WTP or WTA via direct questions such as 'What is the maximum amount you would be prepared to pay every year to receive good x?' (the 'open-ended' format) or 'Which of the amounts listed below best describes your maximum willingness to pay every year to receive good x?' (the 'payment card' format). CM studies, on the other hand, elicit values by presenting respondents with a series of alternatives and then asking which is most preferred.[3]

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[1] For more information on hedonic pricing see CSERGE publication, Day (2001) 'The Theory of Hedonic Markets; Obtaining Welfare Measures For Changes In Environmental Quality Using Hedonic Market Data': 'Report for the EU Working Group on Noise'.

[2] Guidance on the use of stated preference techniques can be obtained from 'Economic Valuation with Stated Preference Techniques: Summary Guide' available on the DfT website (http//:www.dft.gov.uk).

[3] The term Choice Modelling encompasses a range of stated preference techniques. The term includes choice experiments (often preferred because of their firm base in welfare economics), contingent ranking, contingent rating and paired comparisons. Further detail is contained in *Economic Valuation with Stated Preference Techniques: Summary Guide*, see DfT website: http//:www.dft.gov.uk.

7 The technique chosen will depend on the individual circumstances, and should be judged on a case-by-case basis. As a general rule, revealed preference methods are fairly reliable, and should be used where the relevant information can be inferred. However, they cannot estimate the value placed on an asset by people who make no direct use of it. In these circumstances, stated preference methods may be helpful. In some cases, it will be appropriate to use both techniques together, for example, to check the consistency of results.

Other approaches

8 When faced with a mix of both monetary values and quantified data (and probably some unquantified considerations as well), weighting and scoring can be used to bring data expressed in different units into the appraisal process. Using this technique, options can be ranked and the preferred option identified. This approach usually involves an explicit relative weighting system for the different criteria relevant to the decision.[4] It often involves an implicit monetisation of different impacts, once the performance against the various criteria is compared to the costs considered worth spending to secure or to avoid them.

9 Where a direct assessment of the value of a benefit or cost is particularly uncertain, reference can be made to the costs of preventing the loss of, or replacing, a non-marketed good (such as a natural habitat or recreational facility). This does not provide a measure of its value but can provide a figure to focus discussion upon whether the good is worth as much as this expenditure.

10 In the absence of an existing reliable and accurate monetary valuation of an impact, a decision must be made whether to commission a study, and if so, how much resource to devote to the exercise. Key considerations that may govern a decision to commission research are:

- Tractability of the valuation problem: whether research is likely to yield a robust valuation;
- Range of application of the results of a study to future appraisals;
- How material the accuracy of the valuation is to the decision at hand. This may be gauged through sensitivity analysis around a range of plausible estimates; and,
- Scale of impact of the decision at hand. If the decision relates to a multi-billion pound programme or to regulation that will impose costs of similar scale upon industry, it is clearly worth devoting much more resource to ensuring that the valuations of the non-market benefits (and costs) are accurate than would be appropriate for a smaller scheme.

11 It is often difficult to assess the reliability of estimates emerging from a single study using a single method. Valuations may be unreliable because responses to questionnaires may be inconsistent or biased, or because valuations may take insufficient account of budget constraints. Estimates can be given more credence if different methods, or studies by different researchers, give similar results.

12 When using any technique, it is advisable to provide a range of values, and to subject the estimated values to a plausibility check with decision makers. The minimum or maximum valuation of a benefit or cost that would support a particular decision ('switching value') should be made explicit, compared with the real or implied valuations derived from previous decisions, and qualified by a statement of the robustness of the valuation techniques employed.

[4] An introduction to multi-criteria decision analysis – weighting and scoring – is given in *Multi-Criteria Analysis: A Manual* available from the ODPM website: http://www.odpm.gov.uk (see DTLR archive)

CURRENT RESEARCH / PLAUSIBLE ESTIMATES

13 Following are some areas where research has been undertaken to derive plausible estimates for particular non-market costs and benefits.

Valuing Time

14 Within central government, the Department for Transport's (DfT) approach to valuing time in the appraisal of road schemes and other projects is well established.[5] This approach uses different values for 'employers' time and 'own' time (or working and non-working time).

15 The value of employees' time-savings (working) is the opportunity cost of the time to the employer. This will be equal at the margin to the cost of labour to the employer: the gross wage rate plus non-wage labour costs such as national insurance, pensions and other costs that vary with hours worked.[6]

16 The values for working time used in the appraisal and modelling of transport projects and policies, are based on the mileage weighted labour costs of users of each mode of transport. The National Travel Survey (NTS) contains detailed information on the distance and amount of time spent in travel by individuals in each earnings band to provide the appropriate weights for each mode of transport. The New Earnings Survey provides estimates of the earnings of drivers of commercial and public service vehicles. In theory, it is possible to collect data on the earnings of those who would use the project being appraised, although this is rarely practical.

17 It is accepted practice to use a national average standard value of non-working time (equity value of time-savings) for all modes of transport for appraisal purposes. The use of a project-specific value of non-working time might be preferable in cases where time-savings can be captured through revenue from fares. These will often form part of a commercial decision by, for example, a train operator assessing the case for accelerating a service.

18 For transport appraisals, journeys to and from work are included in non-working time. The value of savings in travel time for work is assumed to rise at roughly half the rate of real income.[7] For non-work time, this assumption balances a number of factors that might either tend to increase or decrease the value of time-savings relative to income. These might include a decline in the marginal utility of money as incomes increase, changes in the length of the working week and changes in the quality of travelling conditions.

19 Some additional considerations when valuing time-savings include:

- People place a higher value on saving walking or waiting time than on saving time spent in a vehicle. Evidence suggests that walking and waiting time should be valued at double that used for in-vehicle time.[8]
- Time spent in overcrowded conditions on public transport also carries a higher weight, the value being determined by the severity of the overcrowding.

[5] See DfT website for additional guidance: http://www.dft.gov.uk

[6] DTI uses 27 per cent as an adjustment for non-wage labour costs, while HSE uses 30 per cent. See Labour Cost Survey (LCS) 1992

[7] See DfT website: http://www.dft.gov.uk

[8] See DfT website: http://www.dft.gov.uk

- Unreliability, measured in terms of deviations around the expected journey time, can also carry an additional penalty.
- Time-savings should be valued at the same rate per minute, whatever the extent of the saving or duration of the journey.

20 Using the estimated average values of travel time-savings from previous projects or proposals may not be appropriate if the characteristics of the client group are not similar to those of transport users, or if the circumstances differ significantly. Nevertheless, the estimates may serve as orders of magnitude.

Valuing Health Benefits

21 Health impacts are rarely a question simply of lives lost or saved. In policy areas that affect mainly health, an alternative approach is often used, to take account of changes in life expectancy (including expected life years where lives are lost or saved), and changes in the quality of life. This approach is known as the quality-adjusted life year (QALY).

22 The EuroQol instrument provides a simple and consistent framework for measuring general health and deriving QALY values and is the most commonly used measure of health benefits in Europe. It weights life expectancy for health-related quality of life over time.

23 The comparison of health interventions may reveal the impact of different factors on clinical effects. For example, working out the relationship between dosage and response of a particular medicine is a necessary prior step to properly valuing a policy for the provision of that medicine. In some cases, such as when the benefits of an intervention are measured in 'natural' units (e.g. reduced incidence of a disease or lower blood pressure rates), it may be appropriate to undertake an appraisal on the basis of its cost effectiveness.[9]

24 It is difficult to determine whether a health programme should be funded, or how large it should be, without first allocating a monetary value to the projected health gains. Valuation is also important when health impacts are to be weighed against non-health impacts. There are a number of techniques available, including undertaking a survey to estimate an individual's WTP for certain health benefits.[10] Once WTP is known, appraisers can compare the marginal benefits of an intervention against its marginal costs.

25 An example of a broad approach to estimating acute health impacts is set out in Box 2.1.[11]

[9] It is also possible to appraise a proposal on the basis of its 'cost utility' if there is an appropriate measure of the benefit of an intervention in terms of human welfare.

[10] The interim Interdepartmental Group on Costs and Benefits (IGCB) report, *'An Economic Analysis of the National Air Quality Strategy Objectives'* provides an example of how to conduct an economic analysis including health benefits.

[11] Further guidance on the assessment and valuation of health impacts is given in the Department of Health's (DH) *'Guidance on Policy Appraisal and Health'* (1995) and *'Evaluation of Health Technologies for Use in the NHS: Good Practice Guidelines'* (1999). HSE guidance on the valuation of health impacts is included in GAP23, *'Regulatory Impact Assessment – Policy Appraisal'*, June 2002.

BOX 2.1: MEASURING SHORT TERM HEALTH BENEFITS ASSOCIATED WITH REDUCTIONS IN AIR POLLUTION[12]

A FIVE-STEP APPROACH TO VALUING HEALTH IMPACTS

1. Estimate the annual average concentration of pollutants and resident population in each 1km grid square of the country.
2. Assign the baseline level of the given health-related and pollution affected events to each grid square e.g., daily deaths, hospital admissions for the treatment of respiratory diseases.
3. Combine the data from (1) and (2) and apply a dose-response function linking pollutant concentrations with the relevant effects. Dose-response functions are expressed as a percentage increase in the baseline rate of health outcome per unit concentration of pollutant. Three outputs can be derived:
   - 3.1 The current effect on health of the relevant pollutant per grid square
   - 3.2 The benefit to health per grid square produced by the fall in concentrations of air pollutants expected to occur
   - 3.3 The benefit to health produced by reducing the concentration of pollutants in each grid square, in accordance with the proposed policies which aim to meet the objectives.
4. Sum the results obtained in (3) to estimate the total reduction in the number of cases of each health effect (which has an accepted dose-response function) associated with meeting or approaching the objectives.
5. Apply monetary values for each health effect to transform quantitative estimates into monetary estimates.

The Value of a Prevented Fatality or Prevented Injury

26 A benefit of some proposals is the prevention of fatalities or injuries. The appropriate starting point for valuing these benefits is to measure the individual's WTP for a reduction in risk of death (or their willingness to accept a new hazard and the ensuing increased risk).

27 The willingness of an individual to pay for small changes in their own or their household's risk of loss of life or injury can be used to infer the value of a prevented fatality (VPF). The changes in the probabilities of premature death or of serious injury used in such WTP studies are generally very small.[13]

[12] See *An Economic Analysis to Inform the Review of the Objectives for Particles Air Quality Strategy* available on the Defra website (http://www.defra.gov.uk).

[13] Franklin (2000), chapter 7, suggests that individuals systematically undervalue small risks, possibly introducing a downward bias in estimating VPF.

28 In the UK, the main measure of VPF incorporates the 'extra' value placed on relatives and friends, and any further value placed by society on avoiding the premature death of individuals. Accordingly, the addition of an individual's WTP for the safety of others to his 'own' WTP for 'own' safety may lead to double counting.[14]

29 A lower bound on the value of a prevented fatality may be determined by revealed preference and stated preference studies. This lower bound is useful for determining a threshold of value for money for safety expenditure and also for comparing proposals concerning increased safety.

30 Revealed preference studies can derive individual WTP for risk reduction from, for example, the size of wage differentials for more or less risky occupations; or price versus safety trade-offs in choosing transport modes; or WTP for safety devices such as smoke alarms or car air bags. However, in practice, these estimates of the revealed value of a prevented fatality are not precise. Stated preference approaches have also been used to provide estimates of VPF using questionnaires.[15]

31 In the UK, the Department for Transport (DfT) values the reduction of the risk of death in the context of road transport at about £1.145m per fatal casualty prevented (in 2000 prices).[16] In addition to the WTP measures, these estimates include gross lost output, medical and ambulance costs. Values are uprated in line with assumed changes in GDP per head.

32 DfT also attributes monetary values to the prevention of non-fatal casualties, based on a WTP approach. Serious and slight casualties are valued separately and the values are uprated in line with changes in GDP per head. Values currently in use for preventing a serious and slight road injury are £128,650 and £9,920 respectively (at 2000 prices).[17] Costs of police, insurance and property damage are added to these casualty values to obtain values for the prevention of road accidents. The HSE tariff of monetary values for pain, grief and suffering begins at £150 for the most minor non-reportable injury.[18]

33 There is evidence that individuals are not indifferent to the cause and circumstances of injury or fatality. For example, in their estimate of benefits from asbestos proposals, HSE currently doubles the VPF figure to allow for individual aversion to dying from cancer, and the additional associated personal and medical costs.[19]

Valuing Design Quality

34 Design quality is an important element of all public sector building projects and should be assessed during appraisal. Limiting property valuation to traditional methods without consideration of the costs and benefits of design investment can distort the decision making process. Good design will not always result in the lowest initial capital cost. However, over the period of the contract a higher initial investment can, when expressed as a discount value, result in the lower whole life costs.

[14] This augmentation of the 'own' WTP-based figure is legitimate only if concern for others' safety takes the form of 'safety-focused altruism' where despite being concerned for others' safety, people are indifferent to other determinants of their overall well-being. For cases that are intermediate, some augmentation of the 'own' WTP-based figure is justifiable. (M W Jones-Lee, (1992))

[15] For additional information, refer to HSE (2000a), *'Valuation of Benefits of Health and Safety Control, Final Report'*, which describes an approach used to update the DfT value for reduction in risk of a fatality.

[16] DfT See (Highways Economic Note No 1. 2000) 'Valuation of The Benefits of Prevention of Road Accidents And Casualties'. Available on the DfT website (http://www.dft.gov.uk).

[17] ibid

[18] See HSE website: http://www.hse.gov.uk

[19] There is currently no evidence to support this adjustment. HSE has commissioned a study to investigate public preferences for preventing fatalities due to 'dreaded' risks to inform this issue.

35 The benefits of good design include:

- Simplification and savings in cost, by ensuring that capital costs are competitive and that savings can be achieved on running costs;
- Increased output and quality of service through enhancement of the environment in which a service is provided; and
- Staff recruitment and retention.

36 Where good design has a direct economic impact, such as staff retention or patient recovery times, it may be possible to calculate the costs and benefits directly. However, it is often difficult, if not impossible, to calculate the monetary value of many of the benefits of good design, such as civic pride, educational achievement or user experience. In such instances, it may be necessary to use contingent valuation or a similar technique. For smaller projects, where contingent valuation may prove too complicated, research studies can help with comparisons and benchmarking to ensure good design is accounted for.

DETAILED GUIDANCE ON EVALUATING AND DELIVERING DESIGN QUALITY CAN BE FOUND IN:

- *The Value of Good Design*, CABE
- *Achieving Well Designed Schools Through PFI*, CABE
- *Better Civic Buildings and Space*, CABE
- *Treasury Guidance Note 7: How to Achieve Design Quality in PFI projects*
- *Improving Standards of Design in the Procurement of Public Buildings*, CABE/OGC
- *The CABE website* (http://www.cabe.org.uk)

VALUING ENVIRONMENTAL IMPACTS

37 The valuation of environmental costs and benefits is constantly evolving, with new research continually being funded by the UK government and its agencies. Research covers both methodological development and the estimation of values. There are a number of valuable reference sources that discuss valuation issues in depth.[20] The following paragraphs provide information on government research and guidance on the quantification and monetisation of impacts, including which departments are sponsoring research. As this is a developing field, policy makers are encouraged to refer to the Green Book homepage, in order to locate the most up to date information.

[20] See, for example, "Economic Valuation with Stated Preference Techniques: Summary Guide", available on the DfT website at http://www.dft.gov.uk.

Impacts of policies and measures on greenhouse gas emissions

38 Current methodologies for assessment of the effects of policies and measures on greenhouse gas emissions are policy specific with no standard guidance available. There are some models available that can be used to assess the effects of particular types of proposals on emissions (e.g. National Road Traffic Forecasts).[21]

39 The impact of a new policy, project or programme on emissions should be expressed in terms of carbon savings, or in terms of additional emissions, measured in million tonnes of carbon-dioxide equivalent (MtC02).

40 In cases where quantification of the climate change effect is impractical, an assessment of whether the policy is likely to increase or decrease emissions, combined with a qualitative assessment of the significance of this change, should be included in the appraisal.

41 Once the emissions impact of a proposal has been quantified, current research informs the calculation of illustrative values for the social damage cost of carbon.[22] This can then be used to estimate the monetary value of the impacts.

Assessing vulnerability to the impacts of climate change

42 In 1997, the UK government established the UK Climate Impacts Programme (UKCIP) to help public and private organisations assess their vulnerability to climate change. UKCIP, together with Defra, can provide the latest information on climate change predictions and assessments. This includes guidance on how to identify and assess the risks and uncertainties posed by a changing climate, and a methodology for costing the impacts of climate change.

43 Key policy areas where climate change might be a particularly important consideration include: investment appraisal for long-term planning and infrastructure projects, regulatory and planning frameworks, contingency planning and long-term policy frameworks.

Air Quality

44 Assessing the impact of particular policies on air quality is a complex science. Sophisticated modelling tools exist to forecast emissions from different sources and estimate the impact on ambient concentration levels of different pollutants at different locations.[23] Government departments and agencies may need to consider air quality impacts in the design of their policies. For example, the Highways Agency's Design Manual for Roads and Bridges can be used to forecast the impact of new or existing road schemes on emissions of key pollutants from road transport.

45 Impacts on air quality are generally expressed in terms of either the total volume change in emissions of a particular pollutant from a particular source; the likely impact of this change on levels of ambient air quality in the affected area; or the total number of households likely to be affected by these changes.

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[21] Contact Defra for further advice on assessing the effects of a proposal on emissions.

[22] A Government Economic Service working paper 'Estimating the Social Cost of Carbon Emissions' suggests illustrative values for the social damage cost of carbon that can be used to estimate the monetary value of impacts once they have been quantified. A copy of this working paper is available on the Treasury's website http://www.hm-treasury.gov.uk. Defra can provide an associated guidance note on how to use these values in policy appraisal.

[23] For a technical reference on the approach to air quality mapping and modelling, see "The Air Quality Strategy for England, Scotland, Wales and Northern Ireland", Defra, January 2000,

46 In cases where detailed modelling is not possible, a reasoned statement of whether or not a particular policy is likely to result in greater or lesser emissions of particular pollutants should be included in the appraisal.

47 Research has been funded to develop a methodology for quantifying and monetising, where appropriate, the health and environmental impacts of air quality changes.[24]

Landscape

48 Landscape includes townscape, heritage, and other related matters. Guidelines for assessing the impact of policies, projects and programmes on landscape have been devised by English Heritage and the Countryside Commission.[25] The Commission for Architecture and the Built Environment (CABE) may also be able to provide guidance.[26]

49 Research has also been commissioned Defra to estimate the value of environmental landscape features associated with agri-environment schemes. Contingent valuation techniques have been used, producing an Environmental Landscape Features (ELF) model. This constitutes a first attempt at a benefits transfer tool for appraising agri-environment policy.[27] Features covered include heather moorland, rough grazing, field margins and hedgerows. The model provides estimates of WTP for these features on an area basis, and estimates of their diminishing marginal utility.

Water

50 It is not easy to derive economic values for damage costs of water pollutants. The complexity of the way in which pollutants entering the water environment affect chemical water quality and ecological status means that it is difficult to devise simple dose-response functions. Furthermore, there are several ways in which the benefits of improving water quality are location-dependent and it is not easy to determine the relevant population to use for grossing up values, or how to take account of decay functions to represent 'distance decay'.[28] Therefore, water valuation studies do not generally produce 'marginal damage cost' estimates for specific pollutants; they are more geared towards producing values for observable changes in environmental quality.

51 Numerous studies have attempted to estimate the economic value of changes to water quality or flow rates/levels in water bodies,[29] but establishing values that can be transferred is difficult. New research is planned by Defra, the Environment Agency and Ofwat to value the environmental benefits of changes in water quality.

[24] Guidance can be found on the Defra website (http://www.defra.gov.uk). Defra has also sponsored research to generate empirical estimates of UK WTP for reductions in health risks associated with air pollution.

[25] These guidelines draw extensively on the Guidance on the Methodology for Multi-Modal Studies (GOMMMS) available from the DTLR archive accessed from the ODPM website: http://www.odpm.gov.uk.

[26] See website: http://www.cabe.org.uk

[27] "Estimating the Value of Environmental Features", Reports to MAFF, January 1999 and June 2001.

[28] "Distance decay" refers to the observation that people living further away from an environmental impact care less about it and therefore express lower valuations.

[29] For example, "Valuation of Benefits to England and Wales of a Revised Bathing Water Quality Directive and Other Beach Characteristics Using the Choice Experiment Methodology", Eftec report to Defra, 2002. Also, the Environment Agency has a register of 50 water valuation studies which covers values for recreation, water quality, flood defence, navigation and fishing (Netcen 1998).

Biodiversity

52 The benefits of biodiversity can be difficult to measure, define and value. However, if these benefits are disregarded or given a low priority in appraisal work, there is a risk of excessive and potentially irreversible degradation of natural resource stocks.

53 Defra and the Forestry Commission fund research on the valuation of biodiversity that is concerned both with developing methodological approaches and deriving empirical estimates.[30]

Noise

54 Assessing the impact of noise can be complex, not least because of the subjective nature of many of its effects. Despite this, a number of approaches to quantifying the impact of changes in noise according to the source, the scale and nature of the proposals have been developed. For example, the impact of new transport infrastructure or industrial developments can be quantified according to the number of people/households affected by an increase or decrease of noise levels measured in average decibels (dB(A)). This approach can also be used to assess the impact of changes to traffic control measures.

55 This is a rapidly developing area and studies are being taken forward to obtain monetary values for noise.[31] Recent studies across Europe have yielded a range of values, many of which lie in the range of €20 - 30 per household per decibel per year. The median value from those studies is €23.5 per household per decibel per year (2001 prices).[32]

Recreational and amenity values for forests

56 In 1992, the Forestry Commission established a value for recreational visitors to forests of £1 per visit. More recent work on the recreational value of forests in Northern Ireland suggested that mean willingness-to-pay (WTP) varies between £0.60 and £1.74 per visit, depending upon the location of the forest, its attributes and socio-economic characteristics of the visitors.[33] If a high level of accuracy is required, recreational values need to be more sensitive to the attributes of individual forests, the location and availability of substitutes, and the characteristics of the visitors in the catchment area. However if a broader estimate is sufficient, the 1992 value (£1 per visit) indexed to the year of the appraisal should suffice.

57 The Forestry Commission commissioned a further study to estimate the range of non-market benefits associated with forestry. This reviewed existing methodologies and research to determine the best approach to valuing the non-market benefits of UK forestry and made recommendations on non-market values for recreation, landscape, amenity, biodiversity and carbon sequestration.[34]

[30] Guidance is also available from two OECD publications, "Handbook of biodiversity valuation: a guide for policy makers" and "Valuation of Biodiversity Benefits: Selected Studies."

[31] The results of DfT noise studies in the UK and guidance on how to implement values when undertaking appraisal are published on the DfT and Defra websites.

[32] Summarised in the 2002 report to the European Commission DG Environment "The State of the Art on Economic Valuation of noise" by Stale Navrud .

[33] Summarised in a report to the Forestry Commission. "Non-Market Benefits of Forestry, Phase 1". (See http://www.forestry.gov.uk)

[34] ibid.

Valuing disamenity

58 Activities including the transport and disposal of waste and the quarrying of minerals and aggregates give rise to a range of undesirable impacts that can undermine public enjoyment of an area. A number of studies have attempted to value these, which together can be considered disamenity impacts and which may include noise, traffic disturbance, dust, odours and visual intrusion.

59 The former DETR commissioned a study to inform the decision on whether to impose a tax on aggregates and, if so, at what level (See Box 2.2). [35]

BOX 2.2: SUMMARY OF DETR STUDY

The study estimated how much people valued avoiding the adverse environmental effects of quarrying for construction aggregates, such as crushed rock, sand and gravel, both in their locality and in landscapes of national importance.

Ten thousand respondents were picked at random from areas surrounding 21 sample quarries and other extraction sites. They were asked how much they would be willing to pay, in the form of increased taxes over a five year period, for the local quarry to be shut down, assuming that the site was restored in keeping with the surrounding landscape, and that the workers found new employment. A further 1,000 respondents, chosen at random from 21 English postcodes not near aggregates production sites, were asked what they would be willing to pay to close a quarry in a National Park (the Peak District and the Yorkshire Dales were used as examples). These results show the value attributed to the environmental damages of quarrying by people not themselves directly affected.

The environmental effects which people were asked to value included: adverse effects on nature, such as loss of biodiversity; noise from quarry transport and blasting; traffic and dust levels; and visual intrusion.

From the results of the surveys, national estimates were calculated for the average amount that people are willing to pay for the environmental benefits obtained from early closure of a quarry. These are shown below for each category of sample site:

'Willingness to Pay' estimates:

Case Study Sites	**£/tonne**
Hard rock	0.34
Sand and Gravel	1.96
Quarries in National Parks	10.52

The national average amount which individuals were willing to pay for the closure of all types of quarry sites, weighted by the type of output, was calculated to be £1.80 per tonne.

[35] London Economics (1999) *The External Costs and Benefits of the Supply of Aggregates: Phase II.* Report for DETR, now found on the ODPM website (see http://www.odpm.gov.uk)

Land and Buildings

Annex 3

Introduction

1 This annex contains sections on the valuation of land and buildings. It discusses how the value of property rights should be taken into account and provides a worked example (see Box 3.1) to show how the techniques discussed apply.

Acquisition and Use of Property

Valuing Property Rights

2 Appraising for projects involving interests in land and buildings is complicated by the longevity of the freehold and leasehold interests and the durability of the assets. This section discusses these issues.

3 Many appraisals involve considering the optimisation of government interests in land and buildings. The appraisals will involve interests in leasehold and freehold properties, PFI/ PPP arrangements where property forms a part, and direct investment in construction.[1]

4 Securing value for money from existing investments, as well as new public infrastructure requires careful consideration. With existing assets, consideration needs to be given as to whether these can be surrendered, merged or modified to release value. With newly built assets, consideration has to be given to design, whole life costs, fitness for purpose, operational efficiency, and end of life costs as well as the initial impact of the capital payment.

5 If a proposal involves the acquisition, management or disposal of legal rights in land and buildings, the value of those property rights needs to be taken into account, whether these interests are freehold, leasehold, a licence, or subsumed within a PPP/ PFI contract. With new construction, the initial cost, lifetime costs and residual value will need to be considered.

6 Property interests are costed in terms of capital value, or rental value. Some leasehold interests, where the rental is different from the market value, may also have a capital value. Appraisals normally use capital values when appraising freehold property, properties with development value, and longer leasehold interests. As for other appraisals, this is done by bringing the cashflows to a net present value or net present cost.

The Basis Of Valuation

7 The valuation of a site should be based on the most valuable possible use, rather than the highest value that could be obtained for its current use. The valuation should include an assessment of the social costs and benefits of alternative uses of a site, not just the market value.

Obtaining Valuations

8 An assessment of the value of a site in the most valuable alternative use should be based on the advice of suitably qualified and experienced valuation surveyor.[2] Either in-house valuers or external experts can be commissioned to carry out the valuation.

[1] New orders obtained by contractors from the public sector totaled £6,176 million in 2000 (Construction Statistics Annual 2000 DTI, Table 1.1, pg. 16 and Table 1.4, page 20).

[2] For instance, a corporate member of the Royal Institution of Chartered Surveyors or the Institute of Revenues, Rating and Values.

9 Valuations should be based on the definitions of 'market value' (MV) or 'open market value' (OMV) used in the '*RICS Appraisal and Valuation Manual*'. Valuations should take into consideration the prospects for development and the presence of any purchaser with a special interest, insofar as the market would do so. To take into account such potential purchasers, it may be necessary in instructing the valuer to adapt the RICS definition of MV/ OMV.

Common Issues In Valuation

10 The value of an interest in property depends on the use for which it is being valued (e.g. as residences, shops or offices), the physical state of the asset, the duration of the legal interest, and obligations such as rents and repairs, etc.

11 Normally, as noted above, the alternative use with the highest market value should be considered. To assess the highest value reasonably obtainable, the valuer must consider the market demand for that use together with the planning situation.

12 Where the development property has planning consent for a more valuable use, the valuation should reflect the market demand for that use. If the appraiser believes that there is the prospect of planning consent for an even more valuable use than that previously obtained, and that there is a real economic demand for that use, then the appraisal should ignore both the existing use of the building and the existing planning consent. Instead, it should normally reflect the best use and highest value of the site, in the way that the market would do.

13 If there is no planning approval, the potential for obtaining such approval should be estimated, and reflected in the valuation. Alternatively, the value of a property may be depressed by restrictions on development. It should be considered whether or not these can be lifted (and at what cost), and the result of this should be reflected in the valuation. In all cases, the prospect for obtaining a higher planning consent should be considered by the appraiser and his professional property advisor.

14 Valuations based on market prices reflect private, rather than social, costs and benefits. Accordingly, they will not always take into full account the actual or potential amenity value, or environmental impact, of a particular land use. Generally, where there is such an impact (for example along the route of a proposed new road), land should be valued at its market price. Environmental costs or benefits of a change of use that are not captured in the market price should also be included in the reckoning.

15 Where the current use of land is subsidised, it is sometimes necessary to adjust market prices to reflect the impact of the subsidy. In particular, when considering transferring land from agricultural use, it will generally be appropriate to make a downward adjustment to the market price of the land to reflect the capitalised impact of expected future UK and EU subsidies: i.e. the land should be priced net of the impact of such subsidies.

16 As these adjustments reflect avoided future costs to taxpayers, it is the adjusted sum that should be included in the assessment.

17 Assessing the value of buildings in their most profitable use is fairly straightforward where the building can be readily adapted to different user requirements, such as standard office accommodation. However, many public sector buildings (such as prisons and hospitals) may not be so easily adaptable to other purposes.

18 Even if there is no developed market for a particular type of property, there may be relevant market information. Such evidence might come from market transactions from the sale, or lettings of buildings or part of buildings such as in the private hospital sector, letting of accommodation for tribunals, etc. It is desirable to estimate

value as close to objective market transactions evidence as possible. However, there are some public sector buildings (such as prisons and defence installations) that may not be easily adaptable to other purposes.

19 If there is no alternative use for the buildings, the property should be valued as the higher of:

- The value of the site, cleared of buildings and contamination and ready for redevelopment; or
- The value of the site and buildings in its current use.

Valuations Where There Is No Market

20 The valuation of a specialised building for which there is no market is problematic for valuers and appraisers. The RICS *Appraisal and Valuation Manual* suggests using the 'Depreciated Replacement Cost' basis of valuation.

21 Depreciated Replacement Cost (DRC) comprises the 'open market value' of the land in the present use, plus the current gross replacement cost of the buildings and their site works. The buildings costs are depreciated by an allowance to reflect their condition and age, and their functional, economic and environmental obsolescence. These factors render the existing property less valuable than a new replacement.

22 Valuers have two approaches to depreciated replacement cost. One involves envisaging an exact replacement of the existing building, which can be artificial if the skills and materials do not actually exist to replicate that building. The second approach is to imagine a modern building that is a functional substitute, even if it is smaller, or differently configured to reflect modern circumstances.

23 DRC valuations are relatively specialised and advice should be sought from a professional property consultant. DRC figures are subjective figures, which reflect the value to the owner, rather than objective, transaction based, opportunity cost. They tend to be on the high side and require careful handling. DRC should only be used where there is a continuing operational need for the property (or the stream of services derived from it) over the period of the appraisal.

Leases and Rents

24 Sometimes, the actual rent paid on leasehold property (the 'passing rent') will vary from the market rent. This most often occurs in older long leases with unusual rent review patterns. In longer leases with infrequent rent reviews, the market rent can substantially exceed the passing rent and this difference is known as a 'profit rent'. This lasts until the next rent review or the lease ends. This can give the lease a capital value in its own right and such leases are sold from time to time. In a depressed market, the passing rent can exceed the market rent so that the property is described as 'over-rented'. Such leases usually contain upward only rent review clauses (UORR) so that if a rent is set at the top of a property cycle, this may persist over one or more rent review periods.

25 The market rent is the estimated amount for which a property would lease at the date of the appraisal between a willing lessor and a willing lessee operating at arms length, after proper marketing, with proper market knowledge, prudently and without compulsion.

26 Appraisers should also note that the passing rental value (and thus the capitalised rental value) on physically similar properties might be quite different. This may reflect the fact that the lease of one office block may be on full

repairing and ensuring terms where the tenant pays for all repairs and insurance. A physically identical office block may have an entirely different lease but with the landlord responsible for insurance and repairs.

27 It is important to remember that what is being valued is the legal interest in a property rather than the physical property itself. This means that appraisers should generally use the market rent because the legal interest that is being appraised will usually cover a number of rent review periods, and it will be the market rent that, over time, will be the relevant value. However, where UORR clauses are imposed, it would be incorrect to use sensitivity testing to show the impact of falling market rents, as the actual rent paid will not fall in line with the market.

Disposal of Property

28 Departments have a duty to dispose of property surplus to requirements within three years and should not hold land speculatively. They are encouraged to obtain professional, specialist advice when doing this. The sale of freehold property, or the assignment or subletting of leasehold property, is likely to involve significant costs, (e.g. legal fees, marketing costs and removal costs). Situations can be complex where there is more than one occupier.

29 One question to consider is what should be done to a surplus property prior to putting it on the market. Initiatives to improve its marketability would include:

- Refurbishment;
- Applying for a different outline (or detailed) planning consent. However, sometimes it is not clear what is the best alternative use, in which case properties could be put on the market 'subject to planning permission'; and
- Consulting other public sector bodies about their property requirements. The OGC maintains a register of property surpluses and requirements.

30 More detailed advice on property disposals can be obtained from the Office of Government Commerce (OGC).[3]

Cost-effective Land Use

31 The plots of land that are available for new developments may not precisely match requirements, but where a plot exceeds requirements, the surplus should be disposed of as soon as possible.

32 An exception to this rule is in cases where future expansion is anticipated, (for example within a phased development), and where the extra land may not be available later. Efforts should still be made to secure some return from land than needs to be retained, but which is temporarily surplus (for example by short term letting).

33 Including the value of land already owned means that an appraisal must also include the costs of retaining vacant land. It is sometimes argued that vacant land on government sites could not be used for any other purpose because of the demands of security, and so the opportunity cost of this land is zero. However, it is generally possible, by the re-organisation of a land portfolio taken as a whole, to release land elsewhere. In practice, land that can be used for a public sector project nearly always has an opportunity cost.

[3] http://www.ogc.gov.uk and from '*Government Accounting*', particularly Chapter 24, Disposal of Assets

BOX 3.1: LAND AND BUILDINGS WORKED EXAMPLE

34 The purpose of this example is to introduce basic concepts regarding typical accommodation appraisals and/or evaluations; some are specific to land and property valuation, and others apply more generally.

CONTEXT

A government department (A) owns the freehold of a 2000 m2, 1960's office block on the outskirts of the city. It lets 500 m2 to another government department (B) under a memorandum of terms. Department B continues to occupy the premises, with Department A's permission, although the current memorandum of terms has expired. Department A occupies the remainder.

Enquiries of the local authority have confirmed that planning consent for conversions of the buildings for high density, high quality residential development would be granted. Department A's current accommodation is poor; a staff survey has revealed widespread dissatisfaction with its facilities. Managers are now exploring the options for providing future accommodation needs.

OBJECTIVES

The main aim of Department A is to provide modern office accommodation for its staff in a manner which represents value for money.

OPTIONS

A number of options are being considered, including relocating the activities of this branch to the Department A's head office. For this example, only three will be considered in detail.

Option 1 'Do Minimum'

This entails refurbishing the current property at a cost of £1 million. Department B has expressed an interest in taking a new lease after refurbishment for 15 years, with 5 yearly upwards-only rent reviews at a rent of £60,000 per annum, effectively on full repairing and insuring terms, which represents the current open market rental value.

It is likely that there will be a need for a further minor refurbishment of the building in 10 year's time at a cost of £0.5 million, but it is anticipated that this will help maintain the open market rental value of the property in real terms, with only a slight decline.

Option 2 New office block

Department A moves into 1500m2 of a new city centre office block, to be completed in the near future, situated next door to a rail and bus terminus. The location is seen as one that will improve markedly over the next couple of years or so and consequently, rental values are expected to grow faster than the rate of inflation over this period.

continued

BOX 3.1: LAND AND BUILDINGS WORKED EXAMPLE (contd)

The developer would be prepared to accept a fifteen-year full repairing and insuring lease for the property, with a tenant's option to break at the end of the 10th year, without penalty. The initial rent can be agreed today at £240,000 per annum subject to upwards-only rent reviews every 5 years. Department A's consultant surveyors have confirmed that the rent and other terms generally reflect current market conditions.

Option 3 Re-use existing vacant government office space

Department A moves to a vacant office property currently leased to another department and surplus to their requirements.

The property, known as Crown Building, comprises a 1500m2 modern city center office block. The location is similar to that of the new city centre property outlined in Option 2 above. The passing rent is lower at £200,000 as it is a second hand building with a more basic specification, but growth assumptions are similar.

The existing 15 years' lease has 5 years left to run and can be renewed under the Security of Tenure provisions of the Landlord and Tenant Act. The Owning Department's agents advise that the cost of disposal or surrender will be equivalent to the rent and running costs for the remaining period of the lease.

ASSUMPTIONS

The detailed assumptions are shown in the notes to the tables of calculations.

Option appraisal

The Department initially performs a cost-effectiveness analysis on the three options. Table 1 shows the results of this analysis.

Initial appraisal findings (table 1)

The cost effectiveness analysis shows that option 3, the reuse option, provided significantly better value.

Valuing benefits (table 2)

Managers want to investigate the differences between the options further. Models are developed of the benefits that accrue from each option. There are some additional benefits in moving to the new, more accessible site. These include times-savings for the public who use the site regularly, accruing from the more central location.

CONCLUSION

In this example, cost effectiveness analysis is sufficient to make an appropriate choice. Valuing its additional benefits further improves the case for developing a solution based on Option 3.

This example illustrates some specific aspects of accommodation appraisals, as well as introducing benefits valuation in the appraisal process, which is considered in more detail in Annex 2.

Reference to Notes		TOTAL	Year 0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Option 1 Do minimum - refurbish																	
	Property/capital costs																	
1	Rent received (nominal terms)		*0.0*	*30.0*	*60.0*	*60.0*	*60.0*	*60.0*	*67.1*	*67.1*	*67.1*	*67.1*	*67.1*	*75.9*	*75.9*	*75.9*	*75.9*	*75.9*
2 & 3	Rent received (real terms - year 0 prices)		0.0	29.6	57.8	56.4	55.0	53.7	58.5	57.1	55.7	54.4	53.0	58.5	57.1	55.7	54.4	53.0
4	Site value		-3,500															3,200
5	Refurbishment costs		-1,000										-500					
6	*Running costs*																	
	Rates (real terms)			-103	-105	-108	-110	-113	-116	-119	-122	-125	-128	-131	-134	-138	-141	-145
	Maintenance/repairs			-30	-30	-30	-30	-30	-30	-30	-30	-30	-30	-30	-30	-30	-30	-30
7	Utilities/other			75	-100	-100	-100	-100	-100	-100	-100	-100	-100	-100	-100	-100	-100	-100
8	Costs of holidng Crown Building vacant			-295	-290	-286	-281	-277	0	0	0	0	0	0	0	0	0	0
9	Tenants' service charge contribution			12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
	Business costs																	
	Business travel and courier costs			-130	-130	-130	-130	-130	-130	-130	-130	-130	-130	-130	-130	-130	-130	-130
	CASHFLOW		-4,500	-441	-585	-585	-584	-584	-305	-310	-314	-319	-823	-238	-325	-330	-335	2,860
10	Net present cost @ 3.5%	**-7,692**	-4,500	-433	-556	-537	-518	-501	-253	-248	-243	-238	-594	-166	-219	-215	-211	1.737
	Option 2 New City Centre Block																	
	Property/capital costs																	
11	Rent paid (nominal terms)			*-180*	*-240*	*-240*	*-240*	*-240*	*-313*	*-313*	*-313*	*-313*	*-313*	*-354*	*-354*	*-354*	*-354*	*-354*
11 & 12	Rent paid (real terms - year 0 prices)			-178	-231	-226	-220	-215	-273	-266	-260	-254	-247	-273	-266	-260	-254	-247
	Fitting out, telecoms, removals		-250															
13	Tenants' compensation		-120															
	Dilapidations on lease expiry																	
	Running costs																	-250
	Rates			-128	-131	-135	-138	-141	-145	-149	-152	-156	-160	-164	-168	-172	-177	-181
	Maintenance/repairs			-20	-20	-20	-20	-20	-20	-20	-20	-20	-20	-20	-20	-20	-20	-20
	Utilities/other (cleaning/security)			-85	-85	-85	-85	-85	-85	-85	-85	-85	-85	-85	-85	-85	-85	-85
	Costs of holiding Crown Building vacant			-295	-290	-286	-281	-277	0	0	0	0	0	0	0	0	0	0
	Business costs																	
	Business travel and courier costs			-90	-90	-90	-90	-90	-90	-90	-90	-90	-90	-90	-90	-90	-90	-90
	CASHFLOW		-370	-796	-848	-841	-834	-828	-613	-610	-607	-605	-602	-632	-629	-627	-625	-873
	Net present cost @ 3.5%	**-8,732**	-370	-782	-805	-772	-739	-709	-507	-488	-469	-451	-434	-440	-424	-408	-393	-530
	Option 3 Reuse Crown Building																	
	Property/capital costs			*-200*	*-200*	*-200*	*-200*	*-200*	*-261*	*-261*	*261*	*-261*	*-261*	*-295*	*295*	*295*	*295*	*295*
11	Rent paid (nominal terms)																	
11 & 12	Rent paid (real terms - year 0 prices)			-198	-193	-188	-183	-179	-228	-222	-217	-211	-206	-228	222	217	211	206
	Fitting out, telecoms, removals		-750															
13	Tenants' compensation		-120															
	Dilapidations on lease expiry																	
	Running costs																	- 250
	Rates			-103	-105	-108	-110	-113	-116	-119	-122	-125	-128	-131	-134	-138	-141	-145
	Maintenance/repairs			-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25	-25
	Utilities/other (cleaning/security)			-85	-85	-85	-85	-85	-85	-85	-85	-85	-85	-85	-85	-85	-85	-85
	Business costs																	
	Business travel and courier costs			-90	-90	-90	-90	-90	-90	-90	-90	-90	-90	-90	-90	-90	-90	-90
	CASHFLOW		-870	-500	-498	-496	-494	-492	-543	-541	-538	-536	-534	-559	-113	-121	-130	-389
	Net present cost @ 3.5%	-6,094	-870	-492	-473	-455	-438	-422	-450	-432	-416	-400	-385	-389	-76	-79	-82	236
			0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

NOTES TO TABLE 1 – EXPLANATIONS AND ASSUMPTIONS

1 'Passing rent' (nominal) and real rental values ('market rent'). In this example, rent is reviewed every five 5 years. This means that the real rent level is eroded by inflation between rent reviews; inflation is assumed to be 2.5%, as is the market rental growth rate (i.e. rents rise in line with inflation). For example, in year 6, actual rent (the passing rent) catches up with the market rent (the calculation is 60,000*1.025^4.5=67,052).

There are two main methods to deal with rental cash flows – (a) convert the nominal cash flow into the real terms by deflating the rent by the rate of inflation and then discount at the appropriate discount rate, or (b) discount the nominal cash flow at the 'double discount' rate, which is derived by multiplying the discount rate with the inflation rate. The Treasury's preferred method (as shown in this example) is (a), which is more explicit, allowing all the cash flows to be gathered together and expressed under a common term. However, the results produced are identical.

2 Rental growth is assumed to be 2.5% for Option 1: no higher than inflation.

3 Rent-free period: The tenant will enjoy a rent-free period of 6 months in year 1 (as part of the terms negotiated for the new lease).

4 Site value. This is the opportunity cost of not selling the site at its open market value in the best alternative use (i.e. for residential accommodation).

5 Running costs inflate annually and therefore can be expressed in real terms relating to year 1.

6 Utilities costs reduce in real terms from Option 1 to 2 because of energy and environmental efficiencies of the new building.

7 Other costs also reduce in real terms from Option 1 to 2 because of other efficiencies (location and scale).

8 Tenants contribution: tenants will contribute towards some of the cost of the ten-year refurbishment.

9 Business travel costs reduce from Option 1 to 2 because of the more accessible location of the new building.

10 Cash flows and net present costs. The net present costs are shown using the 3.5% discount rate.

11 Rental growth = 10% during the first two years, 2.5% thereafter; this is only realised at the rent reviews. For example in year 6, the calculation for the rent paid is 240,000*1.1^2*1.025^3.

12 Initial rent free period of 3 months.

13 Tenants' compensation under the Landlord and Tenants Act 1954 is based upon twice the rateable value on the assumption that there has been continued occupation of the existing premises for more than 14 years.

14 Timing of cash flows: all cash flows are to the midpoint of the year.

15 Decanting costs have not been included for option 1 for the sake of simplicity.

16 Costs of holding Crown Building vacant rent and running costs until lease expiry. Rent passing £200,000. Running costs when vacant £100,000

17 Costs of fitout/telecoms/removals to move to Crown Buildings estimated at £750,000

18 The costs of holding Crown Buildings vacant must be shown in Options 1 and 2 as the investment appraisal must account for all costs, not just to the individual Department

Land and Buildings Worked Example: Table 2

COST AND BENEFIT ANALYSIS

		TOTAL	Year 0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Option 2 New City Centre Block																	
	Costs		-370	-796	-848	-841	-834	-828	-613	-610	-607	-605	-602	-632	-629	-627	-625	-873
	Additional Benefits																	
1	Improved disabled access			10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
2	Reducing commuting time (visitors)			30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
	Net cost		-370	-756	-808	-801	-794	-788	-573	-570	-567	-565	-562	-592	-589	-587	-585	-833
3	NPV(3.5%)	**-8,225**	-370	-743	-767	-735	-704	-675	-474	-456	-438	-421	-406	-413	-397	-382	-368	-506
	Option 3 Reuse Crown Building																	
	Costs		-870	-500	-498	-496	-494	-492	-543	-541	-538	-536	-534	-559	-113	-121	-130	-389
	Additional Benefits																	
	Improved disabled access			10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
	Reducing commuting time (visitors)			30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
	Net cost		-870	-460	-458	-456	-454	-452	-503	-501	-498	-496	-494	-519	-73	-81	-90	-349
	NPV (3.5%)	**-5,625**	-870	-452	-435	-418	-402	-387	-417	-400	-385	-370	-356	-361	-49	-53	-57	-212

NOTES TO TABLE 2

1 Calculated assuming that additional value is attached to these benefits.

2 Assumes that it is a public building.

3 Standard NPV calculation.

Risk and Uncertainty

Annex 4

Introduction

1 This annex provides further guidance in each of the following areas:

- Risk management;
- Transferring risk;
- Optimism bias;
- Monte Carlo analysis;
- Irreversibility; and,
- The cost of variability in outcomes.

Risk Management

2 Risk management is a structured approach to identifying, assessing and controlling risks that emerge during the course of the policy, programme or project lifecycle. Its purpose is to support better decision-making through understanding the risks inherent in a proposal and their likely impact.

3 Effective risk management helps the achievement of wider aims, such as: effective change management; the efficient use of resources; better project management; minimising waste and fraud; and supporting innovation.

Organisation level risk management

4 Public sector organisations should foster a pragmatic approach to risk management at all levels.[1] This involves:

- Establishing a risk management framework, within which risks are identified and managed;
- Senior management support, ownership and leadership of risk management policies;
- Clear communication of organisational risk management policies to all staff; and
- Fully embedding risk management into business processes and ensuring it applies consistently.

5 These actions should help establish an organisational culture that supports well thought out risk taking and innovation.

Policy, programme and project level risk management

6 At the level of individual policies, programmes and policies, risk management strategies should be adopted in a way that is appropriate to their scale.

[1] On the 20 Novemeber 2002, the government (Strategy Unit) published new proposals to help improve risk management in the public sector. See the Cabinet Office website for further details (http://www.cabinet-office.gov.uk/)

7 A risk register or risk log is a useful tool to identify, quantify and value the extent of risk and uncertainty relating to a proposal. A risk register / log can be used to identify the bearer of each risk and uncertainty associated with the project being appraised, provide an assessment of the likelihood of each risk occurring, and estimate its impact on project outcomes. Box 4.1 provides more detail.

BOX 4.1: RISK REGISTER (RISK LOG)

PURPOSE

A risk register lists all the identified risks and the results of their analysis and evaluation. Information on the status of the risk is also included. The risk register should be continuously updated and reviewed throughout the course of a project.

CONTENT

A risk register is best presented as a table for ease of reference and should contain the following information:

- ❑ Risk number (unique within register);
- ❑ Risk type;
- ❑ Author (who raised it);
- ❑ Date identified;
- ❑ Date last updated;
- ❑ Description;
- ❑ Likelihood;
- ❑ Interdependencies with other sources of risk;
- ❑ Expected impact;
- ❑ Bearer of risk;
- ❑ Countermeasures; and
- ❑ Risk status and risk action status.

FURTHER INFORMATION

For an example of a risk log and further information on the identification of risks and successful project and risk management refer to the OGC.[2]

Risk Mitigation

8 There are a number of approaches appraisers might take to mitigate the impact of the identified risks. These are outlined in Box 4.2.

[2] See website: http://www.ogc.gov.uk

BOX 4.2: OPTIONS TO HELP MANAGE RISK

- **Active risk management** – Effective management of risks involves:
  - identifying possible risks in advance and putting mechanisms in place to minimise the likelihood of their materialising with adverse effects;
  - having processes in place to monitor risks, and access to reliable, up-to-date information about risks;
  - the right balance of control in place to mitigate the adverse consequences of the risks, if they should materialise; and,
  - decision-making processes supported by a framework of risk analysis and evaluation.
- **Early consultation** – Experience suggests that costs tend to increase as more requirements are identified. Early consultation will help to identify what those needs are and how they may be addressed.
- **Avoidance of irreversible decisions** – Where lead options involve irreversibility, a full assessment of costs should include the possibility of delay, allowing more time for investigation of alternative ways to achieve the objectives.
- **Pilot Studies** – Acquiring more information about risks affecting a project through pilots allows steps to be taken to mitigate either the adverse consequences of bad outcomes, or increase the benefits of good outcomes.
- **Design Flexibility** – Where future demand and relative prices are uncertain, it may be worth choosing a flexible design adaptable to future changes, rather than a design suited to only one particular outcome. For example, different types of fuel can be used to fire a dual fired boiler, depending on future relative prices of alternative fuels. Breaking a project into stages, with successive review points at which the project could be stopped or changed, can also increase flexibility.
- **Precautionary Principle** – Precautionary action can be taken to mitigate a perceived risk. The precautionary principle states that because some outcomes are so bad, even though they may be very unlikely, precautionary action is justified. In cases where such risks have been identified, they should be drawn to the attention of senior management and expert advice sought.
- **Procurement / contractual** – risk can be contractually transferred to other parties and maintained through good contractual relationships, both formal and informal. Insurance is the most obvious example of risk transfer. The main text of this annex provides further information about the types of risk that can, and often are, transferred.
- **Making less use of leading edge technology** – If complex technology is involved, alternative, simpler methods should also be considered, especially if these reduce risk considerably whilst providing many of the benefits of the option involving leading edge technology.
- **Reinstate, or develop different options** – Following the risk analysis, the appraiser may want to reinstate or options, or develop alternative ones that are either less inherently risky or deal with the risks more efficiently.
- **Abandon proposal** – Finally, the proposal may be so risky that, whatever option is considered, it has to be abandoned.

9 By reducing risks and uncertainty in these ways, the expected costs of a proposal are lowered or the expected benefits increased.

10 Additional guidance on risk management can be obtained from Risk Analysis and Management for Projects (RAMP), the Office of Government Commerce (OGC), the National Audit Office (NAO), HM Treasury, and the Cabinet Office.[3]

TRANSFERRING RISK

11 Box 4.3 describes the general types of risk a project manager is likely to encounter.[4]

12 Risk assessment will inform an overall view of the viability of an option, i.e. whether its risk-adjusted benefits exceed its risk-adjusted costs, or whether (in the case of uncertainty) the costs of a possible adverse outcome are so great that precautionary action needs to be introduced to obtain a cost-effective solution.

BOX 4.3: GENERAL TYPES OF RISK

Availability risk	The risk that the quantum of the service provided is less than that required under a contract.
Business risk	The risk that an organisation cannot meet its business imperatives.
Construction risk	The risk that the construction of physical assets is not completed on time, to budget and to specification.
Decant risk	The risk arising in accommodation projects relating to the need to decant staff/ clients from one site to another.
Demand risk	The risk that demand for a service does not match the levels planned, projected or assumed. As the demand for a service may be partially controllable by the public body concerned, the risk to the public sector may be less than that perceived by the private sector.
Design risk	The risk that design cannot deliver the services at the required performance or quality standards.
Economic risk	Where the project outcomes are sensitive to economic influences. For example, where actual inflation differs from assumed inflation rates.
Environment risk	Where the nature of the project has a major impact on its adjacent area and there is a strong likelihood of objection from the general public.

[3] Reference can be made to RAMP (http://www.ramprisk.com/), or the OGC (http://www.ogc.gov.uk/) for a range of materials including 'Managing a Successful Programme', HM Treasury: Management of Risk: A Strategic Overview (The 'Orange Book'), NAO: Supporting Innovation: Managing Risk in Government Departments. Also available are: Management of Risk: A Practitioner's Guide, published through the Stationery Office, and the Risk Portal found on the Cabinet Office website (http://www.cabinet-office.gov.uk/)

[4] See OGC website: http://www.ogc.gov.uk/

BOX 4.3: GENERAL TYPES OF RISK (contd)

Funding risk	Where project delays or changes in scope occur as a result of the availability of funding.
Legislative risk	The risk that changes in legislation increase costs. This can be sub-divided into general risks such as changes in corporate tax rates and specific ones which may affect a particular project.
Maintenance risk	The risk that the costs of keeping the assets in good condition vary from budget.
Occupancy risk	The risk that a property will remain untenanted – a form of demand risk.
Operational risk	The risk that operating costs vary from budget, that performance standards slip or that service cannot be provided.
Planning risk	The risk that the implementation of a project fails to adhere to the terms of planning permission or that detailed planning cannot be obtained, or if obtained, can only be implemented at costs greater than in the original budget.
Policy risk	The risk of changes of policy direction not involving legislation.
Procurement risk	Where a contractor is engaged, risk can arise from the contract between the two parties, the capabilities of the contractor, and when a dispute occurs.
Project intelligence risk	Where the quality of initial project intelligence (eg preliminary site investigation) is likely to impact on the likelihood of unforeseen problems occurring.
Reputational Risk	The risk that there, will be an undermining of customer/ media perception of the organisations ability to fulfil its business requirements e.g. adverse publicity concerning an operational problem.
Residual Value risk	The risk relating to the uncertainty of the value of physical assets at the end of the contract.
Technology risk	The risk that changes in technology result in services being provided using non-optimal technology.
Volume risk	The risk that actual usage of the service varies from the level forecast.

13 When faced with significant risks, a public body should consider transferring part or all of it to the private sector. The governing principle is that risk should be allocated to whichever party from the public or private sector is best placed to manage it. The optimal allocation of risk, rather than maximising risk transfer, is the objective, and is vital to ensuring that the best solution is found. Accordingly, the degree to which risk is transferred depends upon the specific proposal being appraised.

14 Successful negotiation of risk transfer requires a clear understanding by the procuring authority of the risks presented by a proposal, the broad impact that these risks may have on the suppliers' incentives and financing costs, and the limits to risk transfer which might still be considered for value for money.

15 Where the private sector has clear ownership, responsibility and control, it should be encouraged to take all of those risks it can manage more effectively than the procuring authority. If the public body seeks to reserve many of the responsibilities and controls that go hand-in-hand with service delivery and yet still seek to transfer significant risk, there is a danger that the private sector will increase its prices.

16 Appropriate transfer of risk generates incentives for the private sector to supply timely cost effective and more innovative solutions. As a general rule, PFI schemes should transfer risks to the private sector when the supplier is better able to influence the outcome than the procuring authority. Risks to be considered include:

- Design and construction risk: to cost and/ or time;
- Technology and obsolescence risks;
- Commissioning and operating risks, including maintenance;
- Regulation and similar risks (including taxation, planning permission);
- Demand (or volume/ usage) risks;
- Residual value risk; and
- Project financing risk.

17 A risk allocation table can be a useful tool to identify the bearer of each risk relevant to a proposal. An example of this is set out in Box 4.4.

BOX 4.4: EXAMPLE OF RISK ALLOCATION TABLE

Risk	Scale	Bearer		Key Issues
		Purchaser	Provider	
Obsolescence	Low		√	Assets require low levels of technology
Demand Risk	Med	√		…
Design risk	High		√	…
Residual Value	Low	√		…
3rd party revenues	Low		√	…
Regulatory change	High	√		…
etc.	…	…	…	…

Optimism Bias

18 Optimism bias is the demonstrated systematic tendency for appraisers to be over-optimistic about key project parameters. It must be accounted for explicitly in all appraisals, and can arise in relation to:

- Capital costs;
- Works duration;
- Operating costs; and
- Under delivery of benefits.

Capital costs

19 The two main causes of optimism bias in estimates of capital costs are:

- poor definition of the scope and objectives of projects in the business case, due to poor identification of stakeholder requirements, resulting in the omission of costs during project costing; and
- poor management of projects during implementation, so that schedules are not adhered to and risks are not mitigated.

20 Appraisers should adjust for optimism bias in the estimates of capital costs in the following way:

- Estimate the capital costs of each option;
- Apply adjustments to these estimates, based on the best available empirical evidence relevant to the stage of the appraisal; and,
- Subsequently, reduce these adjustments according to the extent of confidence in the capital costs' estimates, the extent of management of generic risks, and the extent of work undertaken to identify and mitigate project specific risks.

21 Departments or agencies may be able to provide the best empirical evidence to support adjustments for optimism. Alternatively, and if applicable, they may be taken from the Green Book homepage[6], which provides the recommended adjustments to be made at the outline business case stage for buildings, civil engineering, equipment and development, and outsourcing projects.

22 If no obvious empirical evidence is available, this may indicate that the project is unique or unusual, in which case optimism bias is likely to be high. In these cases, adjustments should be based on the nearest equivalent project type, and adjusted up or down, depending on how inherently risky the project is compared to its nearest equivalent type.

23 If a department chooses to apply its own adjustments, these must be prudent. Where possible, the cost estimates, and the adjustments for optimism bias should be reviewed externally (using Gateway reviews for large projects, or internal audit reviews of smaller projects).

[6] See website: http://www.hm-treasury.gov.uk/greenbook for empirical adjustments for generic project categories outlined in Review of Large Public Procurement in the UK, published in July 2002

Works duration

24 The same approach should be taken with estimating the length of time it will take to complete the capital works. In summary:

- Estimate the time taken to complete the capital works;
- Apply adjustments to these estimates, based on the best available empirical evidence relevant to the stage of the appraisal;
- Subsequently, reduce these adjustments according to the extent of confidence in the works duration estimates, the extent of management of generic risks, and the extent of work undertaken to identify and mitigate project specific risks; and,
- The estimates of works' duration, and the adjustments for optimism, should ideally be reviewed independently.

25 The application of optimism bias adjustments to works' duration should be reflected in a delay in the receipt of benefits. This will be shown in the net present value calculations. The appraisal period may need to be extended to reflect the expected delay in benefits' stream, but different periods should not usually be set for different options.

Operating costs and benefits

26 Analysis should also be undertaken on potential benefits' shortfalls and increases in operating costs. If there is no evidence to support adjustments to operating costs or benefits' shortfalls, appraisers should use sensitivity analysis. This should help to answer key questions such as:

- By how much can we allow benefits to fall short of expectations, if the proposal is to remain worthwhile? How likely is this?
- How much can operating costs increase, if the proposal is to remain worthwhile? How likely is this to happen?
- What will be the impact on benefits if operating costs are constrained?

Preventing optimism bias

27 To minimise the level of optimism bias in appraisal, best practice[6] suggests that the following actions should be taken:

- Project managers, suitably competent and experienced for the role, should be identified;
- Project sponsor roles should be clearly defined;
- Recognised project management structures should be in place;
- Performance management systems should be set up; and

[6] 'Review of Large Public Procurement in the UK', Mott MacDonald (2002), available at www.hm-treasury.gov.uk/greenbook

- For large or complex projects:
  - Simpler alternatives should be developed wherever possible;
  - Consideration should be given to breaking down large, ambitious projects into smaller ones with more easily defined and achievable goals; and,
  - Knowledge transfer processes should be set up, so that changes in individual personnel do not disrupt the smooth implementation of a project.

MONTE CARLO ANALYSIS

28 Monte Carlo analysis allows an assessment of the consequences of simultaneous uncertainty about key inputs, and can take account of correlations between these inputs. It involves replacing single entries with probability distributions of possible values for key inputs. Typically, the choice of probabilistic inputs will be based on prior sensitivity testing. The calculation is then repeated a large number of times randomly (using a computer program) to combine different input values selected from the probability distributions specified. The results consist of a set of probability distributions showing how uncertainties in key inputs might impact on key outcomes.

29 Box 4.5 provides an example illustrating the use of Monte Carlo analysis.[1]

BOX 4.5: ALLOWING FOR UNCERTAINTY IN AN ANALYSIS OF COSTS

The table below gives the costs of various parts of a construction project, broken down into excavation (E), foundations (F), structure (S), roofing (R), and decorations (D). All costs are independent of each other. The model for total cost is as follows:

Total cost = E + F + S + R + D

Costs for construction project (£)

	Minimum	Best Guess	Maximum
Excavation (E)	30,500	33,200	37,800
Foundations (F)	23,500	27,200	31,100
Structure (S)	172,000	178,000	189,000
Roofing (R)	56,200	58,500	63,700
Decoration (D)	29,600	37,200	43,600

From this information we can produce a best guess of £334,100 for the total cost of the project. However, we can also conclude a possible range from £311,800 to £365,200. Suppose the project would not go ahead unless the total cost is unlikely to exceed £350,000; how much assurance can we take from these figures that the total cost will be less than £350,000?

[1] This example was adapted from 'Measuring costs and benefits – a guide on cost benefit and cost effectiveness analysis', National Audit Office (NAO) and Vose, D (1996)

BOX 4.5: ALLOWING FOR UNCERTAINTY IN AN ANALYSIS OF COSTS (contd)

By undertaking a Monte Carlo analysis, we can simulate many possible values of the input variables, weighted so that the 'best guess' value is more likely than the extreme values. The total cost is calculated for each simulation, giving a distribution of values for total cost. The precise weighting depends on the probability distributions specified for each variable.

Using triangular distributions, it can be concluded that the most likely total cost is £334,000; and that the chance of total cost exceeding £350,000 is less than 1%.

IRREVERSIBLE RISK

30 Irreversibility occurs where implementation of a proposal might rule out later investment opportunities or alternative uses of resources. Examples of irreversibility are destruction of natural environments or historic buildings. It is particularly important to make a full assessment of the costs of any irreversible damage that may arise from a proposal.

31 Irreversibility is often associated with facilities on which people place 'option values' (the value of knowing a facility is available to enjoy, if they wish to do so). This is also linked to 'existence values' (the value of knowing that something continues to exist, even if the respondent does not expect to make any practical use of it).

32 Where lead options involve irreversible damage, assessment should include the consideration of options which involve delay, allowing more time for investigation of alternative less damaging ways to achieve stated objectives. Appraisal of different proposals should not ignore the 'option' value of avoiding or delaying irreversible actions, and the benefits of ensuring flexibility to respond to future changed conditions.

THE COST OF VARIABILITY IN OUTCOMES

33 In estimating the future costs and benefits associated with particular proposals, there will inevitably be variation between these estimates and the actual costs and benefits realised. This will be over and above the impact of optimism bias, and will be as a result of random factors unforeseen at the time of appraisal.

34 For the public sector as a whole, such random factors will tend to cancel out, taking all proposals together. But in some cases, this would not be expected to happen. Some projects - for example transport use - will tend to have appraisal risks that are systematically related to the overall performance of the economy. Because the majority or all of such projects will be affected by this same factor, appraisal errors will not cancel out between projects.

35 A decision-maker who is risk averse cares about this potential variability in outcomes, and is willing to pay a sum in exchange for certainty (or willing to put up with variability on receipt of compensation). This compensation is the cost of variability, and should be included in appraisal when it is considered appropriate.

36 Generally, a variability adjustment may be required when:

- Risks are large relative to the income of the section of the population that must bear them (including very large risks borne by the whole population); or

- When risk is correlated systematically with income or GDP, and so cannot be diluted by spreading across the economy.

37 The fraction of income worth paying for certainty (C) is approximated by the expression:

$$C = -\text{var}(y) / 2y^*$$

where y is the net additional income resulting from the proposal, and y* is the total expected income or benefits (including the project income) of those impacted by the proposal.

38 Given the size of national income relative to the scale of most individual projects, the cost of variability for projects that benefit the community as a whole is usually negligible.

Distributional Impacts

Annex 5

Introduction

1 'Distributional impacts' is a term used to describe the distribution of the costs or benefits of interventions across different groups in society. Proposals might have differential impacts on individuals, amongst other aspects, according to their:

- Income;
- Gender;
- Ethnic group;
- Age;
- Geographical location; or
- Disability.

2 It is important that these distributional issues are assessed in appraisals.

Distributional Analysis

3 Any distributional effects identified should be explicitly stated and quantified as far as possible. At a minimum, this requires appraisers to identify how the costs and benefits accrue to different groups in society. If, for example, the costs of a government action fall largely upon one ethnic group this impact should be detailed in the appraisal.

4 It follows from this that a rigorous analysis of how the costs and benefits of a proposal are spread across different socio-economic groups is recommended. Where it is considered necessary and practical, this might involve explicitly recognising distributional effects within a project's NPV.

Analysis of Impacts according to Relative Prosperity

5 The impact of a proposal on an individual's well-being will vary according to income; as income grows, the satisfaction derived from an additional unit of consumption declines.

6 The relative prosperity of a household affected by a proposal is determined not only by its income, but also by its size and composition. For example, a single person on £100 a week is better off than a couple on £100 a week. Table 5.1 adjusts for varying costs of living for some specimen family types through a process called equivalisation. These calculations use the McClements scale[1] that takes account of the number of adults and the number and ages of children in the household.

[1] DWP, Households Below Average Income, (2000/01)

TABLE 5.1: INCOME RANGES BY QUINTILE OF EQUIVALISED NET INCOME

£ per week	Single with no children	Couple with no children	Single with child aged 5-7	Couple with child aged 5-7	Single with two children aged 5 & 11	Couple with two children aged 5 & 11	Single with Pensioner	Pensioner Couple
Quintile of equivalised net income								
1	0 to 114	0 to 184	0 to 154	0 to 224	0 to 199	0 to 269	0 to 114	0 to 184
2	115 to 154	185 to 254	155 to 209	225 to 309	200 to 274	270 to 369	115 to 154	185 to 254
3	155 to 204	255 to 339	210 to 274	310 to 409	275 to 359	370 to 494	155 to 204	255 to 339
4	205 to 284	340 to 469	275 to 384	410 to 564	360 to 499	495 to 684	205 to 284	340 to 469
5	285 plus	470 plus	385 plus	565 plus	500 plus	685 plus	285 plus	470 plus

Table 5.2 provides the same rankings for specimen family types in terms of equivalised gross income.

TABLE 5.2: INCOME RANGES BY QUINTILE OF EQUIVALISED GROSS INCOME

£ per week	Single with no children	Couple with no children	Single with child aged 5-7	Couple with child aged 5-7	Single with two children aged 5 & 11	Couple with two children aged 5 & 11	Single with Pensioner	Pensioner Couple
Quintile of equivalised gross income								
1	0 to 129	0 to 214	0 to 174	0 to 259	0 to 224	0 to 309	0 to 129	0 to 214
2	130 to 89	215 to 314	175 to 254	260 379	225 to 334	310 to 459	130 to 189	215 to 314
3	190 to 269	315 to 444	255 to 364	380 to 534	335 to 474	460 to 644	190 to 269	315 to 444
4	270 to 394	445 to 644	265 to 529	535 to 779	475 to 689	645 to 939	270 to 394	445 to 644
5	395 plus	645 plus	530 plus	780 plus	690 plus	940 plus	395 plus	645 plus

7 Appraisers should assess how the costs and benefits of each option are spread across different income groups, such as the income quintiles provided in Table 5.1 or Table 5.2.[2] A proposal providing greater net benefits to lower income quintiles is rated more favourably than one whose benefits largely accrue to higher quintiles.

8 Further analysis can then be undertaken, using distributional weights, to recognise the identified impacts within the cost-benefit analysis. A benefit or cost accruing to a relatively low income family would be weighted more heavily than one accruing to a high income family.

9 In principle, each **monetary** cost and benefit should be weighted according to the relative prosperity of those receiving the benefit or bearing the cost.[3] However, in practice, this information is most unlikely to be available at acceptable cost for many applications. The decision on whether an explicit adjustment is warranted should be informed by the:

[2] Where a household being assessed is not defined by one of the categories in Table 5.1 or Table 5.2, appraisers should use the closest specimen family.

[3] Generally, non-monetary costs and benefits (eg life, health, time savings, etc) are not adjusted as they are considered to be independent of income. For example, the DfT's valuation of non-working travel time savings is averaged across all income groups, so has already been implicitly equity weighted. If values are not standard and are calculated for a specific project an adjustment might still be required.

- Scale of the impact associated with a particular project or proposal;
- Likely robustness of any calculation of distributional impacts; and,
- The type of project being assessed.

10 If appraisers decide not to use distributional weights to make an explicit adjustment, this decision must be fully justified.

Deriving distributional weights

11 One approach to deriving the weights used is the concept of an underlying social welfare function that links personal utility (or satisfaction) to income.

12 Broadly, the empirical evidence suggests that as income is doubled, the marginal value of consumption to individuals is halved: the utility of a marginal pound is inversely proportional to the income of the recipient. In other words, an extra £1 of consumption received by someone earning £10,000 a year will be worth twice as much as when it is paid to a person earning £20,000 per annum.

BOX 5.1: THE MARGINAL UTILITY OF CONSUMPTION

Welfare Weights, by Cowell and Gardiner (1999) concluded that "most [studies] imply values of the elasticity of marginal utility of just below or just above one".[4] Pearce and Ulph (1995), in their survey of the evidence, estimate a range from 0.7 to 1.5, with a value of 1 being defensible.[5]

Assuming a value of 1 implies a utility function of the form

$$U = \log C$$

where C is consumption.

The marginal utility of consumption is then given by $\delta U/\delta C$ i.e. $1/C$.

This implies that if consumption doubles, the marginal utility of consumption falls to one half of the previous value.

13 Box 5.2 provides an example of how distributional weights might be calculated from the equivalised income quintiles in Table 5.1 or Table 5.2. The weights provided are merely illustrative. Despite this uncertainty it is important that appraisers, where deemed appropriate, attempt to adjust explicitly for distributional implications. The assumptions underpinning the chosen distributional weights should be fully explained.

[4] Cowell and Gardiner (1999) page 31

[5] Pearce and Ulph (1995) page 14

BOX 5.2: DERIVING ILLUSTRATIVE DISTRIBUTIONAL WEIGHTS

The marginal utility of each quintile in Tables 5.1 and 5.2 can be calculated by dividing 1 by the median income of each quintile (U' = 1/C). Distributional weights can then be derived by expressing the marginal utility of each quintile as a percentage of average marginal utility (1 divided by the median income). The table below provides the illustrative weights as ranges, reflecting uncertainty in the utility function and the assumed income quintiles.

Quintile	Range (Net)	Range (Gross)
Bottom	1.9 – 2.0	2.2 – 2.3
2nd	1.3 – 1.4	1.4 – 1.5
3rd	0.9 – 1.0	1.0 – 1.1
4th	0.7 – 0.8	0.7 – 0.8
Top	0.4 – 0.5	0.4 – 0.5

14 It will often be the case that neither net nor gross incomes of those affected by a proposal are known directly, so as to allow the distributional adjustment to be calculated. However, if the family or other circumstances of a group affected are known, an adjustment may be calculable indirectly using whatever is known about the relative incomes of those in the relevant category.

15 For example, it may be that a particular proposal will disproportionately provide additional employment for people on probation in a particular area. If it is known that probationers in that area are predominantly in the lowest income quintile, it will be reasonable to use the adjustment factor calculated for that quintile.

16 The regional impact of policy may assist the analysis: the income impact of a proposal may be estimated indirectly by determining its geographical impact and taking note of small-area indices of deprivation.[6] However, care must be taken to assess whether the beneficiaries of a proposal are representative of the geographical area from which they come.

ANALYSIS OF OTHER DISTRIBUTIONAL IMPACTS

17 UK discrimination law currently covers gender, marriage, disability and race. In addition, the government is bound by European law, which currently covers discrimination on the grounds of gender, marital status, pregnancy and maternity only, but is likely to be extended in due course.

18 The scope of racial discrimination law in the UK has recently been significantly extended with the Race Relations (Amendment) Act 2000. It now requires certain listed public authorities to comply with a new general duty to promote racial equality.[7] This aims to ensure that the listed bodies give due regard to racial equality when carrying out their functions, including policy-making.

[6] 'Where does public spending go? A pilot study to analyse the flows of public expenditures into local areas', by the former DETR (now ODPM).

[7] See Section 71 of the Race Relations Act 1976 (as amended by the Race Relations (Amendment) Act 2000)

19 The UK is also a signatory to various international treaties and conventions with anti discrimination provisions. These do not provide the right of individual complaint against the UK, but should inform the development of policy. Box 5.3 details the relevant legislation and the more important conventions.

BOX 5.3: RELEVANT ANTI DISCRIMINATION LEGISLATION, TREATIES AND CONVENTIONS

ANTI DISCRIMINATION LEGISLATION

- The Sex Discrimination Act 1975 (as amended)
- The Employment Act 1989 & The Employment Rights Act 1996
- The Equal Pay Act 1970 (as amended)
- The Race Relations Act 1976 (as amended)
- The Disability Discrimination Act (1995)
- Pregnant Workers Directive
- Article 119 of the Treaty of Rome, and Equal Treatment and Equal Pay Directives made under the Treaty. EC Law on free movement of workers, services and capital, and freedom of establishment.

CONVENTIONS

- The UN Convention on the Elimination of All Forms of Discrimination against Women
- The UN Convention on the Elimination of All Forms of Racial Discrimination
- The UN International Covenant on Civil & Political Rights
- The UN International Covenant on Economic, Social and Cultural Rights
- The UN Standard Rules on Equalisation of Opportunities for People with Disabilities
- The Council of Europe European Convention on Human Rights

20 Analysis of distributional issues should not be limited to assessing compliance with discrimination law, and international treaties and conventions. Unless appraisers consider the impact a particular proposal has on different groups in society, they cannot be sure the action is having the intended affect.

21 There are three steps when considering equality during appraisal[8]:

1. Analyse how the proposal will affect different groups of people (e.g. gender, ethnic group, age, disabled, location).

2. Consider whether there are any adverse differential impacts on a particular group. If so, are these impacts unfair or unlawful, or do they contradict overall Government policy.

[8] See Policy Appraisal for Equal Treatment, issued to all departments in 1998 by the Cabinet Office, Home Office, and the (then) DfEE

3. If the action is not permissible in the above senses, remedial action is necessary. If, however, it is permissible, appraisers must decide:

   - ❑ If alternative action could meet the objectives without the same adverse consequences; or
   - ❑ Whether there are any measures that can be taken to reduce the predicted adverse impact.

22 Following is a list of useful organisations when considering equality in appraisal:

- ❑ Equal Opportunities Commission (EOC)
- ❑ Commission for Racial Equality (CRE)
- ❑ Women and Equality Unit – Cabinet Office
- ❑ Race and Gender Mainstreaming Team – Home Office
- ❑ Disability Rights Commission

Discount Rate

Annex 6

Introduction

1 This Annex shows how the discount rate of 3.5 per cent real is derived and the circumstances in which it should be applied.

Social Time Preference Rate

2 Social Time Preference is defined as the value society attaches to present, as opposed to future, consumption. The Social Time Preference Rate (STPR) is a rate used for discounting future benefits and costs, and is based on comparisons of utility across different points in time or different generations. This guidance recommends that the STPR be used as the standard real discount rate.

3 The STPR has two components:

- The rate at which individuals discount future consumption over present consumption, on the assumption that no change in per capita consumption is expected, represented by ρ; and,
- An additional element, if per capita consumption is expected to grow over time, reflecting the fact that these circumstances imply future consumption will be plentiful relative to the current position and thus have lower marginal utility. This effect is represented by the product of the annual growth in per capita consumption (g) and the elasticity of marginal utility of consumption (μ) with respect to utility.

The STPR, represented by r, is the sum of these two components, i.e.

$$r = \rho + \mu.g \qquad (1)$$

Each element of STPR is examined in turn below.

Estimates of ρ

4 This comprises two elements:

- Catastrophe risk (L); and
- Pure time preference (δ).

5 The first component, catastrophe risk, is the likelihood that there will be some event so devastating that all returns from policies, programmes or projects are eliminated, or at least radically and unpredictably altered. Examples are technological advancements that lead to premature obsolescence, or natural disasters, major wars etc. The scale of this risk is, by its nature, hard to quantify.[1]

6 The second component, pure time preference, reflects individuals' preference for consumption now, rather than later, with an unchanging level of consumption per capita over time. [2]

[1] Newbery (1992) estimates L as 1.0, Kula (1987) as 1.2, Pearce and Ulph (1995) as 1.2, OXERA (2002) as 1.1 currently and 1 in the near future.

[2] Scott (1977, 1989) estimates δ as 0.5. Other literature suggests it lies between 0.0 and 0.5. However, if zero, this implies pure time preference does not exist, which is not regarded as plausible.

7 The evidence suggests that these two components indicate a value for ρ of around 1.5 per cent a year for the near future.[3]

Estimates of μ

8 The available evidence suggests the elasticity of the marginal utility of consumption (μ) is around 1.[4] This implies that a marginal increment in consumption to a generation that has twice the consumption of the current generation will reduce the utility by half.

Estimates of g

9 Maddison (2001) shows growth per capita in UK to be 2.1 per cent over the period 1950 to 1998. Surveying the evidence, the Treasury paper *Trend Growth: Recent Developments and Prospects* also suggests a figure of 2.1 per cent for output growth to be reasonable.[5] The annual rate of g is therefore put at 2 per cent per year.

The calculated STPR

So with g = 2 per cent, ρ = 1.5 per cent, μ = 1.0, then from equation (1) the STPR to be used as the real discount rate is

0.015 +1.0*0.02 = **3.5 per cent**

Long-term Discount Rates

10 Where the appraisal of a proposal depends materially upon the discounting of effects in the very long term, the received view is that a lower discount rate for the longer term (beyond 30 years) should be used.[6]

11 The main rationale for declining long-term discount rates results from uncertainty about the future. This uncertainty can be shown to cause declining discount rates over time.[7]

12 In light of this evidence, it is recommended that for costs and benefits accruing more than 30 years into the future, appraisers use the schedule of discount rates provided in Table 6.1 below.

[3] Scott (1977) derives a central estimate value of 1.5 from past long-term returns received by savers in the UK. A later estimate in Scott (1989), updated this estimate to 1.3. However, this was based on United States, as well as UK, evidence. OXERA (2002) estimates ρ to lie between 1.0 and 1.6.

[4] Pearce and Ulph (1995) estimate a range from 0.7 to 1.5 with 1.0 being considered defensible; Cowell and Gardiner (1999) estimate μ as being just below or just above one; OXERA (2002) estimate a range from 0.8 to 1.1.

[5] This estimate removes the impact of net migration. The paper is available on the HM Treasury website (http://www.hm-treasury.gov.uk).

[6] OXERA (2002)

[7] Weitzman (1998, 2001) and Gollier (2002)

TABLE 6.1: THE DECLINING LONG TERM DISCOUNT RATE

Period of years	0–30	31–75	76–125	126–200	201–300	301+
Discount rate	3.5%	3.0%	2.5%	2.0%	1.5%	1.0%

EXCEPTIONS TO THE DISCOUNT RATE SCHEDULE

13 The standard schedule of discount rates may not be appropriate in the following circumstances.

- For international development assistance projects, a discount rate derived from estimates of the social time preference rate appropriate to the recipient economy should be used.
- When undertaking sensitivity analysis, the impact of changing the precise value of the discount rate can be analysed in the same way as for other parameters in the appraisal. The rationale for undertaking sensitivity analysis on the discount rate should be clearly explained.

DISCOUNT FACTORS

	Discount rates									
Year	1.0%	2.0%	3.0%	3.5%	4.0%	5.0%	6.0%	7.0%	8.0%	9.0%	10.0%
0	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1	0.9901	0.9804	0.9709	0.9662	0.9615	0.9524	0.9434	0.9346	0.9259	0.9174	0.9091
2	0.9803	0.9612	0.9426	0.9335	0.9246	0.9070	0.8900	0.8734	0.8573	0.8417	0.8264
3	0.9706	0.9423	0.9151	0.9019	0.8890	0.8638	0.8396	0.8163	0.7938	0.7722	0.7513
4	0.9610	0.9238	0.8885	0.8714	0.8548	0.8227	0.7921	0.7629	0.7350	0.7084	0.6830
5	0.9515	0.9057	0.8626	0.8420	0.8219	0.7835	0.7473	0.7130	0.6806	0.6499	0.6209
6	0.9420	0.8880	0.8375	0.8135	0.7903	0.7462	0.7050	0.6663	0.6302	0.5963	0.5645
7	0.9327	0.8706	0.8131	0.7860	0.7599	0.7107	0.6651	0.6227	0.5835	0.5470	0.5132
8	0.9235	0.8535	0.7894	0.7594	0.7307	0.6768	0.6274	0.5820	0.5403	0.5019	0.4665
9	0.9143	0.8368	0.7664	0.7337	0.7026	0.6446	0.5919	0.5439	0.5002	0.4604	0.4241
10	0.9053	0.8203	0.7441	0.7089	0.6756	0.6139	0.5584	0.5083	0.4632	0.4224	0.3855
11	0.8963	0.8043	0.7224	0.6849	0.6496	0.5847	0.5268	0.4751	0.4289	0.3875	0.3505
12	0.8874	0.7885	0.7014	0.6618	0.6246	0.5568	0.4970	0.4440	0.3971	0.3555	0.3186
13	0.8787	0.7730	0.6810	0.6394	0.6006	0.5303	0.4688	0.4150	0.3677	0.3262	0.2897
14	0.8700	0.7579	0.6611	0.6178	0.5775	0.5051	0.4423	0.3878	0.3405	0.2992	0.2633
15	0.8613	0.7430	0.6419	0.5969	0.5553	0.4810	0.4173	0.3624	0.3152	0.2745	0.2394
16	0.8528	0.7284	0.6232	0.5767	0.5339	0.4581	0.3936	0.3387	0.2919	0.2519	0.2176
17	0.8444	0.7142	0.6050	0.5572	0.5134	0.4363	0.3714	0.3166	0.2703	0.2311	0.1978
18	0.8360	0.7002	0.5874	0.5384	0.4936	0.4155	0.3503	0.2959	0.2502	0.2120	0.1799
19	0.8277	0.6864	0.5703	0.5202	0.4746	0.3957	0.3305	0.2765	0.2317	0.1945	0.1635
20	0.8195	0.6730	0.5537	0.5026	0.4564	0.3769	0.3118	0.2584	0.2145	0.1784	0.1486
21	0.8114	0.6598	0.5375	0.4856	0.4388	0.3589	0.2942	0.2415	0.1987	0.1637	0.1351
22	0.8034	0.6468	0.5219	0.4692	0.4220	0.3418	0.2775	0.2257	0.1839	0.1502	0.1228
23	0.7954	0.6342	0.5067	0.4533	0.4057	0.3256	0.2618	0.2109	0.1703	0.1378	0.1117
24	0.7876	0.6217	0.4919	0.4380	0.3901	0.3101	0.2470	0.1971	0.1577	0.1264	0.1015
25	0.7798	0.6095	0.4776	0.4231	0.3751	0.2953	0.2330	0.1842	0.1460	0.1160	0.0923
26	0.7720	0.5976	0.4637	0.4088	0.3607	0.2812	0.2198	0.1722	0.1352	0.1064	0.0839
27	0.7644	0.5859	0.4502	0.3950	0.3468	0.2678	0.2074	0.1609	0.1252	0.0976	0.0763
28	0.7568	0.5744	0.4371	0.3817	0.3335	0.2551	0.1956	0.1504	0.1159	0.0895	0.0693
29	0.7493	0.5631	0.4243	0.3687	0.3207	0.2429	0.1846	0.1406	0.1073	0.0822	0.0630
30	0.7419	0.5521	0.4120	0.3563	0.3083	0.2314	0.1741	0.1314	0.0994	0.0754	0.0573

LONG TERM DISCOUNT FACTORS

Year	Long Term Discount Factor	Year	Long Term Discount Factor
0	1.0000	23	0.4533
1	0.9662	24	0.4380
2	0.9335	25	0.4231
3	0.9019	26	0.4088
4	0.8714	27	0.3950
5	0.8420	28	0.3817
6	0.8135	29	0.3687
7	0.7860	30	0.3563
8	0.7594	40	0.2651
9	0.7337	50	0.1973
10	0.7089	60	0.1468
11	0.6849	75	0.0942
12	0.6618	80	0.0833
13	0.6394	90	0.0651
14	0.6178	100	0.0508
15	0.5969	125	0.0274
16	0.5767	150	0.0167
17	0.5572	200	0.0062
18	0.5384	250	0.0029
19	0.5202	300	0.0014
20	0.5026	350	0.0009
21	0.4856	400	0.0005
22	0.4692	500	0.0002

GLOSSARY

Additionality An impact arising from an intervention is additional if it would not have occurred in the absence of the intervention.

Adverse Selection When asymmetric information restricts the quality of the good traded. This typically happens because the person with more information is able to negotiate a favourable exchange.

Affordability An assessment of whether proposals can be paid for in terms of cashflows and resource costs.

Appraisal The process of defining objectives, examining options and weighing up the costs benefits, risks and uncertainties of those options before a decision is made.

Assessment(s) Either an appraisal or an evaluation (or both).

Base Case The best estimate of how much a proposal will cost in economic terms, including an allowance for risk and optimism.

Choice modelling This term encompasses a range of stated preference techniques and includes choice experiments (often preferred because of its firm base in welfare economics), contingent ranking, contingent rating and paired comparisons.

Contingent valuation This involves directly asking people how much they would be willing to pay for a good or service, or how much they are willing to accept to give it up.

Contingency An allowance of cash or resources to cover unforeseen circumstances.

Cost Benefit Analysis Analysis which quantifies in monetary terms as many of the costs and benefits of a proposal as feasible, including items for which the market does not provide a satisfactory measure of economic value.

Cost-Effectiveness Analysis Analysis that compares the costs of alternative ways of producing the same or similar outputs.

Cost of capital The cost of raising funds (expressed as an annual percentage rate).

Cost of variability in outcomes This is the most a person is willing to pay to have a benefit that is certain, rather than one that is uncertain.

Crowding out The extent to which an increase in demand occasioned by government policy is offset by a decrease in private sector demand.

Deadweight Expenditure to promote a desired activity that would in fact have occurred without the expenditure.

Diminishing marginal utility The tendency as extra units of any commodity or service are used up or 'consumed', for the satisfaction provided by those extra units to decline.

Discounting A method used to convert future costs or benefits to present values using a discount rate.

Discounted Cash Flow (DCF) A technique for appraising investments. It reflects the principle that the value to an investor (whether an individual or a firm) of a sum of money depends on when it is received.

Discount rate The annual percentage rate at which the present value of a future pound, or other unit of account, is assumed to fall away through time.

Displacement The degree to which an increase in productive capacity promoted by government policy is offset by reductions in productive capacity elsewhere.

Do minimum option An option where government takes the minimum amount of action necessary.

Economic cost (or opportunity cost) The value of the most valuable of alternative uses.

Economic Efficiency This is achieved when nobody can be made better off without someone else being made worse off.

Effectiveness A measure of the extent to which a project, programme or policy achieves its objectives.

Evaluation Retrospective analysis of a project, programme, or policy to assess how successful or otherwise it has been, and what lessons can be learnt for the future. The terms 'policy evaluation' and 'post-project evaluation' are often used to describe evaluation in those two areas.

Existence value The value placed by people on the continued existence of an asset for the benefit of present or future generations. The latter is sometimes referred to as bequest value. See also Use value.

Expected value The weighted average of all possible values of a variable, where the weights are the probabilities.

Externality costs or benefits The non-market impacts of an intervention or activity which are not borne by those who generate them.

GDP deflator An index of the general price level in the economy as a whole, measured by the ratio of gross domestic product (GDP) in nominal (i.e. cash) terms to GDP at constant prices.

Hedonic pricing Deriving values by decomposing market prices into their constituent characteristics.

Information asymmetry Differences in information held by parties to a transaction where this information is relevant to determining an efficient contract or a fair price or for monitoring or rewarding performance.

Impact statement A description, quantified where possible, of all the significant impacts of a proposal, and of how they are distributed between those affected.

Implementation The activities required during the period after appraisal to put in place a policy, or complete a programme or project, at which point 'normal' service is achieved.

Internal rate of return (IRR) The discount rate that would give a project a present value of zero.

Irreversibility This applies when an option would rule out later investment opportunities, or would use resources now that might subsequently be preferred for a more important later use.

Market failure An imperfection in the market mechanism that prevents the achievement of economic efficiency.

Market value The price at which a commodity can be bought or sold, determined through the interaction of buyers and sellers in a market.

Marginal utility The increase in satisfaction gained by a consumer from a small increase in the consumption of a good or service.

Monte Carlo analysis A technique that allows assessment of the consequences of simultaneous uncertainty about key inputs, taking account of correlations between these inputs.

Moral Hazard An example of information asymmetry where a contract or relationship places incentives upon one party to take (or not take) unobservable steps which are prejudicial to another party.

Multi Criteria Analysis See Weighting and Scoring

Net Present Value (NPV) The discounted value of a stream of either future costs or benefits. The term Net Present Value (NPV) is used to describe the difference between the present value of a stream of costs and a stream of benefits.

Opportunity cost (or Economic cost) The value of the most valuable of alternative uses.

Optimism bias The demonstrated systematic tendency for appraisers to be over-optimistic about key project parameters, including capital costs, operating costs, works duration and benefits delivery.

Option appraisal The appraisal of various options chosen to achieve specific objectives.

Option value The value of the availability of the option of using an environmental or other asset (which in this context is usually non-marketed) at some future date. See also Use value.

PFI Private Finance Initiative

PPP Public Private Partnership

Precautionary principle The concept that precautionary action can be taken to mitigate a perceived risk. Action may be justified even if the probability of that risk occurring is small, because the outcome might be very adverse.

Present Value The future value expressed in present terms by means of discounting

Price index A measure of the amount by which prices change over time. General price indexes cover a wide range of prices and include the GDP deflator and the Retail Price Index (RPI). Special price indices apply to one commodity or type of commodity.

Proposal An idea for a policy, programme or project that is under appraisal.

Public Sector Comparator Public Sector Comparator is a hypothetical risk-adjusted costing, by the public sector as a supplier, to an output specification produced as part of a PFI procurement exercise. It:

- is expressed in net present value terms;
- is based on the recent actual public sector method of providing that defined output (including any reasonably foreseeable efficiencies the public sector could make); and,
- takes full account of the risks which would be encountered by that style of procurement.

Pure time preference Pure time preference is the preference for consumption now, rather than later.

Real option theory This presumes that decision making is sequential and that decision makers may benefit from choosing options that may seem sub optimal today but which increase flexibility at later times, leading to better decision making when more is known about the project.

Real price The nominal (i.e. cash) price deflated by a general price index, e.g. RPI or GDP deflator, relative to a specified base year or base date.

Real terms The value of expenditure at a specified general price level: that is a cash price or expenditure divided by a general price index.

Relative price effect The movement over time of a specific price index (such as construction prices) relative to a general price index (such as the GDP deflator).

Relevant cost/benefit All costs and benefits that can be affected by decisions and that are therefore related to the objectives and scope of the proposal in hand.

Required rate of return A target average rate of return for a public sector trading body, usually expressed, for central government bodies, as a return on the current cost value of total capital employed.

Resources/ resource cost Terms used in a variety of senses, according to context. In resource accounting, 'resource costs' are accruals accounting costs expressed in real terms. In economic analysis a distinction is sometimes drawn between 'transfers', such as social security payments and 'resource costs' which are payments for goods or services. In departments and agencies 'resources' is a term sometimes used to describe expenditure from their budgets, or sometimes requirements of staffing.

Revealed preference The inference of willingness to pay for something which is non-marketed by examining consumer behaviour in a similar or related market.

Risk The likelihood, measured by its probability, that a particular event will occur.

Risk register / log A useful tool to identify, quantify and value the extent of risk and uncertainty relating to a proposal.

Sensitivity analysis Analysis of the effects on an appraisal of varying the projected values of important variables.

Shadow price The opportunity cost to society of participating in some form of economic activity. It is applied in circumstances where actual prices cannot be charged, or where prices do not reflect the true scarcity value of a good.

Social Benefit The total increase in the welfare of society from an economic action - the sum of the benefit to the agent performing the action plus the benefit accruing to society as a result of the action.

Social Cost The total cost to society of an economic activity - the sum of the opportunity costs of the resources used by the agent carrying out the activity, plus any additional costs imposed on society from the activity.

Stated preference Willingness to pay for something that is non-marketed, as derived from people's responses to questions about preferences for various combinations of situations and/ or controlled discussion groups.

Substitution The situation in which a firm substitutes one activity for a similar activity (such as recruiting a different job applicant) to take advantage of government assistance.

Switching point or switching value The value of an uncertain cost or benefit at which the best way to proceed would switch, for example from approving to not approving a project, or from including or excluding some extra expenditure to preserve some environmental benefit.

Systematic risk Risk which is correlated with movements in the economic cycle and cannot therefore be diversified away.

Time preference rate Preference for consumption (or other costs or benefits) sooner rather than later, expressed as an annual percentage rate.

Total Economic Value The sum of the use, option and existence value of a good: a term used primarily in environmental economics.

Transfer payment A transfer payment is one for which no good or service is obtained in return.

Uncertainty The condition in which the number of possible outcomes is greater than the number of actual outcomes and it is impossible to attach probabilities to each possible outcome.

Use value Value of something which is non-marketed provided by people's actual use of it. See also Existence value and Option value.

Weighting and Scoring An technique that involves assigning weights to criteria, and then scoring options in terms of how well they perform against those weighted criteria. Weighted scores are then summed, and can then be used to rank options.

Willingness to Accept The amount that someone is willing to receive or accept to give up a good or service.

Willingness to Pay The amount that someone is willing to give up or pay to acquire a good or service.

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INDEX

Note: page numbers suffixed '*n*' indicate a reference to a footnote.