SCOTTISH CAPITAL

INVESTMENT MANUAL

Option Appraisal Guide

A practical guide to the Appraisal, Evaluation, Approval and Management of Policies, Programmes and Projects

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1. Introduction

The need to get the best possible value from spending public money will always remain a constant for those entrusted with spending decisions. It is essential that resources associated with infrastructure investment across NHSScotland are allocated efficiently and effectively and the impact/ benefit of such investment decisions are maximised.

In order to arrive at such decisions, sound analysis is essential. This ***Option Appraisal Guide***builds on the HM Treasury Green Book guidance and specific Scottish Government guidance issued on assessing Value for Money.

As part of the Scottish Capital Investment Manual, this guidance is mandatory for all NHSScotland Bodies taking forward infrastructure investment proposals. The ***Option Appraisal Guide***is the primary guide for information regarding appraisal in NHSScotland. It should be read in conjunction with both the *Green Book*, which remains an authoritative guide to the principles of appraisal and evaluation and the SCIM Business Case Guide.

The principles of this guide apply to all infrastructure investments regardless of whether they are above or below NHS Board delegated limits. However, it is important that they are applied with appropriate and proportionate effort.

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1. General Appraisal Guidance

This guidance is based on a step- by-step approach to simplify the practical business of carrying out an appraisal.

By the time a full appraisal is to be undertaken as part of an Outline Business Case, the following steps should be understood and captured as part of the strategic context and Initial Agreement.

* The strategic context.
* The need / rationale for expenditure.
* Defined investment objectives, benefits, risks and constraints.
* Identification and description of the preferred/ strategic option.

Whilst there is a degree of flexibility in the following appraisal steps, e.g. it is not necessary to wait until all the options are defined before starting to consider costs or to identify all the costs and benefits, something that should be interpreted rigidly is that the conclusions and recommendations should not be decided before analysis is undertaken!

The main steps in the appraisal process are to:

* Identify and Quantify the Monetary Costs and Benefits of Options (Including Do nothing or Do Minimum).
* Outline Non-Monetary Costs and Benefits.
* Calculate Net Present Value.
* Sensitivity Analysis and Risk assessment.
* Present NPVs across all Options and Present Preferred Option.

1. Identify and Quantify the Monetary Costs and Benefits of Options
   1. The Relevant Costs and Benefits

The relevant base case costs and benefits to government and society of all options should be valued, and the net benefits or costs calculated. Relevant costs and benefits are those that will be affected by the decision at hand. These will vary depending on the scope of the proposal but it is useful to consider which potential costs and benefits may be relevant early on in the appraisal process.

Before discounting is applied, costs and benefits should generally be adjusted for both optimism bias and inflation. Other adjustments may be needed in some cases e.g. for tax differences among options or for displacement. Guidance on most of the necessary adjustments is given in this section together with general principles of cost and benefit measurement. Wider social and environmental costs and benefits for which there is no market price also need to be assessed. These will often be more difficult to assess but are no less important and should not be ignored simply because they cannot easily be costed. This guidance provides more information on how to take into account the impacts of proposals that cannot be expressed in money terms.

* 1. Principles of Cost Measurement

Costs should generally be valued on an *opportunity cost (or economic cost)* basis. The opportunity cost of using a resource is its value in its next best alternative use (i.e. its most valuable use other than in the project). An emphasis on opportunities foregone is central to the way of thinking that underpins all the costings in an economic appraisal.

*Current market prices* should generally be used to measure opportunity costs, because they reflect what firms, households or other entities are willing to pay to draw resources into the next best alternative use. Households and firms generally know their own costs and preferences best and have strong incentives to respond to market signals by putting their resources to their best possible use.

It is important to cost *all* the public resources used in each option, not just those for which cash will change hands, or which fall to a particular NHSScotland Body or budget. Resources should be costed even if they are already owned by the public sector; they have an opportunity cost because they could be sold or put to another use.

Costs and benefits considered should cover the useful lifetime of the assets encompassed by the options, although if the appraisal concerns the contractual purchase of outputs and outcomes, the appraisal period may be different. A whole life costing approach is expected to be demonstrated in assessing options.

A number of different types of costs can be categorised to aid sensitivity analysis but the categorisation should be used carefully e.g. a cost that is fixed relative to one factor may change with another. More complex modelling may be required to describe how costs change over time and with different variables. The following table describes some common examples of differing cost types:

Table: Different Cost Types

|  |
| --- |
| **Fixed costs** remain constant over wide ranges of activity for a specified time period (such as an office building);  **Variable costs** vary according to the volume of activity (external training costs, for example, varying with the number of trainees);  **Semi-variable** costs include both a fixed and variable component (maintenance is an example, where there is usually a set planned programme, and a responsive regime whose costs vary in proportion to activity, i.e. the number of call-outs); and,  **Semi-fixed, or step costs**, are fixed for a given level of activity but they eventually increase by a given amount at some critical point (e.g. after telephone call volumes reach a certain level, a new call centre may be required). |

In substantial proposals, the relevant costs are likely to equate to the full economic cost of providing the associated goods and services. For these proposals the full economic cost should be calculated, net of any expected revenues, for each option and include direct/ indirect costs and attributable overheads. The full cost of the base case for each option (i.e. the best estimate of its costs and benefits) should also equal the total of the analysis of costs into their fixed, variable, semi-variable and stepped elements. A dual cost analysis of this kind enables opportunity costs to be fully considered, and sensitivity analysis to be conducted later on.

Cost estimation can be difficult and will normally involve input from accountants, economists and other specialists, depending on the type of appraisal. The appraiser needs to understand and communicate clearly the scope of the appraisal to ensure that specialists provide relevant cost information, whilst ensuring that opportunities have been thoroughly explored.

Depreciation is an accounting device used to spread the expenditure on a capital asset over its lifetime. Capital charges reflect the opportunity cost of funds tied up in capital assets once those assets have been purchased. They are used to help test the value for money of retaining an asset. However, they should not be included in the analysis of economic costs and benefits informing the decision whether or not to purchase the asset in the first place.

Even where an appraisal covers the full expected period of use of an asset the asset may still have some residual value:

* in an alternative use within an organisation;
* in a second-hand market; or as scrap

These values should be included and tested for sensitivity as it may be difficult to estimate the future residual value at the present time.

Costs and benefits should reflect opportunity cost values. Affordability analysis should be conducted separately. Cash flows are important for this purpose. Proposals are also likely to require resource budgets, so that it is clear how they will be funded, and, ex post, accounted for. However, cash flows and resource budgets do not reflect opportunity costs.

Public spending should be cost-effective. Judgement of this is aided by comparing the ratios for a proposal with those for other similar cases e.g. cost per treatment, cost per m2 of floor space. If unit costs appear too high, the costings may need to be reviewed, or the proposal re- designed or rejected.

Expenditures that have already been incurred on goods and services or resources that are already irrevocably committed should be ignored in an appraisal as these are “**sunk costs**” and the focus should be on costs about which decisions can still be made. However, the latter includes the opportunity costs of continuing to tie up resources that have already been purchased e.g. assets such as land, buildings, machinery or vehicles that are already owned have an opportunity cost because if the project were not to proceed, these assets could be sold or put to an alternative use. Current market values of such assets should therefore be included as opportunity costs when appraising any option that will make use of them.

* 1. Total Versus Incremental Costing

In order to enable fair comparison of options costs and benefits should be measured by reference to a common baseline to:

* clarify the differences between the options; and to ensure that all the resources used in the project are accounted for
* The approach that addresses both of these aims best is to include the **total** resource consequences of all options, including the do nothing or do minimum ('status quo') baseline option.

The project boundary should be sensibly defined e.g. if a new management information system is to be introduced to an NHS Board, in regard to staff costs it should be sufficient to cost only the staff time directly affected by the new system, not the cost of the entire NHS Board's staff. Large blocks of cost that are common to *all* options do not need to be appraised in detail, although they should generally be indicated.

There is an alternative **incremental** approach which is to set the baseline for cost/ benefit measurement equal to those of current provision or a ‘do minimum’, so that only the costs and benefits over and above this are included for the alternative options.

This incremental resource approach is however:

* less informative than the total resource method,
* provides poorer accountability by distracting attention from the totality of the resources devoted to a proposal, and
* can pose problems for post implementation evaluation.

For these reasons, the **total cost approach** is recommended.

If estimating the total resource consequences of options proves difficult, for example because of serious data limitations, some flexibility in approach may be needed. Direction from economists from SG Analytical Services Division should be sought to help determine the most suitable modified approach. In such cases, SG approval is required, agreement to the use of the proposed modified approach should be sought in advance of the submission of business cases from SG Analytical Services Division.

* 1. Treatment of Taxes and Subsidies

Goods and services procured by government should generally be costed gross of tax and subsidies. The ideal would be to assess all options net **of tax and subsidies** but this is not generally straightforward whereas in most cases the costs of options can be compared gross of tax and subsidies without biasing the appraisal.

In practice it is rarely worthwhile to adjust market prices for taxes or subsidies. However, in certain circumstances e.g. where the tax structures of options differ very substantially such that failure to allow for differing tax treatment could distort the choice of best option, it will be appropriate to consider adjusting for taxes and subsidies..

It is important to adjust for any tax differences between options arising from different contractual arrangements such as in-house supply versus buying in, or lease versus purchase. For example, when considering contracting out a service that was previously provided in-house, at least a part of the tax payable by the contractors and their funders would not have been paid under a ‘do minimum’ option of continued in-house provision.

Adjustment for indirect taxes such as VAT is not generally required. It is appropriate only where the adjustment may make a material difference, and this is a matter for case by case judgement. However, where options attract different VAT conventions e.g. new build versus refurbishment they should usually be compared as if none were made in all options.

* 1. Treatment of Transfer Payments

A transfer payment is one for which no good or service is obtained in return. Social security payments are an example of this, where there may be a change to the distribution of income but this does not represent a direct economic cost, except for any associated costs of administration or compliance. Transfer payments should be excluded from the costs and benefits in an appraisal, but recorded separately and taken into account in financial analysis.

* 1. Estimating the Value of Benefits

The purpose of valuing benefits is:

* to consider whether an option’s benefits are worth its costs, and to allow alternative options to be systematically compared in terms of their net benefits or net costs.

The general rule is that benefits should be valued unless it is clearly not practicable to do so. Even if it is not feasible or practicable to value all the benefits of a proposal, it is important to consider valuing the differences between options.

In principle, appraisals should take account of all benefits to Scotland/the rest of UK. This means that as well as taking into account the direct effects of interventions, the wider effects on other areas of the economy should also be considered These effects should be analysed carefully as there may be associated indirect costs, such as environmental costs, which would also need to be included in an appraisal. In all cases, these wider effects should be clearly described and considered.

Real or estimated market prices provide the first point of reference for the value of benefits. There are a few exceptions where valuing at market prices is not suitable however if a market is dominated by monopoly suppliers, or is significantly distorted by taxes or subsidies, prices will not reflect opportunity costs and adjustments may be required and specialist economic advice will be needed.

The results of previous studies may sometimes be used to estimate the economic value of changes stemming from current programmes or policies. As databases expand there will be increasing scope for using this ‘benefit transfer’ method, although care must be taken to allow for differences in circumstances e.g. the characteristics of the consumers or client group for which data exist may differ from those of the proposal under consideration. These factors can limit the extent to which values can be transferred or generalised.

In cases where there is an 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. Annex 2 of the *Green Book* sets out the key considerations that may govern a decision to commission research.

Where it is concluded that a research project to determine valuations is not appropriate, a central estimate, together with a maximum and minimum plausible valuation, should be included if possible. These figures should be included in sensitivity analyses to give assurance that benefit valuation is not critical to the decision to be made. A plausible estimate of the value of a benefit or cost can often be drawn out by considering a range of issues which are summarised in Annex 2 of the *Green Book*.

Most appraisals will identify some costs and benefits such as environmental, social or health impacts for which there is no readily available market data but which are still important enough to value separately. In these cases, a range of techniques can be applied to elicit values, even though they may be subjective. Annex 2 of the *Green Book* describes the relevant techniques, and provides further information on how they are being applied in practice.

Costs and benefits that have not been valued should also be appraised; they should not be ignored simply because they cannot easily be valued. All costs and benefits must therefore be clearly described in an appraisal, and should be quantified where this is possible and meaningful. Guidance on the appraisal of non-monetary cost and benefits is given in Section 2.2.

* 1. Cost Savings, Efficiency Improvements and Redundancies

Cost and efficiency savings or improvements may be claimed as part of the justification for projects. In such cases, the appraisal report should make it clear whether the projected cost savings are intended to result in financial savings or in re-deployment of resources. Details of the expected financial savings or planned re-deployment should be given. This is particularly important where *staff savings* are projected. Specific points to note about cost savings include:

When **total costs** are used for all options including the baseline option, cost savings are automatically accounted for in the differences in cost between the baseline option and the alternative options. In these circumstances it is ***incorrect*** *to include cost savings on the* *benefit side of the calculations* as this would be double counting.

Where staff reductions are projected, a detailed analysis should be included separately. This should show the numbers and organisation of staff by grade prior to implementation (which should generally be the same as that assumed at the commencement of the baseline option); and how the numbers and organisation of staff by grade are expected to change year by year over the term of the appraisal under the preferred option.

Where it is assumed that staff time savings will be taken up by extra output, or reallocation to other duties, *justification must be* *provided*.

Redundancy payments should generally be treated as **transfer payments**. Details of any redundancy proposals should be explained fully in the appraisal report, including their financial implications. In some cases they may give rise to local economic and social difficulties, in which event their impact should be assessed. Such impacts may be significant where the numbers of redundancies are relatively large and where unemployed workers with characteristics similar to those being made redundant are taking longer than average to find jobs or are becoming inactive.

* 1. Adjusting for Displacement

Consideration should be given to Displacement. This is:

* the degree to which a promoted activity will be offset by reductions in activity elsewhere

It is important to assess this because appraisal is about identifying a proposal’s *net* impact on the UK. Displacement occurs when a service development/ reconfiguration in one region will draw service users to/ from similar service provision in an adjacent region.

Where Displacement can be quantified in money terms, the cost/ benefit streams should be adjusted to reflect the proposal’s net impact. This is more likely to be the case for a business expansion than a service development. In any case, the nature and extent of anticipated Displacement should be identified and reported fully in appraisal reports. Where significant potential Displacement is foreseen, it may be appropriate to reconsider the nature or scale of the proposed service development.

* 1. Multiplier Effects

In most appraisals it is sufficient to cost direct or 'first round' expenditure and employment effects. Multiplier or 'second round' effects should normally be *excluded* on the grounds that the alternative uses to which the resources would otherwise be put would also generate multiplier effects, and differences in such effects are often difficult to distinguish with confidence or without disproportionate effort. Also, to include them in some appraisals but not in others would distort project comparisons.

However, in a minority of appraisals, such as those concerned with regeneration of specific sub-regions, there may be justification for calculation of multiplier effects in order to estimate the full impact of a particular proposal. Thus, there is flexibility to calculate multiplier effects in cases where they are of special interest.

* 1. Appraisal of Land, Buildings and other Assets

The employment of assets including land and buildings should be costed using **opportunity cost** values. The valuation of property should be based on the higher of the most valuable feasible alternative use, or the best value that could be obtained for its current use.

Determining the right values requires expert advice. Advice should be sought from suitably qualified and experienced valuation surveyors, for instance, members of the Royal Institution of Chartered Surveyors or the Institute of Revenues, Rating and Valuation. Where the planning context is unclear advice should also be sought from surveyors experienced in planning matters.

In many cases, an up-to-date market value should provide a satisfactory measure of opportunity cost. However, valuations based on market prices reflect private rather than social costs and benefits, hence they will not always reflect opportunity costs. For example:

* they may not take full account of the actual or potential amenity value or environmental impact of a particular land use; or
* where the current use of land is subsidised, market prices may need adjustment to reflect the impact of the subsidy; or
* where the market value of a site is enhanced by planning permission the property should be valued to reflect the actual planning approval.

Assessing the value of buildings in their most profitable use is fairly straightforward where the building can be readily adapted to different users’ requirements, such as standard office accommodation. However many public sector buildings, such as prisons and hospitals, may not be readily adaptable to other purposes. In the absence of an alternative use for the buildings, the higher of the value of the site for redevelopment and a valuation in current use of the site plus buildings should be used. The latter can be estimated in terms of depreciated replacement cost (DRC).

DRC value may represent what the land and buildings are worth to the occupier, but a DRC approach is normally only used where no markets exist for a property for its existing use. It would not be unusual for the alternative use value, which represents market value, to be much less than DRC value therefore the DRC value should not be used to represent the expected proceeds of any sale/ disposal as it is unlikely that the market would pay as much as the DRC value.

Land and buildings should generally be costed in terms of either capital values or annual rents. It is normally appropriate to use **capital values** in appraising:

* freehold property;
* properties with development value; and
* longer leasehold interests

In other cases it is usually appropriate to use **annual rentals**. Actual rent paid on leasehold property (the passing rent) will often differ from the market rent. It is the market rent that should be used in appraisal but only from that point in the lease where the rent is subject to review. Common errors in appraisal are either to omit the rental or capital value of land and buildings already owned, or to double count the cost by including both the capital cost and rental value.

Capital values of land, buildings and other assets should be attributed as costs at the beginning of any period in which they are employed by an option. Property should be costed whether or not any financial transaction is anticipated. For instance, it should be costed whether or not it is already owned or needs to be purchased. In new build cases, the cost of construction should be included. Costs of refurbishment should be included in the years in which they are expected to occur.

Where assets have a residual life, their residual values should be included as benefits in the year in which they are released by an option, or the last year of the appraisal period, whichever is sooner. Any enhancement of the value of a building during its life, for instance due to refurbishment, should be taken into account in estimating its residual value. Residual values should be attributed whether or not the property is to be sold or retained.

Double counting of the cost difference between options should be avoided. It is generally sufficient to cost in the alternative option(s) the sites actually employed in those options. For example:

* Suppose there is an option to use a site already in ownership worth £5,000 ("Option 1") and an alternative option to acquire and use another site worth £8,000 ("Option 2").
* The difference in cost between these options is adequately reflected by including a cost of £5,000 in Option 1 and a cost of £8,000 in Option 2.
* It would be incorrect to add a benefit of £5,000 to Option 2 to reflect the sale or release of the owned site.
* That would give the misleading impression that Option 2 is less costly than Option 1 by £2,000; whereas it is more costly by £3,000.

Deciding the correct treatment of **opportunity costs** can be less straightforward than in the above example. For instance:

* suppose there is another alternative (“Option 3”) that involves employing the £5000 site for the first two years and then moving the function to a new £8000 site.
* in this case, £5000 should be included as an opportunity cost at the start of the appraisal period;
* a residual value for the same site should be included as a benefit in Year 2; an opportunity cost of £8000 should also be included in Year 2; and a residual value for the new site should be included at the end of the appraisal period.

In some cases it may be helpful to separate the value of the land from the buildings. This is because buildings usually depreciate in real terms over their lifetime due to contamination, mineral workings, or poor ground conditions but site values may appreciate or depreciate.

Appraisals should include any land price *appreciation* as a consequence of the project or programme. This may occur with appraisals of urban regeneration projects, or of flood protection. In such cases great care is needed, as the appreciation itself is likely to be most uncertain.

Costs to the public sector as a whole must be taken into account in the appraisal calculation. This will be important in the case of jointly occupied buildings where there might be difficulties in finding a replacement tenant if one occupier were to quit, so imposing additional costs on the major occupier.

**Allowance should be made for an appropriate level of ongoing maintenance costs.** If maintenance is not carried out to an appropriate standard this will be reflected in the increased costs of refurbishment, or reduced sale price of a freehold property, while in the case of leasehold property dilapidations payments will be incurred at the termination of the lease.

Costs of providing temporary accommodation and other costs of decanting staff should be included in appraisals.

When a building requires refurbishment, the relative merits of refurbishment, and alternative options such as redevelopment, relocation and disposal should be appraised.

Where possible, appraisals should include both freehold and leasehold options to test both for value for money.

The time period for appraisal should relate to the life of the services being provided and be sufficiently distant to cover all the important cost and benefit differences between options. The appropriate period may be shorter than the physical life of the buildings or longer than the period for which they are leased. A time period of 60 years is typically used, with suitable allowance for refurbishment costs and residual values. However, there is flexibility to tailor the time period to suit the circumstances of the case in hand.

* 1. The Acquisition and Disposal of Assets

NHSScotland bodies have a duty to dispose of property surplus to requirements within three years and should not hold land speculatively. Disposals should be conducted in accordance with the requirements of the NHSScotland Property Transactions Handbook.

Projects should not use more land than is cost effective. Available plots of land for new developments may not precisely match requirements, and where a plot exceeds requirements the surplus should be disposed of as soon as possible.

Decisions involving the acquisition or disposal of assets require the application of appraisal with proportionate effort, including examination of different options and their associated costs and benefits.

The use of appraisal is intended to ensure that NHSScotland bodies acquire assets only where the resulting benefits are greater than or equal to the cost of the asset including any revenue costs. Similarly NHSScotland bodies considering the disposal of an asset should ensure that the options have been subject to appraisal.

Disposal of property, the sale of freehold property, or the assignment or subletting of leasehold property, will generally involve significant costs, e.g. legal fees, marketing costs and removal costs. In a depressed market the timing of disposal must be appraised and appropriately qualified advisers can provide guidance. Timing will be critical where there is excess supply in the market for the particular type of accommodation, or where the property is ‘over rented’. In such cases it might be possible to dispose of a lease by paying a reverse premium, which will be at least equal to the present value of the difference between the passing rent and the market rent until the market improves or the termination of the lease.

Strenuous efforts should be made to dispose of surplus property; but in poor markets it may be necessary to include in an appraisal the costs of holding the property until disposal, or to cover such initiatives as refurbishment to enhance marketability.

Suitably qualified advisers can provide NHSScotland bodies with assessments of the open market values of assets in order to ensure that they obtain the highest possible price for an asset which it decides to sell and pays no more than a reasonable market value for an asset which it decides to purchase. Apart from exceptional circumstances, and then only with the prior approval of SGHSCD Capital Planning & Asset Management, NHSScotland bodies should not:

* propose to acquire assets at a price in excess of open market value notwithstanding the appraisal results;
* consider disposal restricted to open market value where the appraisal indicates a higher continuing operational use value to Government.

Under the SGHSCD Capital Property and Asset Management Policies NHSScotland bodies are now charged with adopting a more active strategy towards disposals. Through the introduction of formal property audits, NHSScotland bodies will be required to justify the retention of all property assets.

1. Weigh Up Non-Monetary Costs and Benefits

Where possible, costs and benefits should be valued in money terms, using techniques such as those presented in Annex 2 of the Green Book. However, it is not always cost-effective or practical to value costs and benefits in money terms. In many assessments there are non-monetary impacts such as environmental, social or health effects that cannot be valued cost-effectively. These non-monetary costs and benefits must be taken into account and should not be assumed to be any less important than the monetary values. Their values may be crucial to the decision.

* 1. Multi- Criteria Analysis

The aim is to find a suitable way to assess non-monetary factors and present them alongside monetary values. In the simplest cases, it may be adequate just to list and describe them however it will often be appropriate to use a more sophisticated technique. The umbrella term Multi-Criteria Analysis (MCA) is frequently used to describe the range of techniques available.

MCA brings structure and transparency to judgement of how non-monetary options compare. It should relate closely to the stated objectives of the project and consist of comparative assessments, both quantitative and qualitative of how well each option meets the objectives. Sometimes the stated project objectives are sufficient to serve as the relevant criteria for the MCA, in other cases they may need to be developed into a set of more detailed criteria.

The nature of the option assessment can vary from qualitative description (in the simplest cases), or ticking a box to indicate that an option satisfies a particular constraint. In larger or more complex cases, measurement of impact in suitable non-monetary units or the use of relative weights for each criterion and explicit scoring or ranking of each option should be adopted.

MCA techniques include, for example:

* *Impact statements or performance matrices*. This method tabulates the impact of each option upon each non-monetary factor. This can be a versatile approach but is not *generally* recommended by SGHSCD.
* *The weighted scoring method*. This involves assigning numerical weights to each factor to reflect its comparative importance, scoring the performance of each option against each factor on a numerical scale and calculating a ‘weighted score’ for each option.

Multi criteria analysis can be used as a way to bring data expressed in units other than money values into the appraisal process. It can be used to rank options or choose a preferred option and usually involves an explicit relative weighting system for the different criteria relevant to the decision. This often involves an implicit quantification of different impacts – especially once the performance against the various criteria is compared to the costs that are deemed worth spending to secure or to avoid them.

The available techniques should be considered carefully before choosing the method most appropriate to the case in hand. It is good practice to cover all non-monetary factors by *either* the impact statement method or the weighted scoring method. It is not helpful to cover some factors in a weighted scoring calculation and others in an impact statement. This can cause confusion and invalidate the rankings emerging from the weighted scores.

The weighted scoring method approach is the **preferred** methodology for SGHSCD.

Whatever the technique adopted:

* It is important to make clear how the options compare in regard to the non-monetary factors. Information should be presented in a way that facilitates this e.g. by use of suitable tables or matrices.
* Costs and benefits should be quantified in suitable non- monetary units where possible. For example, performance indicators may be used to differentiate the performance of options in relation to achievement of the needs and objectives established at the outset of the appraisal. Research may be needed to determine the best units of measurement.
* Details of the methods and assumptions used should be recorded.

**Impact statement** consists of a table summarising the impact of each option upon each objective or ‘difficult to quantify’ factor. The cells of the table should contain suitable quantitative impact measures or indicators; and/ or qualitative impact analysis. The size of the table can be scaled to suit the needs of the case in hand. An accompanying commentary summarising the main trade-offs and other features of the analysis should generally be provided. Departmental economists can advise on the design of suitable impact statements and may be able to provide examples.

Table XX: Impact Statement Layout

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Option 1** | **Option 2** | **Option 3** |
| **Objective 1** |  |  |  |
| **Objective 2** |  |  |  |
| **Objective 3** |  |  |  |

The **weighted scoring** method is the one generally recommended by SGHSCD and this is described in more detail in Appendix 2. Where the weighted scoring method is used, SGHSCD requires the results to be supplemented with details of:

* the criteria used - including the agreed definition of each criterion;
* the weightings applied;
* the scoring process;
* details of, and rationale for, the option scores.

**Failure to explain weights and scores properly has been a feature of a number of past appraisals, and can delay approvals. SGHSCD will not accept figures that are not fully explained.**

In some cases the primary concern of an appraisal may be to determine the least- cost option for achieving a specified level of service provision. However, even when this is the case there may be a need to appraise benefits as well as costs. It is rarely the case that options offer identical benefits; there will usually be some differences in performance that need to be appraised along with the cost information.

* 1. Distributional Effects

Policies, programmes and projects may give rise to distributional effects between people of different incomes, ages, genders, religions, ethnic groups, health states, skills, or locations. Expenditures or other policy proposals invariably leads to both gainers and losers, and information on how the costs and benefits are distributed among different individuals, organisations, or sectors of the economy can be very important. In general, proposals that deliver greater net benefits to lower income groups should be rated more favourably than those that benefit higher income groups.

Significant distributional effects should be identified and as far as possible, quantified in appraisals and evaluations. How the options differ regarding these effects should be analysed in much the same way as for other non-monetary factors. For instance, where an impact statement is being used the distributional impacts should be summarised in it, together with those of all the other non-monetary factors. Alternatively, they may be scored as criteria in a weighted scoring exercise.

The *Green Book* includes a method for applying explicit distributional weights. It is only applicable in cases where benefits to income groups are monetised, and this can require a substantial effort in terms of information collection and analysis. Judgement of the appropriate approach should be informed by consideration of the scale and significance of the distributional impact of the proposal in view; and the ease or cost-effectiveness with which distributional impacts can be measured.

1. Calculate Net Present Values and Assess Uncertainties
   1. Discount Rates and Net Present Values

In appraisals, we generally need to compare options that will impact over a period of years into the future. This raises the question of how future cost and benefits should be valued in today’s terms. Normally people prefer to receive cash sooner rather than later, and pay bills later rather than sooner. This is referred to as the *time preference*.

In the public sector, likewise, *social time preference* is reflected by giving more weight to earlier than to later costs and benefits. This is achieved by applying a ‘discount rate’ to future costs and benefits. The discount rate defines how rapidly the value today of a future real pound declines through time, just as a real rate of interest determines how fast the value of a pound invested now will increase over time.

Discount rates are currently 3.5% for up to 30 years. Values for long term discount rates can be found in Annex 6 of the Green Book. <https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/220541/green_book_complete.pdfDoscount>. This rate should be applied in all cases

The following table shows how net present value of £1000 declines in future years with the 3.5% discount rate:

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Net Present Values and the 3.5% Discount** | | | | | | | | | | |
| Time (yrs) | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| NPV (£) | 1000 | 966 | 934 | 902 | 871 | 842 | 814 | 786 | 759 | 734 |

The 3.5% rate is the standard discount rate up to and including the 30th year of an appraisal. However, there is good reason for discounting longer term impacts less heavily. This is explained in Annex 6 of the *Green Book*. The main rationale for declining long-term discount rates arises from uncertainty about the future. Thus, instead of applying 3.5% to all future years, the following schedule should be used:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Years | 0 - 30 | 31 - 75 | 76 - 125 | 126 - 200 | 201 - 300 | 300+ |
| Discount Rate | 3.5% | 3.0% | 2.5% | 2.0% | 1.5% | 1.0% |

<https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/220541/green_book_complete.pdf>

In addition it has become increasingly common to discount health benefits differentially. If health effects are measured in quantities – e.g. quality adjusted life-years – and the value of health effects is increasing over time, discounting the volume of health effects at a lower rate than costs is a valid method of taking account of the increase in the future value of health effects. In practice the only reason to discount quantities of health is the existence of pure time preference and it is suggested that this is around **1.5%** in real terms (HM Treasury, *Green Book: Appraisal and Evaluation in Central Government*, 2003). Sensitivity analysis should be conducted around this rate. When health effects are valued in monetary terms, they should be discounted at the same rate as other monetary values – i.e. at 3.5% in real terms.

* 1. Treatment of Inflation

The standard discount rate is defined in *real terms*, and should therefore be applied to values which are also expressed in real terms, as opposed to nominal or cash values. This means that the anticipated effects of general inflation should be removed from all the figures before discounting.

The most common assumption is that inflation will affect all prices equally, in which case all values are expressed in constant prices at a given date. This is adequate in a majority of appraisals. The effect of expected future inflation in the general price level should be removed by deflating future cash flows by forecast levels of the relevant deflator. The GDP deflator is the appropriate measure of prices to use as a general deflator. See [HM Treasury’s Gross Domestic Product (GDP) Deflators: A User’s Guide](http://www.hm-treasury.gov.uk/data_gdp_guide.htm) for latest figures and examples of use.

In some cases, it may be anticipated that a certain cost or benefit item for example wage earnings or oil prices, will experience inflation at a significantly different rate to that of general inflation. In such circumstances, the cost or benefit stream for that item should be adjusted accordingly before discounting. Specialist advice should be sought about how to do this if necessary.

* 1. Adjustment for Optimism Bias

It is important to note that where applicable the adjustment for optimism bias (OB) should be made *before* the calculation of NPVs. Following HM Treasury terminology, the base case for each option is the best estimate of its costs and benefits after allowance for appraisal optimism. The base case NPV for each option is its OB-adjusted NPV. Optimism Bias is further explained in the Risk Management SCIM guide.

* 1. Net Present Value

For each option of an appraisal a calculation of its Net Present Value (NPV) should generally be included.

The NPV is the key summary indicator of the comparative value of an option. It is the name given to the sum of the discounted benefits of an option less the sum of its discounted costs, all discounted to the same base date. Where the sum of the discounted costs exceeds the discounted benefits, the net figure may be referred to as Net Present Cost (NPC).

Following the identification and measurement of the costs and benefits for each short listed option a calculation of their Net Present Value (NPV) should be included using the appropriate discount rate.

**The decision rule is to select the option that offers to maximise NPV, or minimise NPC.** This is subject to account being taken of those impacts which cannot be valued in money terms. Conceptually, these also have an NPV or NPC, but inability to express them in money terms means that they must be judged by other means and weighed alongside the monetary values in reaching a decision.

The time horizon for NPV calculations should reflect the economic life of the services being appraised or the useful life of relevant key assets and should be sufficiently distant to cover all the important cost and benefit differences between options. For projects expected to have a very long life, the effect of shorter horizons should be illustrated for key years.

Discount calculations should be shown in detail. Net Present Value (NPV) calculations should show a breakdown of the main cost/ benefit items covered, and how their incidence is distributed over time. In addition, SGHSCD expects the calculations to show:

* the discount factors used, year by year;
* the total NPV (or NPC) for each individual year; and
* the cumulative total NPV (or NPC), for each year of the calculations.

Appraisal reports should record both:

* the *price basis* of the money values (i.e. the date at which prices have been held constant); and
* the *base date for discounting* (i.e. the date corresponding to start of the appraisal - usually the beginning of Year 0 in the NPV calculations).

Discount calculations can be facilitated by the use of software packages. The Generic Economic Model (GEM), developed in conjunction with Department of Health is an Excel spreadsheet suitable for the needs of NHSScotland bodies. SGHSCD expects the GEM to be utilised for option appraisal and for GEM outputs to be contained within business cases prepared by NHSScotland bodies. **The GEM and the guidance for its use is accessible at:**

<http://www.dh.gov.uk/en/Procurementandproposals/Publicprivatepartnership/Privatefinanceinitiative/GenericeconomicmodelPFIschemes/DH_4016193>

* 1. Required Rates of Return and Pricing Rules

Some central government bodies sell goods or services commercially, including to the government itself. These activities may be controlled by requiring prices to be set to provide a required rate of return (RRR) on the capital employed by the activity as a whole. Government policy is generally to set charges for goods and services sold commercially at market prices, and normally to recover full costs for monopoly services, including the cost of capital as defined in the HM Treasury Fees and Charges Guide.

* 1. Assessing Uncertainty

The OB-adjusted NPVs provide a starting point for understanding the impact of risk between different options. However, the future is inherently uncertain therefore no matter how thoroughly costs, benefits, risks and timing are identified and analysed, and even after best efforts have been made to adjust for optimism bias, there will remain uncertainty over the accuracy of the assumptions made. It is essential to test how these uncertainties may affect the choice between options. Whereas OB- adjustment is primarily about ensuring NPVs are based on best estimates, assessment of uncertainty is chiefly about testing the rigour of the appraisal conclusions.

**Sensitivity analysis** is the key technique for this purpose and it is fundamental to appraisal. It is the process of examining how the preferred *option is* affected by reasonable variations in key assumptions. Its purpose is to aid the option selection decision; it is not something to be applied merely to a preferred option after it has been selected. The need for sensitivity analysis should always be considered and dispensed with only in exceptional cases. It is always potentially useful but is particularly valuable when the NPVs of options are relatively close to each other.

The basic procedure is to alter an assumption, recalculate the OB-adjusted NPV for each option, and consider the impact on both the total net benefits and on the appraisal results.

It is generally recommended to consider the effect of varying assumptions one at a time as this helps to isolate the assumptions that have the most impact. Some variations may have little impact on NPVs or option ranking, in which case they may not be regarded as a cause for much concern. Other variations may alter the ranking of options or significantly change the NPV. Such variations should be considered carefully and may require specific risk management actions. For example, it may be appropriate to seek to reduce the uncertainty over particular assumptions in order to make them stronger, and improve the chances of a good outcome.

The calculation of ‘switching values’ is a particular form of sensitivity test. It shows by how much a variable would have to fall (if it is a benefit) or rise (if it is a cost) to switch the balance of advantage from one option to another, or switch the NPV from positive to negative. This may be a crucial input into the decision as to whether a proposal should proceed. For example, it can help answer key questions such as:

* By how much can we allow benefits to fall short of expectations, if the project is to remain worthwhile? How likely is this?
* How much can operating costs increase without jeopardising the VFM of the proposal? How likely is this?

In any particular case, judgement should be used to decide upon the assumptions that are worth subjecting to sensitivity analysis, and the range of variation to be examined for each assumption. A prior analysis of costs into fixed, step, variable, and semi-variable categories can help in understanding the sensitivity of the total costs of proposals. Examples of the assumptions which should be considered for sensitivity analysis include:

* projections of need or demand e.g. projected sickness incidence rates, demographics
* estimates of key costs and benefits e.g. items of capital or recurrent costs, forecasts of revenue income
* changes in real prices e.g. growth of real wages or real energy prices
* weights and scores attached to non-monetary factors
* the phasing of costs or benefits
* the time horizon for the appraisal

The reasons for choosing the assumptions investigated and the range of variations examined should be recorded. In- depth analyses of variations in every assumption should be avoided.

Presentation of sensitivity analyses is important, particularly when many are undertaken. Summary tables should generally be provided, comparing the key results of all the sensitivity tests undertaken. Inclusion of large numbers of spread sheets that repeat most of the rows of figures in the main spread sheets is not very helpful. Sufficient information should be provided to facilitate checking of sensitivity calculations.

NHSScotland bodies should explain the implications of sensitivity analysis for option selection. It is not good practice simply to append sensitivity analyses to appraisal reports without explaining their significance.

It can sometimes be helpful to group potential variations into scenarios, for example, to enable consideration of ‘optimistic’ and ‘worst case’ scenarios. ‘Scenario planning’ looks at the consequences of various possible states of the world for anything from an individual investment project to an entire corporate strategy. Scenario planning supplements sensitivity analysis by describing alternative internally consistent possible future economic and political environment, and outcomes. Scenarios are often useful for planning an investment programme and may also be justified for exceptionally large and complicated projects, or for policies that are very sensitive to the external environment.

Scenarios should be chosen to draw attention to the major technical, economic and political uncertainties upon which the success of the project or option or strategy depends. Generally the best approach is to set up two or three scenarios that differ in important dimensions. The expected NPV can be calculated for each scenario. It may also be helpful to undertake some sensitivity analysis within and between scenarios.

More sophisticated techniques should be used as appropriate in particularly large or complex appraisals. More explanation is given in the *Green Book*. For example,

In certain cases, it may be appropriate to use Monte Carlo analysis to calculate expected values rather than single point estimates for NPVs. Specialised computer software and expert assistance may be required.

Proposals requiring sequential decisions can be analysed using ‘decision trees’, which are graphical representations of the set of possible strategies. Different strategies result in different NNNPVs depending on the events (or states of the world) that occur. An extension of the technique can be employed when the probability of any particular risk is assigned.

1. Option Appraisal Results

The result of the appraisal is a critical part of the evidence base on whether or not to proceed with a particular option. Such decisions can have far reaching consequences. Therefore the presentation of the results and conclusions of an appraisal to decision makers and stakeholders can be as important as the analysis itself.

In all cases transparency is vital. The presentation of the option appraisal in the business case should be comprehensive and include all of the steps of appraisal listed and should make the analysis accessible to personnel who do not have an intimate knowledge of the project but need to make judgements based upon the information given. Presentation should be clear, logical, well founded and geared towards helping the decision at hand. Business cases in particular should be drafted in non-technical language wherever possible, but if it is necessary to use technical terms, they should be explained.

The summary results of sensitivity and scenario analysis should be included in business cases (not just single point estimates of NPV values), with detailed discounted cash flow analysis (using the Generic Economic Model) and optimism bias calculation (using DH guidance) as appendices to the business case.

It is important to include a section which draws together the main findings and conclusions of the appraisal. Decision makers need to understand that there are ranges of potential outcomes to judge the capacity of proposals to withstand future uncertainty. The main results for each short listed option *should be shown* including:

* NPV and/or NPC
* Capital and recurrent costs
* Non-monetary impacts, including costs and benefits not easily valued and distributional issues,
* Main risks and uncertainties
* Budget, Cash Flow and Funding implications

**Summary tables** or matrices should be used to facilitate comparison of the results of the option analysis.

The option appraisal results should be assessed along with other relevant evidence, and a preferred option should be identified. In the simplest cases, this may be a matter of choosing the option with the lowest NPC. In other cases, non-cost factors may be crucial and may justify selection of an alternative that is not the least costly. Timing considerations and affordability may also influence option choice. Whatever the justification for the preferred option is, its VFM should be confirmed and its advantages over the main alternatives should be explained specifically.

1. APPENDIX 1: Comparison of Economic and Commercial Appraisal

**Introduction**

* 1. Differences between economic appraisal and commercial appraisal can be a source of confusion for practitioners.

**Economic Appraisal**

* 1. Economic Appraisal should always include an assessment of value for money in terms of the national interest, therefore its scope is very wide.
  2. Economic Appraisal always values costs and benefits on an economic (opportunity) cost basis. However, the approach to costs and benefits may fall into one of the following three main categories:
* **Cost Benefit Analysis (CBA)** which attempts to quantify *all* the costs and benefits *in money terms*;
* **Cost Utility Analysis (CUA)** this is like CBA except that it seeks to measure benefits using non-monetary indicators of utility.Utility is an economist's term for the satisfaction or usefulness derived from a product.
* **Cost Effectiveness Analysis (CEA)** in which *either* the benefits *or* the costs are held constant. In the former case CEA compares thecosts of different ways of producing the same or similar outputs,which are not necessarily given a monetary value; in the latter casevarious ways of allocating a fixed sum are considered in order tomaximise the benefits.
  1. CBA is rarely applicable in its purest form because relevant costs and benefits are often difficult to measure in money terms. Even when appraising projects producing tradable goods and services (e.g. investments by the nationalised industries, grants to commercial firms) there may be non-monetary effects to take into account, such as environmental impacts and other qualitative outputs. CEA is used to some extent, particularly when the emphasis is upon choosing the least cost method of achieving particular objectives. However, many appraisals fall somewhere between CEA and CUA. They involve options which vary regarding both costs *and* outputs, and it is a matter of judging which of the alternatives is best by comparing the different costs and outputs which they offer.
  2. Commercial Appraisal shares some of the characteristics of Economic Appraisal but is much narrower in scope. Its purpose is to establish whether a proposed activity will be viable in a commercial sense.
  3. Establishing a project’s viability covers several elements including analysis of projected cash flows, examination of the financing, marketing and management arrangements for the specific proposal in view, and assessment of the historical performance and general financial position of the relevant company or public sector trading body.
  4. The crucial differences of substance are that costs and benefits are generally estimated:
* based on ***economic cost***values in Economic Appraisal, but ***financial* values** in Financial Appraisal;
* in **Economic Appraisal**, but ***only for an individual public sector trading body or private company***in Financial Appraisal.
  1. Many of the mistakes made in appraisals arise from failure to recognise these differences. Some of the more common errors are listed below under Common Errors in Economic Appraisal.
  2. Confusion can also arise through misuse of terminology. In Financial Appraisal, an NNNPV calculation is often referred to as a Financial Appraisal. This can confuse in two ways.
* Firstly, the term Financial Appraisal is sometimes used to describe the NNNPV calculations in an Economic Appraisal, which is misleading because NNNPVs in an Economic Appraisal are not based on financial values.
* Secondly, Financial Appraisal may be used to describe a variety of financial assessments, including, for example, an affordability assessment, or an analysis of sources of funds.

**Common Errors in Economic Appraisal**

* 1. Some common errors in Economic Appraisals include:
* **Statement of objectives in vague qualitative terms** such that their achievement can not be measured
* **Failure to cost assets already in public ownership**. These have an opportunity cost and should be costed at their current market value.
* **Inclusion of capital financing charges** such as loan charges. These may be relevant to a Commercial Appraisal or Affordability Assessment but do not represent an economic cost. In an Economic Appraisal, capital should be costed according to its purchase cost at current market values.
* **Double counting of capital expenditure with interest and depreciation charges.** In Economic Appraisal the cost of capital is adequately covered by including expenditure on capital costs in the years in which it occurs. In Financial Appraisal the conventional approach is to include depreciation and interest charges. To combine these approaches is to count capital costs twice.
* **Inclusion of transfer payments** such as social security or redundancy payments. These do not represent economic costs.
* **Applying the test discount rate to cash or nominal values**. This is wrong because the discount rate is defined in real terms and must be applied to values expressed also in real terms.
* **Failure to consider costs and benefits to other bodies or budget holders**. Economic Appraisal is about *all* the costs and benefits to Scotland/rest ofUK and needs to go beyond the horizons of an individual NHSScotland bodyor other body.
* **Ignoring Displacement**. The impact upon the business of other service providers or market competitors should be taken into account.
* **Lack of a clear explanation of the basis of all weights and scores**, leading to misunderstanding and delays until clarification is obtained.

**Checklist**

* 1. The checklist below provides an aide-memoire on whether particular costs should or should not be included in each type of appraisal. It is in the nature of a checklist like this that it cannot cover every eventuality, so it should not be regarded as a substitute for more detailed guidance on the treatment of costs and benefits.

Table: Checklist of Costs

|  |  |  |
| --- | --- | --- |
| **1. COSTS** | **Economic Appraisal** | **Financial Appraisal** |
| **a) Capital Costs** |  |  |
| Land purchases | **✓** | **✓** |
| Land already owned | **✓** | **✓** |
| Fixed Capital purchases | **✓** | **X** |
| Fixed Capital already owned | **✓** | **X** |
| Depreciation on Fixed capital purchases | **X** | **✓** |
| Depreciation on Fixed  capital already owned | **X** | **✓** |
| Interest payments,  capital charges | **X** | **✓** |
| Change in Working capital requirement | **✓** | **✓** |
| Capital subsidies/grants  from UK | **✓** | **✓** |

|  |  |  |
| --- | --- | --- |
| **b) Current Costs** |  |  |
| Cost of inputs & outputs  (excluding capital) | **✓** | **✓** |
| Insurance costs | **✓** | **✓** |
| Corporation Tax | **✓** | **✓** |
| VAT | **X** | **✓** |
| Import Duties | **X** | **✓** |

2. APPENDIX 2: The Weighted Scoring Method
   1. There are a number of approaches to the appraisal of costs and benefits that are difficult to value in money terms. These include, listing and describing them, developing a matrix or impact statement, and applying the weighted scoring method. The various approaches should be considered carefully before choosing the method most suited to the case in hand.
   2. The weighted scoring method approach is the preferred methodology for SGHSCD. It involves identification of all the non-monetary factors (‘attributes’ or ‘criteria’) that are relevant to the project; the allocation of weights to each of them to reflect their relative importance; and the allocation of scores to each option to reflect how it performs in relation to each criterion. The result is a single weighted score for each option, which may be used to indicate and compare the overall performance of the options in non-monetary terms.
   3. This process necessarily assigns numeric values to judgements. These judgements should not be arbitrary or subjective, but should reflect expert views, and should be supported by objective information. To achieve meaningful results which decision-makers can rely on, it is important that:

* the exercise is not left to the ‘experts’, but is undertaken by a group of people who represent all of the interested parties, including those who are directly affected by the project, and those who are responsible for its delivery;
* the group possesses the relevant knowledge and expertise required to make credible measurements and judgments of how the options will impact upon the criteria.
* the group is led by an independent chairman to steer the process, probe opinions, promote consensus and avoid prejudice; and
* the justification for the group’s chosen weights and scores is fully explained.
  1. Appraisal reports should identify the personnel involved in the exercise, including an indication of their credentials, so that decision-makers are fully aware of whose views are represented. If there is a lack of consensus among members of the group regarding any of the weights or scores, the views of the dissenting individuals should be recorded.
  2. The process of deriving weights and scores is explained below step by step, covering the following stages:

1. Identify the relevant non-monetary criteria;
2. Weight the criteria to reflect their relative importance;
3. Score the options to reflect how each option performs against each criterion;
4. Calculate the weighted scores;
5. Test the results for robustness; and
6. Interpret the results.

**Step 1: Identification of Non- Monetary Criteria**

* 1. Identifying the criteria may sound straightforward, but criteria must be clearly defined so that both appraisers and those reviewing appraisal reports have a clear understanding of them. To help in the scoring of options, criteria should be defined as far as possible in service or output oriented terms, and they should generally relate closely to the service objectives and performance measures established at the outset of the overall appraisal.
  2. Criteria are best defined so that the status quo or do minimum baseline option can be given a score other than zero. For example, if one of the project objectives is to improve access for the disabled, the criterion is better defined as ‘accessibility for the disabled’ than as ‘improvement in accessibility for the disabled’. The first definition allows all of the options, including the baseline option, to be scored and thus enables the options to be compared in proportion to the baseline. The second definition necessitates a zero score for the baseline option, which means that the scores for the alternatives can not indicate how much better they perform than the baseline option[[1]](#footnote-1).

**Step 2: Decide the Weights for Each Criterion**

* 1. The second stage is to decide on the weights to be attached to each of the criteria identified. This should reflect the group consensus about the relative importance of the criteria, which is a matter for judgement, based on, for instance, relevant policy statements. The most common approach, and the one which is most readily comprehended, is to express the weights in percentage terms so that they sum to 100.
  2. Justification for the weights ascribed should be recorded. Such an explicit approach helps to ensure that the basis of the weights is fully understood and accepted by all those participating in the exercise as well as those using its results.

**Step 3: Scoring the Options**

* 1. The third stage is to score each option against each criterion on a suitable scale. The approach described here uses a *cardinal* scale. This means that if Option A is considered to perform three times as well as Option B, then Option A is given a score that is three times that of Option B. Simpler alternatives to cardinality are possible, for example an *ordinal* scale may be used. This provides a simple ranking of options against each criterion, which enables one to say that Option A is better than Option B, but it does not indicate *how much* better A is than B. Such an approach may be useful in some circumstances, but a cardinal approach, if sustainable, is more informative.
  2. Options are scored against the criteria by reference to a scale, say from 0 to +20. A score of 0 will indicate that the option offers no benefits at all in terms of the relevant criterion, while a score of +20 will indicate that it represents some "maximum" or "ideal" level of performance. Scores between 0 and +20 will indicate intermediate levels of performance. The scale used does not have to be from 0 to +20, but the same scale should be used for all criteria.
  3. To achieve cardinality, the group needs to think carefully about the differences in the scores awarded to the options, and to provide meaningful justification for them.
  4. The weighted scoring method should not be used to avoid the effort of measuring differences between options in measurable non-monetary units nor should it be used to substitute vague subjective judgments of comparative performance for hard measurement. The credibility of the scores depends upon the provision of a rational justification to support them, including measurement where possible. In any case, project sponsors must be able to provide justification for each and every score that is awarded, and SGHSCD will expect this to be recorded in full detail.
  5. Scores should be allocated to all of the options, including the baseline option (i.e. the status quo or ‘do minimum’). A common error has been to overlook the baseline, but it is important to include it. However inadequate it may seem, the existing or ‘do minimum’ level of service will normally impact on the criteria to some extent, and scoring this helps to give a sense of proportion to the scores of the other options, and to compare their performance to that of the current or minimum level of provision.

**Step 4: Calculate the Weighted Scores**

* 1. This simply involves multiplying each score by the weight for the relevant criterion. Thus weighted, the scores are totalled to obtain an aggregate weighted score for each option.

**Step 5: Test the Strength of the Results**

* 1. It is important to examine how reactive the results are to changes in the weights and scores used. This can be done with the aid of sensitivity analysis.
  2. Details of the sensitivity analysis should be recorded, and the strength of the results confirmed. Where appropriate, attention should be drawn to circumstances in which the ranking of options or the differences in weighted scores are particularly sensitive to plausible changes in certain weights or scores.

**Step 6: Interpret the Results**

* 1. Non-monetary factors are generally important in public sector appraisals therefore weighted scores can have a crucial influence upon option selection.
  2. These scores should act as indices for comparing the options’ overall performance on non-monetary factors, indicating not only how the options rank but also how great the differences between them are. Thus they should serve a similar purpose in respect to non-monetary factors as NPVs do in respect to monetary factors.
  3. The results of a weighted scoring exercise are specific to individual cases, and are not readily transferable to others. However, the criteria relevant to one project are likely to be relevant to other projects of a similar type. The weights given to these criteria may not be the same, but the principles for deciding the weights should show some consistency across similar projects. There should also be some consistency in the principles used for scoring options within similar categories of project.

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1. APPENDIX 3: Basics of Discounting

**Introduction**

* 1. Using a discount rate has the effect of reducing the value of future costs and benefits in present day terms. If society has a discount rate of 3.5% per annum, this implies that £1 in a year’s time is worth only 96.62p now, because 1/1.035 equals 0.9662. The 96.62p figure is called the Net Present Value (NPV) of the £1, and the 0.9662 figure is the relevant ‘discount factor’.
  2. The following figures show how the NPV of £1 declines in future years when the rate of discount is 3.5% per annum.

|  |  |
| --- | --- |
| **Year of Payment**  **(mid year)** | **Net Present Value**  **(at middle of year 0)** |
| 0 | £1.0000 |
| 1 | £0.9662 ( = £1 x 1/1.035) |
| 2 | £0.9335 ( = £1 x 1/1.0352) |
| 3 | £0.9019 ( = £1 x 1/1.0353) |
| 10 | £0.7089 ( = £1 x 1/1.03510) |

* 1. It is important to remember that the discount rate should generally be applied to figures that are:
* **expressed in real terms** i.e. excluding allowance for general inflation; and
* **adjusted for appraisal optimism**
  1. In most appraisals it is sufficient to carry out discounting on costs and benefits identified at *annual intervals*. For example, it is common to identify streams of costs and benefits assumed to occur in the middle of Years 1, 2, 3 etc and to discount them all back to the middle of Year 0. Similarly, they may be assumed to commence at the start of Year 1, 2, 3 etc and discounted back to the start of Year 0.
  2. Table 1 of this appendix (see below) shows the discount factors needed to calculate NPVs at 3.5% per annum. Table 2 provides discount factors for discount rates from 1% to 10% per annum. Detailed discounting calculations are facilitated by the use of suitable computer software, avoiding the need to refer to discount tables. However, tables can be useful in some circumstances, for instance when simple calculations are required. Departmental economists can advise on the design of spread sheets to suit particular cases.

**Equivalent Annual Costs**

* 1. In some cases it can be helpful to calculate NPVs in terms of Equivalent Annual Costs (EAC). A cost of £100 in the middle of Year 0 is equivalent to a stream of 10 annual costs of £12.03 starting in the middle of Year 1 when using a 3.5% annual discount rate. It can be demonstrated that such a cost stream has a NPV of £100 when discounting at 3.5% per annum. An asset that costs £100 and has an expected life of 10 years is thus said to have an EAC of £12.032. Table 3 below provides EAC factors for a 3.5% discount rate.
  2. EACs can be useful when contemplating replacement of a capital asset, where there is a need to compare alternative assets with different lives.
  3. **Example:** Consider two options for replacing a boiler. In Option X a boiler with an expected life of 7 years may be purchased for £2,000. Under Option Y another boiler with an expected life of 10 years may be purchased for £2,500. Which should be purchased?
  4. The relevant costs may be annuitised using EACs as follows:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Option** | **Life (yrs)** | **Cost (£)** | **EAC Factor (@3.5%)** | **EAC (£)** |
| X | 7 | 2,000 X | 0.1635 | = 327 |
| Y | 10 | 2,500 X | 0.1203 | = 301 |

* 1. In this case, the initially more expensive boiler would be the more cost-effective choice.

**Discounting Constant Annual Costs or Benefits**

* 1. Table 3 contains annuity factors, which are convenient for discounting a series of constant annual costs or benefits. For instance, suppose a constant annual payment of £10,000 in real terms has to be paid every year from Year 1 to Year 20. The NPV of this cost stream may be calculated by applying the annuity factor for 20 years, which is 14.2339 using a 3.5% discount rate. The NPV in this example is £142,339.
  2. Annuity Factors may still be used where the constant stream of costs or benefits begins later than Year 1.
  3. **Example:** What is the NPV in the middle of Year 0 of 15 constant real annual costs of £75 starting in the middle of Year 7?
* First, calculate the NPV as if the costs started in Year 1. Using the annuity factor for 15 years and a 3.5% per annum discount rate, the NPV is £865 ( = £75 x 11.5281).
* However, given that the costs start in Year 7, this £865 figure represents the NPV at the middle of Year 6.
* To convert this to the NPV at the middle of Year 0, apply the discount factor for Year 6, which is 0.8135.
* The solution is thus £704 ( = £865 x 0.8135) or ( = £75 x 11.5281 x 0.8135).

TABLE 1: Discount Factors @ 3.5% p.a.

|  |  |  |  |
| --- | --- | --- | --- |
| **Year** | **Discount Factor** | **Year** | **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 |

TABLE 2: Discount Factors @ 1% TO 10% p.a.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Year** | **1.0%** | **2.0%** | **3.0%** | **3.5%** | **4.0%** | **5.0%** | **6.0%** | **7.0%** | **8.0%** | **9.0%** | **10%** |
| 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 |

**Discount Rates**

TABLE 3: Equivalent Annual Cost & Annuity Factors (3.5% p.a)

|  |  |  |
| --- | --- | --- |
| **Years** | **Equivalent Annual Cost**  **of £1 p.a.**  **(“EAC Factors”)** | **Present Value of £1 p.a.**  **(“Annuity Factors”)** |
| 1 | 1.035 | 0.9662 |
| 2 | 0.5264 | 1.8998 |
| 3 | 0.3569 | 2.8019 |
| 4 | 0.2723 | 3.6735 |
| 5 | 0.2215 | 4.5158 |
| 6 | 0.1877 | 5.3296 |
| 7 | 0.1635 | 6.1162 |
| 8 | 0.1455 | 6.8762 |
| 9 | 0.1315 | 7.6107 |
| 10 | 0.1203 | 8.3206 |
| 11 | 0.1111 | 9.0066 |
| 12 | 0.1036 | 9.6696 |
| 13 | 0.0971 | 10.3013 |
| 14 | 0.0916 | 10.9296 |
| 15 | 0.0869 | 11.5281 |
| 16 | 0.0827 | 12.1067 |
| 17 | 0.0791 | 12.6659 |
| 18 | 0.0759 | 13.2064 |
| 19 | 0.0730 | 13.7289 |
| 20 | 0.0704 | 14.2339 |
| 21 | 0.0681 | 14.7221 |
| 22 | 0.0660 | 15.1940 |
| 23 | 0.0641 | 15.6502 |
| 24 | 0.0623 | 16.0913 |
| 25 | 0.0607 | 16.5176 |
| 26 | 0.0593 | 16.9298 |
| 27 | 0.0579 | 17.3283 |
| 28 | 0.0567 | 17.7136 |
| 29 | 0.0555 | 18.0861 |
| 30 | 0.0544 | 18.4462 |

1. This is not to say that the baseline option should never be given a zero score. In the accessibility example, the baseline option will deserve a score of 0 if the current provision is completely inaccessible to the disabled. However, the more likely position is that the disabled can access it with a degree of difficulty, in which case a suitably small positive score would be appropriate [↑](#footnote-ref-1)