Centre for Climate Change Economics and Policy

Grantham Research Institute on Climate Change and the Environment

Handling non-monetised factors in project, programme and policy appraisal

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This policy paper is intended to inform decision-makers in the public, private and third sectors. It has been reviewed by at least two internal referees before publication. The views expressed in this paper represent those of the author(s) and do not necessarily represent those of the host institutions or funders.

Handling Non-Monetised Factors in Project, Programme and Policy Appraisal

Foreword

This paper is based on work undertaken by the author for the Social Impacts Task Force – an interdisciplinary group of analytical specialists, mainly economists and social researchers, in the UK Civil Service.

Since the 1980s there has been an increasing emphasis in UK government policy, programme and project appraisal on the monetisation of factors for which there is no appropriate market value. Much progress has been made and it is a trend that should be welcomed and encouraged. It appeals to the natural instincts of economists and of decision makers, who welcome the clarity and simplicity that monetisation provides or appears to provide.

However there has been much less emphasis on procedures for addressing and presenting factors that cannot be monetised, alongside monetised analysis. Good procedures have been developed for a few programmes. But for the most part non-monetised factors are addressed ad hoc, if at all.

However the idea of more structured approaches to the handling of non-monetised factors in or alongside economic analysis falls uncomfortably between disciplines and between technical analysis and institutional procedure. It is consequently not well addressed in any academic or management literature. This paper is itself something of an ad hoc review, but it records the current situation, clarifies some simpler aspects such as terminology and the limits of monetisation, and discusses some obstacles and potential steps forward.

It is addressed mainly to economists and to those using the work of economists.

Michael Spackman
13 May 2013

1. Introduction

In past three decades the sophistication of policy, programme and project appraisal in UK central government, and the associated central and departmental guidance, has advanced dramatically. Many of these advances have been in the extension of monetisation to an ever wider range of costs and benefits.

For many appraisals the analysis, where it is centred on monetary valuations, is led by economists, whose main appraisal techniques depend upon such valuations. Non-monetised factors are rarely addressed in the economics literature and it is sometimes suggested, by economists, that the handling of such impacts is usually best addressed by immediate further work on monetisation. However in any substantial appraisal there are always significant impacts that cannot in practice be sensibly monetised in the short term, if ever. And there are no widely established principles in government for handling non-monetised factors in the presentation of cost benefit analysis (CBA) or cost effectiveness analysis (CEA). It is also not unknown for non-monetised factors to be addressed superficially, especially when there are pressures for quick delivery of analysis.

The National Audit Office has identified the handling of non-monetised factors as an issue and suggested that "One of the ways to improve discussion of non-monetised factors is to be more specific in central guidelines as to what is expected" and that it would be useful to "promote a more structured approach to its conduct and presentation in the [Treasury] Green Book and the Impact Assessment guidance" (NAO, 2011).

This need has emerged in part from the great expansion in the use of economics-based techniques. This expansion has been reinforced by the widening scope of monetisation and by the increase in political demand for public spending or regulatory interventions to be justified by formal, value-for-money analysis.

The approach to the issue in one policy field with notoriously difficult-to-monetise attributes, namely culture, has been well addressed from the perspective of political science (O'Brien, 2010), with, however, the realistic conclusion that, for the most part, those seeking public funding for culture should seek ways to value the benefits they claim in monetary terms. This paper, written from the perspective of economics, does not question O'Brien's conclusion, but it explores the general issue from the other direction, by examining how factors that cannot be sensibly monetised may best be handled alongside CBA or CEA.

Doing so raises many problems of scope. Thus this paper is concerned mainly with ex ante appraisal, but it also touches on the presentation of non-monetised data in ex post evaluation or for the provision of background information.

It does not address methods of monetisation.[1] Nor does it address the problem sometimes faced of handling monetised values, derived perhaps from a third party's survey data, in which the responsible Department or Agency has less than full confidence. Nor does it address techniques that are normally confined to disciplines other than economics, with the exception of those described as

[1] A bible on stated preference techniques, published in association with the Department for Transport, is still Bateman el al (2002). Especially worth reading is the final short Chapter 12, by Prof Graham Loomes, on 'Cautions, caveats and future directions'. A discussion document on the Green Book website (Fujiwara and Campbell, 2011) provides a general overview of valuation techniques, including the potential contribution of direct measurements of subjective well-being. Fisher (2008) provides a thoughtful and useful paper on valuation of environmental benefits.

'multi-criteria analysis'. Nor is it directly concerned with those policy and operational areas that call for no significant economics input.

It does however address some contextual issues, including terminology and the reasons why not everything can sensibly be monetised.

It is addressed mainly to economists and those working with economists, in contexts in which the core analysis is provided largely by economists. This audience includes the two non-economist specialisms most concerned with policy and project analysis in central government, namely social researchers and operational research scientists.[2] The paper should also be of interest to decision-makers for whom such analysis is undertaken.

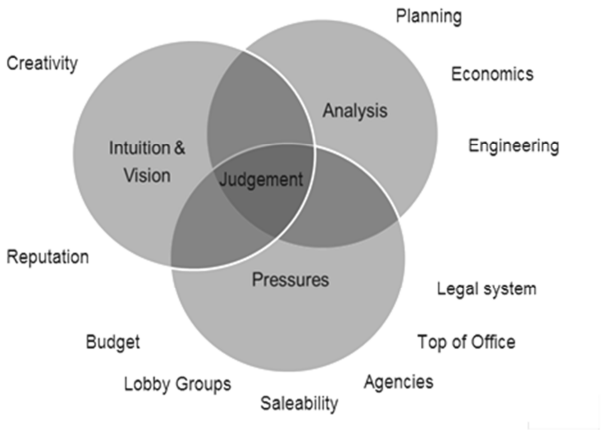
[2] This is not to overlook the essential contributions of scientists, engineers, modellers, statisticians and other specialists. The overlaps of concern here arise most often, in most Departments, between economics and social research and economics and operational research, but in some contexts they are stronger between economists and engineers or other specialists.

2. The Policy and Institutional Context

2.1. Policy context and procedural frameworks

The decision making process in government is well summarised in the following diagram.[3] It draws from experience in Transport, but mostly applies universally (although Planning should shift further over towards 'Intuition & Vision'). The diagram puts in perspective the scope of this paper, which addresses the work of specialists, especially that of economists on their own or with other disciplines, with a focus on the scope of "Analysis".

Decision making in government



Government economists often need to have regard to issues stemming from several points of the compass in this diagram and this paper addresses how these might best be handled, by economists, when they are not monetised.

This paper is concerned primarily with middle level decision making, which most analytical work is supporting. In practice such decision making, on the appraisal of regulatory or major spending proposals, has in recent years fallen into the two main categories of Business Cases and (regulatory) Impact Assessments.[4] This paper is less directly concerned with higher level policy reviews, where the integration of analytical results with wider issues is generally a clearly separate stage, not led by analysts.[5]

In England and Wales the "five case" Business Case structure applies to all spending proposals big enough to qualify for an entry in the European Journal; and Treasury guidance is that the thinking behind it should be proportionately applied to spending proposals below that level. For regulatory proposals, including most proposals for legislation, an Impact Assessment (IA) procedure is used. There is a Better Regulation Executive (BRE) IA template, and, since 2012, a review structure involving the Regulatory Policy Committee and the Reducing Regulation Committee. Many Departments use this template (without the central review structure) also for other policy analysis, before any specific legislation is proposed.

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[3] This diagram was constructed by Professor Peter Mackie of the Institute for Transport Studies, University of Leeds.

[4] A third significant, but narrow category is Tax Impact Assessment.

[5] An example of such a review is that of road maintenance in Scotland, involving many authorities and much handling of non-monetised information: http://www.transportscotland.gov.uk/road/maintenance/road-maintenance-review

Broadly similar procedures apply in Scotland.[6]

The Business Case framework automatically brings together the largely monetised core analysis with the often semi-monetised dimensions of strategy, commercial feasibility, financing and management structure.

The BRE IA template puts relatively more emphasis on monetised analysis. However the two Summary Sheets cover "Intervention and Options" and "Analysis and Evidence" and the latter includes, below the monetised figures, a box for "key non-monetised costs by main affected groups" and a similar box for non-monetised benefits. Scotland's Business and Regulatory Impact Assessment template is more open-ended and less politicised than the BRE template. However it too emphasises monetised analysis, implying that if something cannot easily be monetised a monetary value should be estimated.

Within the core analysis, problems of non-monetised impacts arise much more often with benefits than with costs. They are therefore typically less serious in cases of cost-effectiveness analysis, to derive the most cost-effective way of delivering a public service output that is already fairly well defined.[7] But they are still usually significant.

2.2. Institutional frameworks

The seminal publication on multi-criteria decision analysis (Keeney and Raiffa, 1993) distinguishes between the technical aspects of good analysis, which were those authors' concern, and what they discreetly describe as "constraints imposed by the implementation phase":
"How do good analyses get done? How can you choose good analysts? Should you use outside consultants or an inside group? Where in the organisation hierarchy should an analytical capability be created? How does the introduction of an analytical team shake up an existing bureaucracy?"
The authors explain that they say nothing of these issues, except that issues of organisational structure, personal incentives of the people involved and quality of the analysis are crucial considerations.

This current paper is more directly concerned with these issues than were Keeney and Raiffa. But these are issues that have been addressed over many decades across UK government. The arrangements vary widely, not least because of the huge variations in the types of project and policy for which departments and agencies are responsible. And the arrangements continue to change over time.

It is often found that the effective integration of monetised and non-monetised information is greatly helped by interdisciplinary working; and especially if those concerned are used to working together. And a common problem in government is loss of corporate memory, about data or technical processes, over periods of more than a few years.

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[6] The procedures for Scotland are set out exceptionally clearly. Pre-Expenditure Assessment guidance can be found at: http://www.scotland.gov.uk/Topics/Government/Finance/spfm/appraisal#PEAs In practice that guidance is often overtaken by the competing - and much more formal - requirement to produce Business and Regulatory Impact Assessments: http://www.scotland.gov.uk/Topics/Business-Industry/support/better-regulation/partial-assessments

[7] Or, exceptionally, where the non-monetised output is well defined in terms of some widely accepted non-monetary unit, the most conspicuous example being the quality adjusted life year (QALY) in health economics. (Although the Department of Health now monetises the QALY.)

3. Terminology and Concepts

3.1. Terminology

The handling of non-monetised factors alongside analysis centred on economic techniques steps into interdisciplinary territory, where one obstacle to progress is differing interpretations of familiar terms. The usage in this paper is as follows for some terms that are common, but often ambiguous.

Cost benefit analysis (CBA): This term is sometimes used in a lay sense to describe any comparison of costs and benefits. In this paper it is used more narrowly, in a textbook sense, and as in the Treasury Green Book, to describe the analysis of monetised factors, including the value of one or more significant non-marketed quantities, based on stated or revealed preference data.[8]

Multi-criteria analysis (MCA): The term MCA is sometimes used in government in a literal sense, to describe any technique that assesses a policy, programme, or project against multiple criteria. Economists describe Appraisal Summary Tables, as discussed later, and sometimes CBA itself, as MCA. Social researchers describe the technique of 'deliberative MCA', which is outlined in section 4.4 below. In this paper the term **multi-criteria decision analysis (MCDA**) is used to describe a set of techniques based in the discipline of 'decision analysis', as outlined in sections 4.5.2 and 4.5.3 below and a little more fully in 'Multi-criteria analysis: a manual' (DCLG, 2009).[9]

Economic: The adjective 'economic' is used in government in several different, but overlapping senses, which often causes confusion.

- It is used to describe 'economic techniques' or 'economic analysis' such as CBA, which are based in the discipline of economics.
- It is used to describe 'economic costs and benefits' in the sense of impacts on 'the economy' – which is generally equated in this context with GDP.
- The terms 'economic costs and benefits', and 'economic values' are also used more widely to cover all impacts that can be monetised (and that can therefore be included in 'economic analysis'), whether or not the impact has any direct effect on the economy as it is usually defined.[10]
- 'Economic impact' is also sometimes used to mean 'welfare impact'.

In this paper the word 'economic' is avoided where possible, but it is used in the first and second of these senses where the context is clear. Thus, for example, CBA is an 'economic technique', based in the discipline of economics; and it is sometimes helpful to distinguish between 'economic', 'social' and 'environmental' impacts, where economic means impact on 'the economy' (and 'social' and 'environmental' impacts have little effect on GDP as conventionally measured, and are therefore not 'economic' impacts, but they may still sometimes be monetised).

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8 "Stated or revealed preference data" is taken here to include monetary valuations derived from subjective well-being data, or from formal multicriteria decision analysis, as discussed later.

9 MCDA is the usual UK usage, but other terms used by decision analysts include Multiple objective decision analysis, Multi-attribute decision analysis and Multi-criteria decision making.

10 'Economic costs and benefits' tends to be used in this sense in contexts where most of the public service benefits can be monetised. 'Economic values' is used more widely, by non-economists (e.g. O'Brien, 2010) as well as economists.

Value for Money (VFM): The term VFM is widely used, but rarely defined in precise, operational terms. It can be applied at many levels, to policy (or to institutional structure), or to programme, project, or lower level activity, each presenting a different set of issues. And the question of 'whose money?' is not always clearly defined. The term is not used in this paper, except in the context of specific departmental guidance.

Wellbeing, welfare, happiness and utility: Most of these terms can usefully have specialised meanings in some contexts. However in this paper no distinction is made between them. It is assumed that the objective of all government activity is to maximise welfare.[11]

Benefit-cost ratio (BCR): This term is included here because, although, with a constrained budget, a BCR is sometimes the best way to present the output of a CBA alongside factors that have not been monetised, the basis of estimated BCRs is sometimes ambiguous. There is no standard convention defining which costs should be included in the denominator, rather than deducted as negative benefits in the numerator. This is not relevant to the calculation of a net present value (NPV), but it can substantially affect the estimated BCR.[12]

Quantification and valuation: These terms are included here because it is not uncommon for the term quantification to be used ambiguously, where it may mean valuation in monetary terms or may mean valuation in physical units. This can cause confusion.[13]

Appraisal and evaluation: In the Green Book (HM Treasury, 2011a) and in general usage by government economists the term appraisal is used for ex ante analysis and evaluation is used for ex post analysis. This is a helpful usage for capital projects. Outside government, evaluation is widely used to mean either, perhaps more often ex ante than ex post. In the academic and professional "evaluation" literature, and among government Social Researchers, the term is normally used in a dual sense, as in the Magenta Book (HM Treasury, 2011b), to apply to the use of ex post analysis as a direct means of developing new or revised policy. This is a helpful usage in those areas of policy which entail frequent trial and error to establish what works best in new or evolving social environments. This paper adopts the Green Book usage. The paper is also framed in terms of ex ante analysis, but much of its content is also relevant to ex post evaluation.

This list could be extended. Some problems found by decision analysis in communicating with economists, in an exploration by Defra of the potential for MCDA, are recorded in Phillips and Stock (2003, p18).

3.2. The nature and role of analysis

The term 'analysis' is here used in a broad sense, as in the Green Book, to describe the activities of analysts such as microeconomists, social researchers, operational researchers, engineers and other technical experts. The core of this work, in policy or project appraisal, is generally the establishment

[11] More weight may be given to the marginal welfare of some than that of others. Such distributional issues are examples of factors that may often be best not explicitly monetised.

[12] In practice it is only in those few Departments that are appraising series of projects within the same budget constraint, and which produce mainly monetised impacts, that BCRs are at present routinely used. The cost per QALY ratio is similarly used by NICE in appraising the cost effectiveness of medical treatments.

[13] 'Valuation' itself can be ambiguous, as quantities may be valued in other than monetary terms, as in decision analysis techniques. 'Values' is also sometimes used in appraisal and evaluation in the sense of ethical or cultural values. But 'valuation' is less clumsy than 'monetisation' and in this paper it is mostly used to mean monetisation.

of objectives (and ideally criteria) and then using these objectives and criteria to compare policy or project options against a base case.

'Core analysis' will generally at least record conventional impacts that have not been explicitly monetised, such as landscape perhaps, or serious distributional impacts. But it will normally exclude strategic, commercial, or managerial factors that are separately covered in the Treasury Business Case. This paper is concerned with how non-monetised factors can best be handled and presented both within the core analysis and in setting the core analysis alongside other aspects of the business case.

It assumes, as is usually accepted by analysts themselves, that formal analysis cannot generally do more than provide advice to contribute to the judgements of final decision makers; and that the outputs of analysis should be presented with that objective on mind.

3.3. The limits of monetisation

Any expenditure or regulatory decision implies that the net monetary value of the benefits, in aggregate, is expected to exceed that of the costs. To that extent every significant impact is assigned, at least implicitly, some monetary value, or value range. It is also true that many more impacts can sensibly be monetised directly today than was the case a few decades ago, and the range continues to expand as data and methodology develop. However in practice some important factors may not be *explicitly* monetised for one or two main reasons:

A. collecting and analysing the data to derive an explicit valuation of useful accuracy would be disproportionately costly, or take too long, or otherwise not be feasible; and/or

B. explicit valuation would be hiding, in the black box of backroom analysis, a judgement that should be a transparent, case-specific responsibility of decision makers.

Many case-specific impacts in the core analysis of appraisals fall under Category A. In the absence of adequate valuation data from other, broadly comparable situations, the cost of obtaining reliable, case-specific stated or revealed preference valuations is often disproportionate for all except perhaps mega-projects. Or it may be seen as impracticable because adequate data are unobtainable. For example the distortionary cost of taxation may imply a large shadow price for public spending relative to consumption, but the empirical base for an explicit number is too weak for a value to be endorsed by the Treasury for general use: it is a factor applied indirectly via budget constraints. In more specific policy areas factors such as industrial innovation, security of energy supply, and dynamic responses to new situations are today at least largely non-monetised, straddling categories A and B.

Category B includes many issues that arise mainly in what were described in Section 2.1 as higher level policy reviews. These include impacts with big ethical or political connotations in policy fields such as genetic modification, the sale of human organs, abortion, surrogate pregnancy, or prisoner voting rights. It includes the political or ethical aspects of most distributional issues. The National Institute for Health and Clinical Excellence (NICE) draws a useful distinction, in that field, between scientific value judgements and social value judgements, with excellent guidance on the latter (NICE, 2008). Category B also extends to important political judgments about consequences and about future states of the world in fields such as defence capabilities, or the implications for the UK of

alternative levels of commitment to international issues, such as climate change mitigation[14], or aspects of immigration policy. Most of these issues merit considerable expert briefing and may offer scope for considerable analysis. But in these and other such unusual areas some aspects are essentially for the decision maker's explicit political or professional judgement.

Managerial dimensions *outside the core analysis* normally entail many political and professional judgements about non-monetised factors, mostly in Category B.

Also within Category B are catastrophic risks, which at the individual or global level generally cannot be sensibly valued. Thus in safety analysis wide use is made of the valuation of preventable fatalities, based on measures of people's willingness to pay to reduce fatality risk. But where individual workers or members of the public would be exposed to risks beyond some "tolerable" level the cost ascribed to a potential fatality is greatly increased. These tolerability limits are likely always to be decided by expert judgement, subject to Ministerial discretion. A decision such as not allowing a hospital to be built next to a major hazard site might often be reasonably seen as a matter for administrative/political judgment, rather than monetised analysis.[15] At the global level it is unlikely that the expenditure to avoid a civilisation-destroying catastrophe, such as a major asteroid impact, would be determined by a monetary valuation of the prospective catastrophe.[16]

Other aspects of risk may also be issues of subjective judgement that need to be explicit. Thus it is widely accepted that public sector appraisal should generally be 'risk neutral', in the sense that random variability about the expected mean is virtually costless. But public sector managers may sometimes be concerned about uncertain impacts on their budgets. And different Ministers may wish to be more or less cautious where uncertainty, not about probabilities but about probability distributions themselves, is very high. Such situations may offer much scope for monetised analysis, but robust ex ante monetisation of aversion to uncertain probabilities seems, at least currently, elusive.[17]

3.4. The limits of quantification

It is normally assumed by analysts, and rightly so, that if a factor can be identified but not monetised it is generally good to quantify it as far as it is possible and sensible to do so. But it is sometimes argued that even non-monetary quantification can in some cases hide the real political, or ethical, or other quality of life of strategic aspects on which decision makers should be focusing. Such concerns

[14] This is distinct from the question of, having decided upon a specific degree of commitment, what are the best ways of achieving a target rate of mitigation of emissions. For this purpose the derivation of a monetary cost of carbon to incorporate in CBA, as in the UK, is probably the best approach.

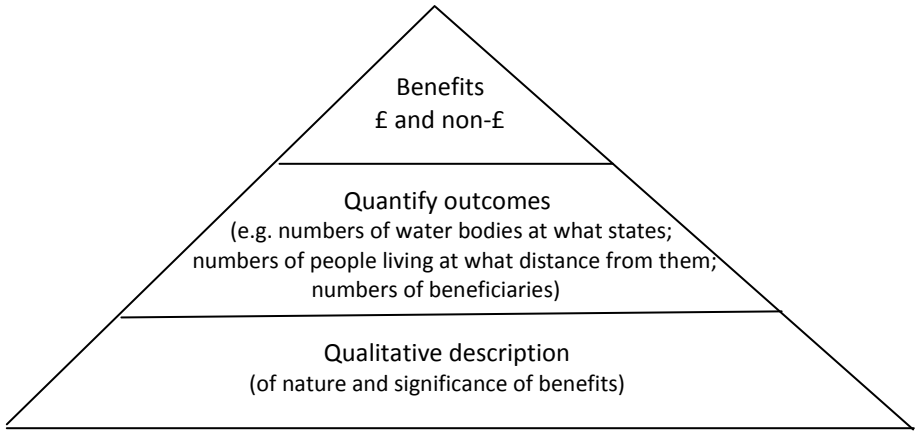
[15] Although the question of "exactly how far distant is acceptable?" might be approached mainly by CBA, with most major factors monetised.

[16] The micro equivalent to this is the "rule of rescue", whereby individuals and institutions generally accept an imperative to rescue people in imminent danger, regardless of cost, although budgets will normally have constrained the resources available to implement the rescue. This is described in the health care context by McKie and Richardson (2003).

[17] Uncertainty about probability distributions is now sometimes called 'ambiguity' and some literature investigates the concept of monetising aversion to ambiguity (e.g. Dietz, Heal and Millner, 2010). But there seems little early prospect of this leading to practicable, quantitative guidance. Uncertainty about uncertainty is most often associated with environmental impacts such as long term climate change, but the extreme overspends that arise from time to time, notably in major IT projects, occasionally in construction (e.g. the British Library) and in some defence projects, arise at least partly from a lack of appreciation of the uncertainty of outturn probabilities. The Treasury response, ten years ago, of defining fairly large default adjustments for overspend risks has probably helped to highlight the dangers but not, apparently, much affected the incidence of such events.

may sometimes reflect a reluctance to open up unavoidable policy trade-offs. But they can sometimes have substance.[18]

In practical application a "building blocks assessment" such as that illustrated below (this example being taken from work by Defra and the Environment Agency on the Water Framework Directive) can sometimes be helpful in promoting proportionality in determining how high up the quantification / monetisation pyramid to climb.



3.5. The philosophical basis of public sector analysis: whose preferences about what?

The philosophy of the social (and indeed natural) sciences is a big subject, debated less by economists than other social scientists. There is just one aspect, noted here, that can be especially relevant to the concerns of this paper, which is that of whose preferences should count in public sector analysis.

Most analysts take it for granted that public policy (or programme or project) analysis is about maximising the public interest, but views can differ on which view of the public interest should count. In the context of lobby groups, analysis may often lean towards "policy based evidence", to support a predetermined policy view. Within government this should be the exception rather than the rule, except in the respectable sense that analysis needs to reflect the political context and the consequences of decisions already made.[19] Most government analysts might see the personal preferences of ministers as an issue to address in the very final stages of the presentation of the analysis.

Some analysts take the view that they themselves have a role, as academics or less often as public servants, to apply their personal, ethical, or other subjective preferences. Most government economists and most teaching of CBA take the view that the relevant preferences are not those of the analyst, but those of the people affected. But there are two schools of thought about exactly which of these public preferences should count.

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[18] Policy towards the Arts presents obvious challenges for quantification. Selwood (2002) presents a thoughtful review and critique of much of the data collection in the 1990s, the main criticism being of the objectivity and use of the data. A no less thoughtful conference report (Clark, K. (ed), 2006) examines what kinds of measurements are relevant to this and related fields. DCMS has since then commissioned much work on monetisation of benefits of culture, media and sport.

[19] For example the Government may specify shadow prices for carbon, for use across government, derived on the basis of estimated marginal carbon abatement costs to achieve the Government's politically determined emissions targets.

One view is that the relevant preferences are generally those revealed by, or analogous to, market preferences – that is people's (or households') preferences for themselves – as is implicit in most "willingness to pay" studies. The other view is that government analysis (and public decision making) should be based on estimates of the preferences of informed citizens for the community as a whole. This is often a fine distinction, but it can be important.[20]

A clear description of the assumptions underpinning the interpretation and presentation of the data is helpful where there is otherwise scope for ambiguity.

[20] The issue is discussed clearly in Sugden (2008), in a collection of papers in memory of Alan Williams, a greatly admired health economist (with wider interests in economics and the social sciences generally) who died in 2005, after more than 40 years as a professor at York University. Sugden explains how, as a young postgraduate, he and Williams wrote what is still one of the best books on cost benefit analysis (Sugden and Williams, 1978). Sugden leant towards the quasi market approach and Williams towards the informed citizen approach.

4. Handling and Presenting Combined Monetised and Non-Monetised Factors

Information on non-monetised factors is often collected and presented in government for direct presentation to project, programme, or policy decision makers for immediate option choices. It is also used in the ex post evaluation of impacts or processes, and to improve background understanding. The main focus of this paper is ex ante appraisal for immediate decision making. However several of the techniques addressed below apply also, and sometimes mainly, to ex post evaluation or background data presentation and some examples are included of the latter applications as well as ex ante appraisal.

This section first stresses the need for analytical advice on appraisal to be founded on well considered *decision criteria*. Various approaches to non-monetised factors are then outlined under the headings of 'supporting commentary', 'checklist approaches', 'deliberative MCA', 'decision analysis techniques' and 'other tools and approaches'.

4.1. The need for decision criteria

With non-monetised factors in analytical outputs for immediate appraisal decision making, a universal requirement is clear decision criteria.

A criticism sometimes levelled against CBA, especially by decision analysts, is that the use of a monetised NPV or BCR as a decision criterion, perhaps subject to some constraints, discourages the close examination of the usually multiple criteria that apply to substantial regulatory or expenditure decisions.

This criticism has substance. If non-monetisable impacts are significant, the decision criteria (as well as the activity's objectives) need to be addressed and clearly articulated. This is rarely a trivial task. Some examples are summarised in the Appendix.

Although the decision criteria appropriate for analysis need to be consistent with any mission statement declaring a Department's objectives, they also need usually to be differently formulated, to relate more directly to the particular case and to avoid ambiguities and double counting.

4.2. Supporting commentary

Non-monetised factors are often presented in the simplest way possible, as a textual account, perhaps supported by tables or graphs. A textual account is obviously sufficient if the non-monetised impacts are trivial, or it is clear that they strengthen the option already favoured by the monetised analysis. But sometimes it is in any case the best that can sensibly be done, provided that the non-monetised factors are quantified, or otherwise explained clearly, with an indication of their practical importance.

Supporting commentary can also be appropriate, as part of a wider presentation, for summarising one particular type of non-monetised impact, such as distributional effects.

Examples of both these cases are presented in the Appendix.

4.3. Checklist approaches

Checklists are invaluable in helping to ensure that factors are not overlooked. A limitation is that, so long as the listed items can be ticked, there may be little incentive for lateral thinking about extending the list, or exploring more imaginative ways of dealing with the items on the list, or interactions between them.

A further limitation of such lists, for immediate decision making, is that they still leave the need for multi-dimensional judgements about the trade-offs between the listed factors. But they can, if well designed and presented, help greatly to inform and focus these judgements.

4.3.1. The five case Business Case structure

The Treasury Business Case was outlined in Section 2.1. Its particular strength is that it brings together the core analysis and other, wider aspects that are relevant to appraisal decision making. The core analysis, or "economic case" is described by the Treasury as "the essential core of the business case" to be prepared "according to Treasury's Green Book guidance". This and the other four "cases" are outlined as a case study in the Appendix.

4.3.2. The Impact Assessment template

As was also noted in Section 2.1, the current England and Wales Impact Assessment template has spaces for non-monetised costs and benefits to be entered. It also includes a requirement for the objectives of the proposed measure. It does not however set costs and benefits against decision criteria. Nor does it include issues outside the core analysis.

4.3.3. Appraisal summary tables

The furthest developed, routine presentation of non-monetised factors in spending proposals in UK government is the use of an Appraisal Summary Table (AST), along the lines of those developed by the Department for Transport and subsequently the Environment Agency.

Creation of such a table prompts a well-considered definition of the significant criteria against which options should be assessed.

The AST approach lends itself most easily to capital projects within large, continuing programmes, where a single, fairly detailed template can be designed to apply to a large number of projects. It provides no analytical mechanism for comparing all the multiple trade-offs within a typically large mass of data. However it can be a major aid to the trade-off judgements that need to be made and it could be applied more widely.

An AST of this kind has much in common with the "performance matrix" in MCDA, as outlined in section 4.3.2 of DCLG (2009). However, as currently used, the performance matrix is generally in more of a summary form, but also compares a range of options wider than simply one proposal against "do minimum", and, more substantially and in contrast to ASTs, it is often a precursor to further formal analysis drawing on stakeholder judgements.

Sometimes the trade-off against at least some non-monetised factors in an AST is approached by creating "adjusted" BCRs, derived by including estimates by expert officials of the monetary value of at least some of the non-monetised impacts (DfT, undated), as explained in the Appendix. This has

obvious limitations and dangers that prevent its wide application, but may in some circumstances improve decision making.

As noted earlier the term multi-criteria analysis (MCA) is used in Departments and Agencies in diverse senses. Economists sometimes describe Appraisal Summary Tables as multi-criteria analysis, which is true in a presentational sense.

Links to examples of ASTs are presented in the Appendix.

4.4. Social science based deliberative MCA

Fish et al (2011), in a general guide to 'Participatory and deliberative techniques to support the monetary and non-monetary valuation of ecosystem services', include an example of 'multi-criteria analysis'.

In this example (relating to the management of a large, environmentally sensitive, but tourist intensive catchment area in New South Wales), the participants, all public sector officials, contributed two days of face-to-face discussions, separated by ecosystem services meetings and email exchanges. In this case the participants were the main decision makers themselves. This took the process some way towards a comprehensive analysis for decision making. Its useful outcome was to endorse the prevailing strategy of a balance between environmental, economic, and social objectives, rather than giving a leading emphasis to just one of these three dimensions.

The process in this example has many features in common with the decision-analysis-based MCDA outlined in section 4.5. In particular it includes the identification of options, establishment of criteria against which the options should be judged, and weighting and scoring. It also has in common extended meetings of participants to establish criteria and for the deliberative process. The processes differ, however, in ways that reflect the different orientations of the social researcher, with an emphasis on personal opinions and feelings, and the decision analyst (usually with a mathematics or hard science background), with an emphasis on mathematical formulation and iteration of professional judgements. This catchment area example and the MCDA example of radioactive waste management summarised in the Appendix both address situations that might have been approached from a social research or decision analysis perspective.[21]

Social science based deliberative MCA might be a useful technique in deriving information from the Citizens Councils used by NICE to help the development of guidance such as that in NICE (2008).

4.5. Decision analysis techniques

Decision analysis is a sub discipline of operational research and management science, generally practiced by specialists with a mathematics or hard science background. The techniques are generally based on the maximisation of expected utility, and on well-developed mathematical foundations.

[21] Indeed both examples are quoted in a paper on multi-criteria analysis written from the perspective of a government social researcher (Maxwell et al, 2011).

4.5.1. Decision trees and influence diagrams

Decision trees and influence diagrams originated in rigorous forms, but are now also used by other disciplines in simpler forms. They are used by decision analysts to describe mathematical models applied to practical policy issues. Other disciplines, especially consultants, use influence diagrams i fairly often, but less formally.

Influence diagrams and decision trees are different representations of the same underlying mathematical model and operations. Influence diagrams represent the structure of complex problems less completely but more compactly, which helps communication between analysts and decision makers. Both forms of diagram are composed of "nodes" linked by arrows. "Decision" nodes (conventionally drawn as rectangles) are the decision alternatives: often points at which a decision is assumed, for subsequent testing. "Chance" nodes (ovals) are variables whose value is a probabilistic function. "End", or "value" nodes (hexagons or triangles) are values, monetary or otherwise, of final outcomes.

Academic teaching notes that appear from time to time on the web illustrate how some policy problems can be well addressed by decision analysis mathematical techniques generally beyond the scope of economics or other social sciences. Such analysis may in some cases contribute to the understanding of non-monetised impacts associated with a CBA. Or this may sometimes be achieved from a less formal use of the influence diagram concept.

The appropriate choice of graphical representation depends of course on the problem being analysed, on the experience of the analyst, and on the background of the intended audience. In practice the techniques are used in government most often by decision analysis experts.

4.5.2. Facilitated multi-criteria decision analysis

This section and section 4.5.3 below are about multi-criteria decision analysis (MCDA), as defined as in section 3.1. This is a deliberative process, which complements classical forms of analysis (such as CBA) by formal, iterative procedures to capture expert judgements. It is an operational research technique, normally conducted within a strongly mathematical framework. But it is also a 'sociotechnical' process, the success of which, largely in contrast to CBA, depends as much upon personal relationships as on formal techniques. It is not widely used in government even by decision analysts and is not therefore familiar to OR staff in all Departments.

This section outlines the process in its most rigorous form, with expert facilitation of 'decision conferences' of senior experts in the relevant specialist fields.

The decision criteria, scoring and then weightings are determined by a deliberative process. The weighting of each criterion depends on the scale used for scoring against it *as well as* the criterion's absolute importance. Assessment of the typically numerous, inter-related trade-offs is supported by a facilitator, with software that immediately displays the consequences of changes in judgements and so promotes extensive iteration. The process generally creates a graph of the net benefit of each option (on a cardinal but non-monetary scale) against cost. This is normally a rising curve of declining slope, defining an envelope on, or under which all of the options lie.[22]

[22] This marks another ambiguity in technical language conventions: a curve of this shape would be described by economists as 'concave'; decision analysts generally describe it as 'convex'.

MCDA in this form is used in many high-level contexts, in the private sector and internationally, with much success. However it differs from the kind of analysis with which economists or other social scientists are generally familiar. It looks simple, but it is in several ways more complex and demanding than it appears. It is consequently often misunderstood and incorrectly applied.[23] It is also sometimes seen by lobby groups as a legitimate way into the policymaking process, but this is rarely the case.

An account of a successful UK government use of MCDA (Austin and Mitchell, 2008) includes discussion of the logistical, other institutional and personal issues that contributed to its success over many years. The experts, while representing their own fields, needed to be content to cooperate in working towards the best collective outcome. Basic facilities, such as room layout, were important. Relevant, experienced experts had to be available, so rapid staff changes could be disruptive: major changes in organisational structure and responsibilities could temporarily (or fatally) undermine the whole process. Appropriate training of facilitators and appropriate, advanced software were essential.

Those opposing the process fell into two schools. One was "those that try to make the process work for them by attempting to distort the results to support vested interests". Such an attitude, however, usually becomes clear to other participants and the facilitator during the deliberative process. The other opponents were "those cynical of the whole process" because, in contrast to CBA, it formalises decision makers' assumptions and judgements within the analytical process.[24] But the number of cynics declined over the years.

The procedure lasted from 2001 to 2009, with a gap of one year caused by a major departmental reorganisation, which led to there being temporarily no sufficiently experienced set of participants available. It was finally ended by further major reorganisation and contraction in 2010. It has been succeeded by a less comprehensive form of MCDA, which addresses benefits but not costs.

Outside central government, a large local authority might use MCDA to help determine the allocation of its budget across its main activities, with the experienced heads of functions, such as housing, social services, education, transport, waste management and planning, devoting a day or probably more of their time to the process. At the international level it has been used by NATO and, in Europe, it has been used in relation to pharmaceutical regulation, the participants in that case being technical experts from Member States. The techniques are used in some large companies to help with strategic resource allocation.

However in few fields is central government structured in a way that provides experts of the kind needed for the successful MCDA of any complex prioritisation, and resources are easily wasted on approaches that do not meet the necessary conditions for success. Another constraint is that the technique, while bread and butter to the decision analyst, is intuitively challenging to the typical

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[23] The staff time and logistical requirements are demanding. The most common technical misunderstanding is about the interdependence of scoring and weighting schemes. It is often wrongly assumed that if the chosen criteria are weighted according to their absolute importance, and then each option is scored on scales of say 1 to 10 or 1 to 100 against each criterion, the weighted sums of the scores will provide a sound ranking of the options. But this is not generally so. A widely used, consistent approach is 'swing weighting', as explained in DCLG (2009).

[24] Experts in MCDA or CBA sometimes claim that the one in which they are expert is more "objective" than the other. In fact CBA is more objective so far as it goes, with its monetisation, but MCDA provides a more objective analysis of the option prioritisation as a whole.

senior official from other disciplines. It may need a senior and influential sponsor, who sees the power of the technique, to become and remain established.

It has also been suggested that the Appraisal Summary Table procedure alone may lend itself better to the multi-level approval procedures typical of public administration. On the other hand, facilitated MCDA (which would be informed by the AST) is presented as an auditable process and might provide a better basis for any higher level approval process. There is potential for more examination of these constraints and issues relating to the application of MCDA in government and of its wider potential.[25]

Some examples of MCDA in this rigorous form being applied or considered in government are recorded in the Appendix.

4.5.3. Non-facilitated MCDA

An important element in the central government manual on MCDA (DCLG, 2009) is a light-hearted but presentationally serious example of the technique being applied by a family to the procurement of a toaster, on the basis of information from the November 1995 issue of *Which?* Magazine.[26] A short list of seven toasters are appraised against price and six performance criteria. Three of these criteria are simply 'yes or no' (reheat setting, warming rack and adjustable slot width), one is a five point scale (evenness of toasting) and one a very rough and ready measure (number of drawbacks). The selection of options, the criteria, the scoring and weighting and the sensitivity analysis were in this example all carried out by the family.

In government also situations do arise where the MCDA process can sensibly be applied, by choice or sometimes necessity, without the full rigour of facilitated MCDA. Conditions include the availability of experts who are competent to construct an appropriate set of criteria, and to assess the options against these criteria in a cooperative spirit, without the use of instant-feedback software. This implies that the criteria will be relatively broad brush and all comprehensible to all the assessors, although assessment against some or all of the criteria may need expert judgement. A further condition is that the exercise should be steered by officials who understand the principles of MCDA as set out in DCLG (2009).

An example of this kind is summarised in the Appendix.

4.6. Other tools and approaches

This section first addresses three disparate tools – switching values, spider charts and benchmarks – which can all in some cases help the handling of non-monetised factors. This is followed by a discussion of the many 'management frameworks' that have been developed over the past several decades, in particular logic models.

4.6.1. Switching values / break-even analysis

Switching values – that is how large or small the monetary value of an input or impact would need to be to have a potentially significant effect on the option choice – are widely advocated in appraisal

[25] If MCDA were applied more widely in government it would rarely if ever displace economic and other analysis. It would use the outputs of such analysis, such as that provided by an AST.

[26] This example was developed by Professor Larry Phillips, principal author of the Manual and a leading international practitioner of MCDA.

guidance, usually in the context of uncertainty. The term break-even point is often used for the magnitude of a major cost or benefit at which benefits would exactly equal costs. But such values have other uses too.

In ex post evaluation they can be a method of semi-monetisation, when it can be shown that a policy decision implied that the monetary value was above or below some figure.

In ex ante presentations to decision makers a switching value may help to show the importance or otherwise of a non-monetised factor. A switching value can also help in deciding whether or not to seek evidence to monetise an impact.

The usefulness of monetary switching values depends upon there being sufficient monetisation of other costs and benefits to allow a meaningful switching value to be derived. Switching values in their various roles are therefore recognised more in some Departments and Agencies than others, depending mainly on the extent to which their outputs are monetised.

An example of the technique is noted in the Appendix in describing DfT's use of ASTs.

4.6.2. Spider charts

Spider charts can be useful presentational devices in fairly limited situations. As with an AST, they force the identification of explicit criteria. They also present in a strikingly clear way how alternative options compare against each ray of the 'web'. However the rays are merely scores. This can be misleading, both because the basis of the scores is typically hidden from the reader and because, even if the scores are reliable, the reader is left with the task of assessing how a score along one ray compares in importance with that of another. The technique may be most useful as a high level presentational device for decisions that are already made or almost finalised.

Spider charts are not widely favoured in UK central government, but they can sometimes be appropriate. Three examples of such charts are recorded in the Appendix.

4.6.3. Benchmarks

Benchmarking, especially comparing current with previous outturns, is central to much monitoring and evaluation of management performance. And almost all project or policy analysis is in some sense benchmarking. The do-minimum option often used in appraisal, for example, is a form of benchmark. In all these cases it can be most helpful if there are external benchmarks, perhaps from other comparable operations, against which non-monetised impacts can be compared to indicate whether such an impact appears to be 'reasonable' or 'acceptable'.

Relevant benchmarks should be sought out and used where they are available, although in practice, apart from comparison of performances over time, they are often difficult to find because of the diversity of contexts and their determining factors.[27]

[27] As an example, the Home Office once sought to compare UK police performance outturns with those of the Netherlands. But it was found that even between such superficially similar countries the institutional and political contexts were too different for useful comparisons to be made.

4.6.4. The Logic Model and other management frameworks

Many frameworks have evolved in recent decades, especially in North America, to help the development of better informed management. Their origins are sometimes outside academia and sometimes with academics who have become very closely involved with management practice. Logic models are one example well known outside North America. Others include SWOT (strengths, weaknesses, opportunities and threats), critical success factors, key performance indicators, the balanced scorecard, and, more specifically in the private sector, Total Quality Management and six sigma.

Many of these frameworks have become popular in some fields and they contribute to better management. However each has evolved to serve one of many different aspects of management, such as organisational assessment, strategic planning, programme planning, performance measurement, or process improvement. Logic models are used widely and to good effect in UK central government in evaluation in the social researchers', policy development sense (HM Treasury, 2011a). It is doubtful however that any of these frameworks can often contribute to the structure of other fields of option appraisal, in procedures such as the five case Business Case or Impact Assessments.

They may however, in Departments or Agencies where such a framework is established, contribute to the quantitative or qualitative data needed to assess options against appraisal criteria. Examples of the use of logic models are recorded in the Appendix.

4.7. Multi-dimensional presentation

The structuring of data presentation, beyond straight text, tables and simple graphs, ranges from familiar devices such as pie charts to complex, custom-designed structures for presenting many dimensions in a comprehensible form.

Some examples are recorded in the Appendix. Such presentational devices are especially conspicuous in the environmental field. They typically serve to give an accessible overview of a large quantity of data to facilitate the drawing of broad conclusions rather than immediate spending or regulatory decisions.

5. Conclusion

5.1. The main issues

Government policy, programme and project appraisal is based in many fields on the principles of cost benefit analysis, in which as many costs and benefits as possible are monetised. The scope of monetisation continues to widen, but there are nearly always other important factors that, for one good reason or another, are not monetised.

UK government economists have in recent years put more emphasis on wider monetisation than on the handling of factors that are not monetised. This properly reflects the comparative advantage of economics as a discipline. However the handling and presentation of non-monetised factors is also widely seen as an area for development. The NAO suggests that the handling of non-monetised impacts could be improved by "more specific central guidelines as to what is expected" in the Green Book and the Impact Assessment guidance.

Some non-monetised factors, such as non-monetised environmental or distributional impacts, would normally be seen (for example in Treasury Green Book guidance) as within the scope of the core analysis of a spending or regulatory proposal. There are often also largely non-monetised strategic, commercial, budgetary, or management perspectives, such as those covered by these four "cases" in the Treasury's Business Case framework, that are outside the core analysis. Economists and other analysts have more to say about the core analysis than the other perspectives. And very high-level decision making often entails strategic factors that analysts are not expected to handle. However non-core factors can still pose problems of presenting information in ways that bring to the fore the issues about which decision maker judgement is needed.

Currently, in appraisals that are led by economists for immediate decision making, it is normal practice to record what are perceived to be significant non-monetised core analysis impacts ad hoc, leaving trade-offs to be clarified and assessed outside the analytical process. And the assessment of trade-offs between core analysis outputs and issues that are outside the core analysis is similarly free from any formal process. Sometimes these procedures are sufficient, but sometimes more could usefully be done.

For ex ante appraisal, the most effective structure currently used in government for presenting monetised and non-monetised impacts alongside each other is an Appraisal Summary Table (AST). This is a technique that is best suited to long-running investment programmes, where successive project proposals need to be assessed against criteria that change only slowly over time. It is therefore unsurprising that it has been used for many years in transport and more recently in flood and coastal erosion risk management. However the technique could be applied more widely. It can cover core and some non-core non-monetised factors. It still falls short of a formal structuring of the trade-offs to steer decision maker judgements. But it does present the information in a systematic way, against well-defined criteria.

In any case, a prior requirement for the integration of monetised and non-monetised factors is clear *criteria* against which options can be compared. Development of such criteria is usually not a trivial task and it goes beyond the normal setting out of objectives.

Other techniques, such as influence diagrams, in parallel or in support of ASTs, can be used at an earlier stage, in the assessment of non-monetised factors. And a crucial final step is supporting

commentary that draws decision makers' attention to the trade-offs about which their judgement is most needed.

The only established set of analytical techniques designed to appraise projects, programmes, or strategies rigorously, using all the available data, monetised and non-monetised, is facilitated multi-criteria decision analysis (MCDA) as developed within the discipline of operational research. But the effective application of MCDA in its most rigorous form requires senior staff with the relevant areas technical expertise and, even when such experts are available, it is demanding of their time. It may also require a senior and influential sponsor. The scope for its application in central government is therefore limited.

MCDA principles can sometimes be applied without external facilitation and associated software. But this still involves scoring of options against criteria and weighting of criteria. The need for the scoring and weighting scales to be consistent is often misunderstood and misapplied.

Some tools and techniques for handling and presenting non-monetised factors in appraisal apply also to ex post evaluation and the assembly of background information on policies or processes. However evaluation in the wider sense used by social researchers and in the Magenta Book, to describe the analysis of new policy on the basis of examination of existing policy, generally involves a balance of techniques different from those of appraisal that is centred on cost benefit analysis.

More generally, while the diverse professional disciplines in government responsible for the development of final policy or major project advice share much in terms of, for example, respect for professional integrity and concern to promote evidence-based decision making, they apply for the most part substantially different skills and techniques. Nonetheless, both despite and because of this, there is much to be gained by interdisciplinary working.

5.2. Some recommendations

Although government activities are extraordinarily diverse some generic recommendations can be made:

1) In appraisal, the tendency for factors to be of less concern if they cannot be monetised should be more strongly resisted. NPVs or BCRs should generally be presented only within a context that prominently covers non-monetised factors as well. These points should be more explicitly promoted in the Treasury Green Book.

2) For any significant appraisal, but especially when there are significant non-monetised factors, *criteria* should always be clearly established against which the options are to be compared. This is distinct from the separate requirement for clear objectives. The Treasury Green Book and other relevant guidance, and the Impact Assessment template, should stress the importance of establishing explicit criteria against which to compare specific proposals, as well as the need for clear objectives.

3) The Appraisal Summary Table (AST) approach is an effective way of establishing criteria and presenting non-monetised and monetised information against these, although it provides no further mechanism to help decision makers with trading off multiple attributes against multiple criteria. ASTs are most easily applied where there is a flow of projects (such as flood management or road improvement schemes), to which the same criteria can be applied. The AST approach could nonetheless be used more widely and its potential should be further examined.

4) Multi-criteria decision analysis (MCDA), as developed within the discipline of operational research, is the most powerful technique for establishing criteria and comparing options on the basis of monetised and non-monetised information. These techniques should normally be facilitated by experts experienced in their use, and with relevant software, and there is scope for their wider use in this rigorous form. There is also sometimes scope for the MCDA principles of scoring and weighting to be applied in a more pragmatic way, without such facilitation.

- The conditions needed for the wider use of facilitated MCDA, in the short term and in the long term, should be further explored;
- so too should the potential for non-facilitated MCDA;
- but the Treasury Green Book and other relevant guidance should explain clearly and prominently the need for scoring and weighting systems to be consistent.

5) For effective handling of non-monetised factors in the core analysis of appraisal, interdisciplinary working is often important, especially where the analysis is led by economists. Such working has been promoted in recent years by the closer organisational integration of specialists, especially in integrated teams in some Departments. Such interdisciplinary coordination should be welcomed.

6) In interdisciplinary working, economists and other specialists should be more encouraged to welcome the use of methods of data collection and presentation with which they are not familiar.

7) Many terms, such as ‘economic’ and ‘non-quantified’, are often used in ways that are confusing. It is especially helpful in interdisciplinary work for potentially ambiguous words to be avoided or their meanings made clear. Ambiguous use of familiar terms should be more actively discouraged.

8) A more intractable feature that, if eased, would improve interdisciplinary working and the handling of non-monetised factors, is loss of corporate memory. Steps to reduce the loss of corporate memory about analytical work or techniques should be considered in advance of significant staff moves.

Appendix: Examples

The simplified examples in this Appendix are based on real cases, most of them in UK Departments or Agencies. While some illustrate problems, most illustrate good practice. None is a template for wider use, but they may help to prompt ideas about the handling of non-monetised factors alongside monetised factors.

The Appendix follows the sequence of the main text, although only some of the tools and techniques addressed there are illustrated. Most examples are presented as a brief textual background to web links. All these links were accessible on 22 April 2013.

A.1. Defining decision criteria

- An elegant example of policy analysis based on six well-considered criteria is illustrated by a document published in 2009 by the Department for Work and Pensions, to explain a Government decision to take no further action on Collective Defined Contribution pension schemes.[28]

- In the Climate Change Act there is a list of criteria under "wider economic and social considerations" that the Committee on Climate Change (CCC) is required to take into account in its advice on carbon targets. These are listed by the CCC as follows and they are discussed most fully in its First Report, in 2008, on the first three carbon budgets.[29]
  - "Economic circumstances, and in particular the likely impact [of carbon budgets] on the economy and competitiveness of particular sectors of the economy."
  - "Fiscal circumstances, and in particular the likely impact [of carbon budgets] on taxation, public spending, and public borrowing."
  - "Social circumstances, and in particular the likely impact [of carbon budgets] on fuel poverty"
  - "Energy supplies", which we have interpreted as relating to security of supply concerns.
  - "Differences in circumstances between England, Wales, Scotland and Northern Ireland."

More examples of decision criteria are illustrated below under ASTs, MCDA and spider charts.

A.2. Supporting commentary

- Policies developed by the Department for Education to help the development of disadvantaged, very young children aim for benefits that are based on solid research findings, but the benefits defy useful explicit monetisation. An example of well-presented commentary addresses the case for free early education for disadvantaged two-year-olds.[30]

- The DWP example mentioned in section A.1 to illustrate clear decision criteria also presents the issues as textual commentary under each criterion extremely clearly.

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28 http://www.dwp.gov.uk/docs/collective-defined-contribution-schemes-dec09.pdf

29 http://www.theccc.org.uk/publication/building-a-low-carbon-economy-the-uks-contribution-to-tackling-climate-change-2/

30 http://www.legislation.gov.uk/uksi/2012/2488/pdfs/uksifia_20122488_en.pdf This Impact Assessment also includes some confusing monetised tables, completed to meet the fixed requirements of the template,

- A competent example of a mainly qualitative account of the costs and benefits of an environmental policy proposal is Defra's 'Evidence base for designation of the Outer Thames Estuary Special Protection Area', from 2010.[31] This was undertaken for an Impact Assessment. The benefits are well-summarised in Table 3.7 (pp 53-54) and the costs in Table 3.8 (pp 55-56). The information is comprehensive and no doubt reliable, but it would be difficult to make a confident judgement from it about whether designation would add to or detract from the national interest. It is a case where some international benchmark to illustrate the circumstances in which designation is considered justified might have been helpful, but none was available. However it is not clear that any better presentation of the evidence would have been feasible.

- A similar challenge was faced by Defra and the relevant Agencies in presenting information to support an Impact Assessment in 2012, proposing the designation by the UK of Marine Conservation Zones.[32] In this case graphical devices were employed to improve the accessibility of the information about between one and two hundred proposed Zones. This is another case where an international benchmark would have been helpful, had any been available.

- DECC provides guidance in the (non-monetised) assessment of security of energy supply in its Background Documentation on 'Valuation of Energy Use and Green House Gases (GHG) Emissions'.[33] It lists many criteria and advises: "Analysts should consider which of the criteria are valid for the policy they are appraising, and use them to explain the implications of their policy in terms of the UK having enough energy that is safe, clean and secure".

- A more wide-ranging example of supporting commentary being used to present *a single non-monetised factor* is that of the distributional effects of Scotland's budget and Spending Review proposals, in the context of 'equality duty obligations' defined by the Scottish Government. The full Equality Statement, now an annual exercise, covers all policy areas, but each chapter contains a programme-specific Equality Assessment, such as the thousand-word summary at the end of Chapter 11 on local authority spending, which provide a good basis for decision makers to absorb what they need to know on the issue.[34]

A.3. Checklist approaches

A.3.1. The five-case business case

In this framework the core analysis is described as 'the Economic (or value-for-money) case'. The other four elements'[35] share some of the inputs, and make use of the outputs of this core analysis.

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31 http://www.naturalengland.org.uk/Images/Thames-finalIA_tcm6-21680.pdf

32 The relevant documents are at http://publications.naturalengland.org.uk/publication/1930432 This includes a link to a Summary, which explains the context and, under "Related publications & products", links to fifteen very full Annexes. Annexes H and K are most relevant in terms of data presentation.

33 http://www.decc.gov.uk/en/content/cms/about/ec_social_res/iag_guidance/iag_guidance.aspx The background documentation pdf, where security of supply is addressed in Chapter 6, is under the heading of 'Background Analysis'.

34 The full document, with links to each main policy area, is at: http://www.scotland.gov.uk/Publications/2012/09/5750/0

35 The other four elements are: 1) Strategic context: The strategic policy context and the fit with the wider public policy objectives and the Department's corporate plan. 2) Commercial feasibility: Commercial feasibility and whether the proposed solution can "be effectively delivered through a workable commercial deal or deals". 3) Financing: The impact on budgetary totals. 4) Management structure: Management responsibilities, governance and reporting arrangements. The framework is summarised at http://www.hm-treasury.gov.uk/d/greenbook_businesscase_shortguide.pdf and a concise checklist is at http://www.hm-treasury.gov.uk/d/greenbook_businesscase_checklist.pdf

And some non-monetised information under these headings will generally need to be presented alongside the core analysis.

The 'Economic case' is said to "assess the economic costs and benefits of the proposal to society as a whole." However the guidance explains that environmental and social (as well as economic) impacts, including distributional impacts, should be included. It also lists for inclusion a range of policy impacts that will typically be beyond the direct policy responsibilities of the sponsoring Department. It refers to "non-quantifiable" impacts, which is probably generally read to mean "non-monetisable".

This business case format does not contribute to the analysis of *trade-offs* between the listed items within the core analysis, nor to trade-offs between the core analysis and the other four cases. However setting the core analysis within a framework including the four other cases helps decision makers to identify these trade-offs.

A.3.2. Appraisal Summary Tables

- Appraisal Summary Tables (AST) are used routinely by the Department for Transport for road projects and other capital investment projects.[36] As explained in DfT (undated) the Department, following the natural instincts of economists, then steers the VFM assessment into a fully monetised decision making process, in two steps. It first constructs an "adjusted" BCR by monetising factors that are not monetised in the standard procedures applied in the initial CBA, but considered amenable to monetisation by case-specific expert judgement. It then considers whether the remaining non-monetised factors could be of sufficient monetary value to switch the project between acceptable and non-acceptable.

- Good transport AST examples from Scotland, in a different but clear format, include those for Rail Enhancements on the Highland Mainline between Perth and Inverness and for A9 Upgrading from Dunblane to Inverness.[37, 38] These ASTs usefully distinguish between Objectives and Criteria.

- The Environment Agency applies ASTs to flood management projects.[39] Customised Tables are developed for each case. The Agency will also be applying the approach in its work on the Water Framework Directive.

- The Home Office Final Impact Assessment, 2012, of proposed Changes to Family Migration Rules adopts an AST format (Table 1, p5) supported by explanations of the non-monetised entries in Table 12 (pp 45-46).[40]

- The HSE uses fairly simple forms of AST in some contexts, sometimes using shapes to demonstrate the relative magnitudes of impacts.

- The DCMS is planning to adopt ASTs in taking forward work on one of its major policy areas.

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[36] Many DfT ASTs are published, but they may not remain openly accessible on the web for long. The revised template proposed by the Department in April 2012 is in WebTAG Unit 2.7.2D at http://www.dft.gov.uk/webtag/documents/project-manager/unit2.7.2d.php

[37] http://www.transportscotland.gov.uk/files/documents/reports/j10194a/j10194a-a2D14.pdf

[38] http://www.transportscotland.gov.uk/files/documents/reports/j10194a/j10194a-a2D15.pdf

[39] http://cdn.environment-agency.gov.uk/geho0310bsdd-e-e.pdf

[40] http://www.ukba.homeoffice.gov.uk/sitecontent/documents/news/fam-impact-state.pdf

- An example of a checklist approach that comes close to an Appraisal Summary Table is provided by Chapter 4 in the guidance provided by DECC, for general central government use, on 'Valuation of Energy Use and Greenhouse Gas (GHG) Emissions for Appraisal and Evaluation'.[41]

A.4. Multi-criteria decision analysis (MCDA)

A.4.1. Facilitated MCDA

The first examples are two of several examples that could be taken from Defence, where the Departmental and military structure, as in most defence administrations worldwide, has an exceptionally strong technical culture and very clearly defined responsibilities.

A.4.1.1. Defence equipment prioritisation

Austin and Mitchell (2008) describe the origins, in 2001, and growth over five years to maturity, of the use of MCDA as a major tool in defining and prioritising potential defence equipment procurement changes to the Ministry of Defence Equipment Plan. Some of the procedural lessons, not repeated here, are summarised in the main text (section 4.5.2).

Use was made of established software, supported by substantial training of staff in the facilitation of 'decision conferences' to agree criteria and to agree on scorings and weightings.

Eleven Directorates of Equipment Capability (DEC), consisting of military, scientific and administrative staff, including Operational Research specialists, used MCDA to prioritise their own fields. The decision conferences of DEC officials were run by a facilitator from outside the DEC, with minimum intervention from a Chairman, a DEC analyst, who ensured that the process was consistent and all participants' views given consideration. There were just three benefit criteria, namely the value of the option to each of three types of operation (Deliberate Interventions, Other Warfighting Operations and Peacetime Activities).

The outputs of these DEC analyses were then brought together in a second round, single MCDA for the Joint Capabilities Board. This second round assessed options against two benefit criteria: Capability Impact and Probability of Success.[42]

The annual budget addressed by this process was of the order of £10 billion. The impact of the work was high, with great improvements in internal communications. Its value was noted at ministerial level. As noted in the main text, it continued through to 2009.

A.4.1.2. Warship design

The Royal Navy's Type 45 Destroyer is now coming into service, the first having been commissioned in 2009. The use of MCDA is described in some detail by the main facilitator, Philips (2011). It enabled a basic design solution to be agreed within 15 months. This set a record for major defence equipment procurement and probably saved the contractor about two years of design work. The exercise was highly praised after the event by the Naval officers involved in the procedure.

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[41] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/68764/122-valuationenergyuseggemissions.pdf

[42] Probability of success is converted to a penalty score, such that a probability of less the 10% leads to rejection, and probabilities of 20%, 50% and 80% lead to penalties of respectively 80%, 30% and 10% of the Capability Impact benefit.

The use of MCDA was made more feasible by the introduction to MOD in 1997 of "Smart Acquisition", which allowed trade-offs between cost and capability before the detailed design stage, as opposed to a specification being defined in terms only of capability. It also specified that lifetime costs should be considered.

The work started initially on the UK's input to a proposed joint international project. This entailed three decision conferences of 3 or 4 days' duration, with much work between these by the ten teams formed to provide support for the ship's functions. The process worked through many differences in opinion, and at the end participants agreed that it provided a sound foundation for the development of an affordable ship. But at that stage the UK withdrew from the international project.

Two conventional business meetings followed with a few senior key players, from the Navy customer, the new contractor and including the Naval architect, who especially welcomed the capability/cost trade-off concept, and the MCDA facilitator. These meetings included clarification of the current directors of the six areas now being studied (commercial, programme, warship design, combat systems, integrated logistics support, and habitability) and the many tasks under each of these.

This led on to an administratively complex MCDA process that evolved over time. There were five 'benefit' criteria as follows, the first two being scored as positive benefits and the other three as negative: performance; growth potential; probability of on-time delivery; probability of delivery of expected performance and expected cost; and 'logistical cost' over the ship's 25 year operating life, which in most civilian contexts would be described as running costs or operating costs.[43]

This was an unusually complex, one-off application, but there may be other areas of high-level public budget allocation where timescales and the availability of senior officials highly skilled in specialised areas might make such a process feasible.

A.4.1.3. Air pollution policy

Defra commissioned a study to explore the potential for MCDA in the policy field of air pollution (Phillips and Stock, 2003). The ten criteria agreed were the costs for each of six industry sectors such as power and steel, the benefits to SSSI ecosystems and rare flora, other SSSI impacts, human health, and impacts on buildings. Considerable, constructive discussion was needed to define the SSSI ecosystem criterion.

The study was seen as a successful experiment, but no champion emerged at the time to carry forward any substantial follow up.

A.4.1.4. Radioactive waste management

The Committee on Radioactive Waste Management (CoRWM), in 2006, found MCDA to be perhaps the only means of reconciling strategic views on the disposal of high level nuclear waste.[44] It is

[43] This last negative benefit is an item that in a CBA would be estimated as a present value cost. The separation of capital and operating costs in this way makes sense insofar as the capital cost was the binding budget constraint. The absence of explicit discounting in MCDA appears to be largely an accident of history.

[44] This study and the history leading up to it are outlined in Annex 4 of CoRWM's Report to the Government of 2006: http://corwm.decc.gov.uk/assets/corwm/post-nov%2007%20doc%20store/documents/reports%20to%20government/nov%20and%20dec%202007/700%20-%20corwm%20july%202006%20recommendations%20to%20government.pdf
A constructive critique of the final process, 'CoRWM MCDA Evaluation', by independent consultants is at:

interesting partly as a rare example of lobby groups being appropriate participants. Although this was an unusual study it did recognise "the importance of undertaking swing weighting rather than simple weighting". It noted that "the process of swing weighting ensures that judgements are made on the relative value/importance of criteria, taking into account the difference, or swing, between the top and bottom scores. Thus safety, for example, is not judged purely on whether safety is considered to be important per se, but the question is asked 'how important is the difference between the top and bottom of the scale'."[45]

A comparison has been made of this application with a no less high profile CBA (the Stern Review of Climate Change), suggesting that each would have benefited from some parallel input of the other technique (Dietz and Morton, 2012). Whether or not this is so in these cases, the examples illustrate circumstances that were better suited to one technique than to the other.

A.4.1.5. Research programme prioritisation

Research programme prioritisation is a widespread issue notorious for not being readily amenable to formal analysis. Sometimes in government MCDA is adopted. Prompted by an enthusiastic sponsor, a successful pilot was conducted by the Home Office in 2008 on prioritising research across one of its security-related responsibilities. This would have been built on in subsequent years, but a policy change forestalled this.

A.4.1.6. Office relocation

Major office relocation decisions may be better suited than many decisions required in government to a fairly simple level of MCDA. They focus the interest of officials, are usually amendable to well-defined decision criteria, and present issues that typically do not require specialist professional knowledge of (as distinct from specialist briefing for) senior decision makers.

This was applied to one such decision in 2010, entailing the restructuring of an Agency's nationwide office capacity, but this faced problems that illustrate some of the difficulties of introducing or developing the technique. The OR staff were unfamiliar with the process and had to learn by experience. Perhaps because it omitted other social and administrative costs (for example the benefits of collocating certain functions) the recommended option was not accepted. Moreover, while the outputs of the analysis are permanently recorded, the detailed methodology was not, and is now lost to the corporate memory.

A.4.2. Non-facilitated MCDA

A.4.2.1. Weekly Waste Collection Support Scheme

In late 2011 the Department for Communities and Local Government announced the proposal of a Challenge Fund for grants to local authorities to improve weekly waste collection. The scheme was launched in early 2012 with a fund of £250m over three years. 130 bids were received, amounting to

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http://corwm.decc.gov.uk/assets/corwm/pre-nov%202007%20doc%20archive/doc%20archive/tier%202%20(8)%20-%20quality%20assurance/tier%203%20-%20external%20evaluator%20reports/1785%20-%20falkland%20report%20-%20mcda%20evaluation%20conclusions.pdf

[45] Paragraph 9 of 'CoRWM's MCDA Process', CoRWM Document 1398: http://corwm.decc.gov.uk/assets/corwm/pre-nov%202007%20doc%20archive/doc%20archive/introduction/top%20level%20key%20docs/1398%20-%20corwm's%20mcda%20process.pdf

£345m. To prioritise the bids the Department considered CBA, but concluded that monetisation of the bids' attributes for all the relevant criteria was not feasible. A procedure was therefore adopted that in technical terms followed fairly closely the "toaster" example in the MCA Manual (DCLG, 2009). This led to the announcement ten months later, in November 2012, of how the £250m total was to be allocated to 90 of the bids, ranging in bid value from £0.4m to £30m. The process was administratively complex, but worked smoothly and was well received by ministers.

The Scheme Prospectus included a full description of how the bids would be assessed, including a reference to the MCA Manual.[46] The types of judgements made and how they were made are also explained in detail in the FAQs pages published when the winning bids were announced.[47] The procedure included Outline Bids, which were returned to bidders with generic comments together with comments specific to each bid to help improve its quality. All the final bids were ranked and accepted down to the point at which the Scheme's budget was exhausted. The criteria used to rank the bids were, in simplified terms, as follows. Given the data available these diverged from the more usual convention where "benefit" criteria are used to assess options against their costs. The cost-effectiveness criterion embedded the costs of the bids.

- a commitment to weekly collections;
- environmental benefits;
- cost-effectiveness (i.e. operational efficiency) of the planned service improvements relative to recognised industry benchmarks, and
- innovation.

Some bids were sifted out because they did not meet one or more of certain minimum requirements. For the MCDA process, each bid was scored against each criterion on a well-defined scale of 0 to 100, and weights applied reflecting the relative importance of these 0 to 100 ranges.

Bid assessment was undertaken by three core teams, with some iteration within and between them. A DCLG team of analysts (economists and social researchers) assessed the commitment to the collection criterion and some administrative aspects of the bids. A team of Local Partnerships specialists in waste management assessed cost-effectiveness and innovation. And a team of Waste and Resources Action Programme (WRAP) experts assessed environmental benefits.

The final scores for cost-effectiveness, innovation and environmental benefits were then peer reviewed by DCLG's Technical Advisory Group, which included representatives from Defra, WRAP, the Local Government Association, Local Partnerships and the Environmental Services Association.

The DCLG Project Team, including two economists, brought together these assessments and applied the weights to the scores against the individual criteria. The bids were then ranked according to their weighted overall scores. The scores, with sensitivity analysis of the weights, were peer reviewed by the Project Board (including DCLG's Chief Economist and a Treasury representative). A Business Case

[46] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/5969/2081256.pdf Neither this Prospectus nor the subsequent FAQs explained clearly how the weighting of the criteria should be based on swing weighting. But in practice the weights applied were chosen, correctly, to reflect the specific 0 to 100 ranges rather than judgments simply of the absolute importance of, say, environmental improvement relative to operational efficiency.

[47] https://assets.digital.cabinet-office.gov.uk/government/uploads/system/uploads/attachment_data/file/15037/Weekly_Collection_Support_Scheme.pdf

explaining the final package of successful bids was then tested by DCLG's Investment Sub-Committee, before it was signed off as Value for Money by Ministers in DCLG and then the Treasury.

A.4.2.2. EC regulation of procurement selection criteria

A common misunderstanding of the interdependence of scoring and weighting processes is illustrated by the EC Directive that requires the governments of Member States, when inviting competitive tenders, to specify the information they require and the relative weights that they will apply to the tender characteristics (such as price, understanding of the requirement, ability to deliver on time, past experience, or technical strength). This implies that each characteristic in each bid must be given a score, but the Directive, perhaps drafted by lawyers, does not specify any associated scoring procedure. The relative scoring scales will therefore often be arbitrary, while the relative weights applied to them are predetermined. This will lead sometimes to poor prioritisation of bids.

This error is far from unique to this case.

A.4.3. An alternative (Italian) methodology

Giove et al (2011) presents an example of 'Multi-criteria Decision Making' applied to a large heritage site in Venice. It adopts three main criteria that follow conventional analysis in this field, of intrinsic sustainability (with sub-criteria), context sustainability, and economic-financial feasibility (all defined in the paper). The mathematical structure is different from that usually applied in the UK, but the paper illustrates the challenge in this respect that such methodologies pose for other disciplines. It draws on questionnaire responses from experts rather than a deliberative process and is consequently aimed only to help clarify issues for further deliberation, rather than work towards an optimal solution.

A.4.4. MCDA as a method of monetisation

The Environment Agency have experimented with the use of MCDA, correctly applying swing weighting, but then using the scores and weights to convert all the attributes to monetary values (Environment Agency, 2009). This is of course a mechanical process if one of the scored attributes is naturally in monetary units. This extra step is likely to lose at least some of the power of the process, but may make it acceptable to officials who are more comfortable with monetised values.

A.5. Other tools and approaches

A.5.1. Spider charts

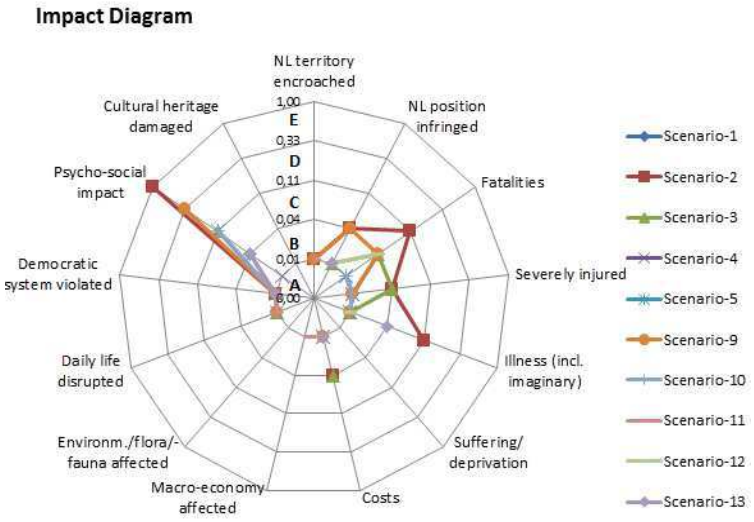
The first two examples here are used for ex post exposition rather than appraisal. The third is used during the course of appraisal, but only as a preliminary step.

- A good and very well explained example (in which the ideal though unattainable solution lies at the origin) is published by NASA.[48]
- A report by the Health and Safety Laboratory (Healey and Sugden, 2012) uses a spider chart to compare the highest and lowest safety climate scores of companies working within the Olympic

[48] http://start1.jpl.nasa.gov/caseStudies/autoTool.cfm

Park with those of the HSL's UK-wide data set, against eight criteria.[49] The chart shows clearly that, "for every factor, the Olympic Delivery Authority mean scores were greater than the highest scores identified in the 'all industry' dataset … In fact, the lowest scores from companies working on the Olympic Park were very similar to the highest scores in the 'all-industry' dataset."

- A third example is from a Dutch paper (Wijnmalen, 2012) on prioritising measures to combat risks of chemical or biological accident or attack, against thirteen criteria. The circumferential ribs mark points of zero impact at the origin, through minor impact and three more steps to catastrophic impacts at the outer edge. However this chart is used only as a helpful prop in the early stages of a complex MCDA process.



A.5.2. Logic models and other management frameworks

- The Scottish Government makes extensive use of logic models. Their application to poverty is well explained in a link labelled 'Tackling Poverty Board – Final full evidence report'.[50]

- It is not uncommon in some policy fields to list "risks" and "opportunities", which perhaps derives from the "opportunities" and "threats" headings of the SWOT framework. An example is at Table B23 in Annex B (page 185) of DECC's Carbon Plan.[51] This lists six environmental areas, such as air quality and landscape, with associated lists of risks and opportunities of carbon mitigation policies. These might equally be described as expected negative and positive impacts.

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[49] The criteria were: organisational commitment, health and safety behaviours, health and safety trust, usability of procedures, engagement with health and safety, peer group attitude, resources for health and safety, and accident and near-miss reporting. The chart is on page 7 of the report.

[50] This link is on the right hand side of the webpage at http://www.employabilityinscotland.com/sites/default/files/articles/5694/Tackling%2520Poverty%2520Board%2520-%2520Final%2520full%2520evidence%2520report_2139_3023.pdf. The document is in fact an 83-page Summary, but it contains much on the logic model approach, including a final Annex on "Logic model development".

[51] http://www.decc.gov.uk/en/content/cms/tackling/carbon_plan/carbon_plan.aspx

- The Health and Safety Executive (HSE) uses Logic Models to set out clearly the steps by which it interacts with industry in its different fields of responsibility.[52]

A.6. Multi-dimensional presentation

- A classic, clear presentation of information in multiple dimensions is the famous flow map of Charles Joseph Minard from the 1860s, of the Napoleonic invasion of and retreat from Russia.[53] The best-known modern UK equivalent, at least to analysts working in energy, is the perhaps less sophisticated but still information-rich UK energy flow chart, now published by DECC.[54]

- A mine of ingenious ways of presenting multi-dimensional data is presented by the Climate Change Risk Assessment Evidence Report, published by Defra early in 2012 .[55] This includes many graphs and extensive use of maps; positive/negative bar charts (e.g. p 86); many multi-dimensional presentations, including that illustrated generically in Figure 2.7 (p 36); a pictorial and therefore high-impact summary of likely impacts on UK regions (Figure 9.2, p 329); a 'Systematic Map based on a search for Agriculture links to "Capital or Operational Expenditure'" (Figure 9.3, p 331), and much else. The Sector report for Energy includes among many other examples a graphical picture of 'Impact clusters for the Energy Sector', (Figure 3.1, p 23).

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[52] A simple, generic version is at: http://www.hse.gov.uk/aboutus/meetings/hscarchive/2005/060905/c102c.pdf. Much more informative models have been constructed, applying to the HSE's responsibilities for, as examples, safety in Agriculture and generally for worker involvement.

[53] http://upload.wikimedia.org/wikipedia/commons/thumb/2/29/Minard.png/1024px-Minard.png

[54] http://www.decc.gov.uk/en/content/cms/statistics/publications/flow/flow.aspx

[55] The links to this material are not always reliable. However http://www.defra.gov.uk/environment/climate/government/risk-assessment/ presents links to the 'UK CCRA Evidence Report' (http://www.defra.gov.uk/environment/climate/government/risk-assessment/#evidence) and to 'Reports and Summaries for each of the eleven sectors', including a Sector report for Energy (http://randd.defra.gov.uk/Document.aspx?Document=10074_CCRAfortheEnergySector16July2012.pdf)

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