

Cost-Benefit Analysis Tool Review and Multi-Criteria Decision Analysis Tool Review

Valuation Tools

TABLES Project 2012: Mini reviews	
Guidance	<i>Using your experience and expertise, consider the following tasks in relation to the tool. It may not be possible to complete all tasks for each tool due to a lack of available information, the task not applying to the tool, etc. Please note where this is the case by giving the reason in the space provided. Please use a maximum of 6 pages of A4 (excluding diagrams and appendices). Your responses are required in the white spaces.</i>
Task 1: Basic information	
Name of the tool	Cost Benefit Analysis (CBA)
Type of tool (list all that apply)	Valuation Tools
Group members <i>(minimum size 3 members, must include a BCU rep)</i>	<ol style="list-style-type: none"> 1. Oliver Hölzinger 2. Tim Sunderland 3. Jasper Kenter
<p>Please provide a brief synopsis of the tool</p> <p><i>This may include: background context, development (and ownership if appropriate), current use and applications etc.</i></p> <p><i>Please also note any desired outcomes of the tool so that you can make reference back to these in Task 7: SWOT analysis</i></p>	<p>Cost-Benefit Analysis (CBA), sometimes referred to as Benefit-Cost Analysis (BCA), is a systematic process where expected costs and benefits of a project or policy are compared. It can be used to determine if an investment is efficient or to compare different investments to identify the most efficient application of funds.</p> <p>Because costs and benefits usually occur at different points of time the net present value of future costs and benefits are calculated, applying a discount rate. The discount rate is used to convert future costs and benefits to present values considering that one pound (nominal) in the future is worth less than one pound in the present. The main argument for the 'social time preference rate' is that individuals as well as society as a whole prefer current consumption more than consumption in the future.</p> <p>Environmental CBA is a tool to evaluate the Total Economic Value (TEV) of policies or projects affecting the environment. This tool is used by governmental bodies and agencies to judge investments and funding for environmental projects (value for money). In this case usually not only the benefits or return on investment to the specific organisation; but to society as a whole are evaluated. To compare costs and benefits the calculation of monetary values for (non-marketable) ecosystem services is necessary. The result of a CBA is usually given as Benefit-Cost Ratio (BCR). In theory a BCR of 3 for example means that one gains £3 worth of benefit for every pound invested. A project or policy with a BCR below 1 is not desirable because the costs exceed the benefits.</p> <p>Estimating the benefits of non-market ecosystem services is challenging. Techniques to calculate such values are for example the revealed preferences method, the stated preferences method or the benefit transfer approach. All of them have their own imperfections and caveats which can limit the accuracy of environmental CBA. Furthermore scientific evidence usually only allow the calculation of monetary values for a part or the baseline of non-market ecosystem services which can lead to a general underestimation of environmental and social costs and benefits. But it should also be</p>

acknowledged that, especially for major projects, the ex-ante cost evaluation is difficult as well.

Considering such limitations environmental CBA is a decision support tool, not a decision making tool. If a CBA for investments in an environmental project or policy results in a BCR below 1 this is usually not a definite indication that the proposed project or policy won't provide a net return on investment. The low BCR can be a result of the incomplete assessment of benefits and limited data basis rather than the low value of benefits themselves. In this case a combination with tools such as Multi-Criteria Analysis (MCA) might be necessary to allow a final judgement. If a CBA results in a positive BCR this is often a sufficient robust indication that the project or policy provides a positive (social) return on investment. However, this obviously depends on the appropriate application of the tool and the sufficient robust data basis (trash in – trash out).

Especially when non-market ecosystem services are affected a high degree of expertise is necessary to apply the tool and interpret the findings sufficiently. Furthermore the costs of undertaking an environmental CBA can be substantial if extensive research is necessary. When environmental goods and services are affected the degree of uncertainty is usually high. Another controversial debate occurs around the 'right' discount rate to calculate the net present value especially of costs and benefits that occur in the remote future. The discount rate has a great impact on CBA outcomes. For longer term projects, the outcome is extremely sensitive to the discount rate, which is one of the hardest parameters to justify objectively. A sensitivity analysis might be an appropriate instrument to take such factors into account. Furthermore CBA usually doesn't concern issues of equity and distributional allocation of costs and benefits. A stakeholder-specific distributional CBA may overcome some of these limitations.

Task 2: Use of the tool			
Position / Use <i>If you can, please indicate which stage(s) of the decision / policy making process your tool is / could be used in (these stages were identified in the specification document)</i>	Stage Ideas	Could be used (blank)	Please add any further comments here:
	Survey	Y	
	Assess	Y	
	Policy / decision	(blank)	
	Implement	(blank)	
	Evaluate	Y	
	Task 3: Existing literature about the tool		
Are you aware of any KEY policy and / or academic literature evaluating your tool? <i>(e.g. reports, journal articles, books)</i>	Author & Date OECD (2006)	Title Vol pages Cost-Benefit Analysis and the Environment: Recent Developments, OECD Publishing.	Web link (if available) http://www.oecd.org/env/environmentalpolicytools/andevaluation/cost-benefitanalysisandtheenvironmentrecentdevelopments.htm
	Editor-in-Chief: Farrow, Scott	Journal of Benefit-Cost Analysis	http://www.degruyter.com/view/i/jbca
	Atkinson & Mourato (2008)	Environmental Cost-Benefit Analysis, Annual Review of Environment and Resources, Vol. 33: 317-344	http://webfirstlive.lse.ac.uk/GranthamInstitute/publications/Other/Atkinson_annurev%20energy%2033%20020107.pdf
	Defra (2007)	An introductory guide to valuing ecosystem services	http://archive.defra.gov.uk/environment/policy/natural-environ/documents/eco-valuing.pdf
	HM Treasury (2003)	THE GREEN BOOK: Appraisal and Evaluation in Central Government	http://www.hm-treasury.gov.uk/d/green_book_complete.pdf
Task 4: Your experience of working on the tool			
Have you done any research/consultancy work on this tool in terms of its development, testing and/or evaluation? <i>If so, please provide an outline.</i>	Oliver Hölzinger has recently applied CBA within his role as consultant for the evaluation of three environmental projects: <ul style="list-style-type: none"> - The Economic Evaluation of Moseley Bog & Joy's Wood LNR (Hölzinger 2012) - The Economic Evaluation of Moorcroft Wood LNR and the Influence of the Black Country Living Landscape Community Involvement Programme (Hölzinger & Morris 2011) - The Economic Value of Gwen Finch Wetland Reserve (Hölzinger & Dench 2011) 		
Guidance	For Tasks 5-7, please also try to consider the future development and application of this tool in the TABLES project in your answers.		
Task 5: Incorporating the ecosystem approach (EA) and ecosystem services (ES) **Please refer to the summary text about ES for concept clarification at the end of this template (appendix)**			
Using examples (from practice, research or	In environmental CBA the use of the ecosystem services framework is crucial to value ecosystem services, even if relevant literature doesn't always explicitly refer to the		

consultancy), explain how EA and/or ES are currently incorporated in/by the tool	framework and applies the corresponding vocabulary. UK examples include e.g. the 'Economic Valuation of the Benefits of Ecosystem Services delivered by the UK Biodiversity Action Plan (Defra Project SFFSD 0702)' (Christie et al. 2011).
How could the ecosystem approach and/or ecosystem services be (further) incorporated within the existing tool?	A better acknowledgement of the 'full' ecosystem services framework within CBA may reveal gaps in the scientific evidence and the limitations of its outcomes e.g. when not all significant ecosystem services can sufficiently be valued. That could make the interpretation of CBA easier and more transparent, especially for non-specialists. Furthermore the ecosystem services framework may be used more often for corporate CBA to reveal external effects of business decisions.

Task 6: Situating the tool within priority questions/criteria arising from the scoping interviews

<p>Explain how the tool can be situated within the priority questions/criteria that arose in the scoping interviews</p> <p><i>Complete as many boxes as required</i></p>	<p>Priority question/criteria</p>	<p>Does your tool address/implement this question/criteria? If yes, please explain how.</p>
	<p>Language and communication</p>	
	<p>1. Contribution to aiding the development of shared vocabulary within which principles of EA and ES can be shared with multiple stakeholders across built and/or natural environment</p>	<p>CBA is comparatively often used to support decisions and a broader implementation of the ecosystem services framework should introduce a broader audience to the concept and its vocabulary.</p>
	<p>2. Capacity of the tool to develop shared understandings of the many identities and values of places from the perspectives of multiple visitors, residents and businesses</p>	<p>To date this is not common but CBA has a potential to develop shared understandings of identities and values if multiple stakeholders participate.</p>
	<p>3. Capacity of the tool to improve or enable engagement across different publics so avoiding the usual suspect problem</p>	<p>The tool allows illustrating 'value for money' of projects/policies affecting ecologies. Monetary calculations are often more tangible for non-environmental specialists and therefore may engage the acceptance of environmental projects, e.g. within the business community, governmental bodies and agencies that are not specialised on environmental issues, and the wider public. However, sometimes there are reservations of especially environmental activists about putting a monetary value on environmental goods and services. A common criticism is that one puts a 'price tag' on the environment which allows selling it.</p>
	<p>Learning from experience/pedagogy</p>	
<p>4. Capacity of the tool to help reveal and value 'hidden' assets that are not recognised by communities or publics that</p>	<p>If the 'full' ecosystem services framework is applied this has a great potential to reveal e.g. values that are usually not recognised. This applies especially if CBA is applied for corporate decision-making. However,</p>	

	use them	there is a danger that benefits and costs that can't be valued in monetary terms may remain 'hidden'.
	5. Extent to which tool is building on other tools or EA/ES progress	In general the tool can be combined with a range of other tools, especially Multi-Criteria Decision Analysis which might be beneficial for many applications (Barfod et al. 2011). To date it is still common to use CBA alone. CBA is also an integral component of impact assessments.
	6. Extent to which tool is locally derived or grounded or can be adjusted to closely reflect 'local' context. Is the tool suitable for an open source approach?	CBA can be applied at different scales and for different scopes including decisions within the 'local' context. The basic mechanism of the tool is well developed so that there is no need for an open source approach. However, open source may aid to standardise an ecosystem services framework for CBA purposes.
	7. Extent to which the tool is open to interpretation and application in a variety of forms (that reflect 'cultural' differences)	The tool is reasonably flexible and allows e.g. to implement equity weights etc. Equity weights can be applied to take into account that one pound is worth more to a poor person than to a rich one (Stern 2006). However, such advanced applications of CBA are still rare.
Developing and selecting tools		
	8. Is the tool dependent on a specific funding source? How onerous is the application procedure? What are the chances of success?	Environmental CBA is not dependent on a specific funding source but its appropriate application requires specific expertise. It often has been successfully applied but the findings are not always uncontroversial one (Stern 2006).
	9. Does skills development (essential or optional?) and support exist for the tool or is there a body to ensure the optimal and correct use of it?	CBA is well developed within consultancies which can provide a knowledge exchange. There are also guides available online. However, the collaboration with a specialised consultancy or a University is recommended to undertake an environmental CBA.
	10. Extent to which current statutory hooks can be exploited by the tool or will benefit the quality or application of the tool (e.g. NNPF's duty to cooperate, SUDS, ecol. networks)	CBA is basically applicable to a wide range of environmental projects and policies and sufficiently flexible to allow a wide range of applications. CBA, in the form of Impact Assessments, is compulsory part of the assessment of any major project or change in regulation in the UK.
Informing resultant policies effectively		
	11. Extent to which the tool informs or improves policies/decisions. What does the tool cover? (full range of positive and negative economic, social and environment impacts / tradeoffs?)	If applied sufficiently, yes (acknowledging caveats and limitations stated in the synopsis).
	12. How does the tool link into the planning system (applications and processes). At what cost / extra burden?	Optional but not mandatory for planning decisions. Could e.g. serve as amendment to Environmental Impact Assessments (EIA).
Delivering management objectives		

13. Suitability or capacity of the tool to assist with managing visitor needs and pressures within protected areas / the considered area? How?	Valued ecosystem services reveal, amongst others, visitor needs. CBA can serve to optimise ecosystem management and the application of funds to increase net-benefits to visitors. CBA can also be used to justify protected areas with reference to their environmental benefits.
Local ownership/new governance	
14. To what extent can the tool assist in developing statutory plans (local and management plans) and improve ownership and use by publics?	CBA can help to identify effective policy options and has a potential to 'test' statutory plans regarding effectiveness. It is also used as part of a Strategic Environmental Assessment (SEA). However, the costs of undertaking a CBA rise with the complexity of a plan. The accuracy of a CBA on the other hand declines with increasing complexity which may limit the applicability in this context.
15. To what extent does/could the tool contribute to a new form of community governance in management of the environment?	As stand-alone tool limited. However, there is potential if combined e.g. with Payments for Ecosystem Services (PES). It can for example serve to distribute the costs across 'buyers' within the PES scheme.
Improved tools: understanding flows, interconnections and spatial issues	
16. Capacity to improve spatial understandings of the flows and interactions of various ecosystem services between sectors and at different scales	Some potential but CBA might not be the preferred tool for this aim.
17. Capacity of the tool to reconcile assessments of options and benefits across different scales (and sectors)	Potentially yes, but very complex in practice.
18. Extent to which the tool is capable or can be manipulated to work across sectoral and administrative boundaries	The application of CBA is not limited to specific sectors or administrations.
19. Extent to which the tool can handle data shortages and gaps (or is effectiveness considerably compromised?)	Environmental CBA demands monetary valuation of ecosystem services. Therefore a robust data basis is necessary to generate reliable and unbiased outcomes. However, valuation shortcomings may be less harmful if CBA is combined with MCA and/or includes a good interpretation of the findings.
20. To what extent has/could the tool put landscape/nature conservation and designated species/sites on the radar (positively or resulting in resentment?)	Monetary valuation of ecosystem services makes trade-offs and impacts of projects and policies visible and tangible for non-specialists. However, there is some danger that – if not applied appropriately – the tool might be used to put additional pressure on designated species/sites.

Please add any further comments here:

Task 7: A SWOT analysis of the tool

Referring back to the relevant policy and academic literature (listed in Task 3), plus

Strengths (of the tool in delivering intended outcomes)

- Costs and benefits of a project/policy can be compared to judge an efficient application of funds.
- The tool reveals the Total Economic Value (including externalities) if applied

your own expertise (listed in Task 4) and the way in which the tool is situated within the priority questions/criteria (listed in Task 6), please complete a summary SWOT analysis ensuring that each point is well justified

Where possible, this analysis should reflect the tool's past and current application, as well as its effectiveness in policy and decision making processes

sufficiently. This serves more rationale decision-making.

- The outcomes (if interpreted correctly) are tangible for non-specialists because based on monetary values.
- The general mechanism of the tool is well known across institutions and decision-makers.

Weaknesses *(factors that detract from the tool's ability to deliver intended outcomes)*

- The appropriate application of environmental CBA demands expertise and sufficient data.
- General limitations to ecosystem valuation and an insufficient data basis can lead to biased outcomes to the disadvantage of non-marketable ecosystem services. There is a general tendency to undervalue non-marketable effects of a policy/project.
- Especially if primary valuation methods are conducted the costs of CBA can be substantial.
- CBA is often applied after the preferred outcome has been decided. If not approached systematically and rigorously there is a danger of confirmation bias.

Opportunities *(consider opportunities for application of the ecosystem approach and services)*

- The tool is already applied in many decision-contexts affecting ecosystem services.
- The application of the 'full' ecosystem services framework within CBA might reveal data demands and limitations which makes the interpretation of findings easier.
- There is a great potential to combine CBA with MCA.
- Social and environmental costs might be better implemented within corporate CBA and corporate decision-making in general.

Threats *(factors which negatively affect the tool and its outcomes)*

Classify these by their "seriousness" and "probability of occurrence" in the table below, and pay particular attention to the threats associated with potential use of ecosystem approach/ecosystem services.

Threat	Seriousness (high, medium, low)	Probability of occurrence (high, medium, low)
'Desired' outcomes might be generated. The danger is that environmental costs (and benefits) are not found because people overlook them or want to overlook them. The selection of ecosystem services that are taken into account within a CBA can have a significant impact on the outcomes.	Medium	Medium
If applied insufficiently there is a potential of CBA to justify ecosystem degradation and destruction.	High	Low

Guidance

Please now use the remainder of the document (box below) to make any general comments, observations or analyses of the tool

Further comments

The HM Treasury Green Book recommends discount rates for policy appraisals (HM Treasury 2003). However, one may take into question if the recommended discount rate is consistent with sustainable development. A critical review and revision might be beneficial.

References

Atkinson, G. & Mourato, S., 2008. Environmental Cost-Benefit Analysis. *Annual Review of Environment and Resources*, 33(1), S.317–344.

Barfod, M.B., Salling, K.B. & Leleur, S., 2011. Composite decision support by combining cost-benefit and multi-criteria decision analysis. *Decision Support Systems*, 51(1), S.167–175.

Christie, M. et al., 2011. *Economic Valuation of the Benefits of Ecosystem Services delivered by the UK Biodiversity Action Plan*, London: Aberystwyth University.

Defra, 2007. An introductory guide to valuing ecosystem services. Available at: <http://www.defra.gov.uk/environment/policy/natural-environ/documents/eco-valuing.pdf>.

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Hölzinger, O. & Dench, D., 2011. *The Economic Value of Gwen Finch Wetland Reserve*, Worcester.

Hölzinger, O. & Morris, J., 2011. *The Economic Evaluation of Moorcroft Wood LNR and the Influence of the Black Country Living Landscape Community Involvement Programme*, Birmingham.

OECD, 2006. *Cost-Benefit Analysis and the Environment Recent Developments: Recent Developments*, OECD Publishing.

Stern, N., 2006. *Stern Review on The Economics of Climate Change*, London: HM Treasury. Available at: http://webarchive.nationalarchives.gov.uk/+http://www.hm-treasury.gov.uk/stern_review_report.htm.

Multi-Criteria Decision Analysis Tool Review

Valuation Tools

TABLES Project 2012: Mini reviews	
Guidance	<i>Using your experience and expertise, consider the following tasks in relation to the tool. It may not be possible to complete all tasks for each tool due to a lack of available information, the task not applying to the tool, etc. Please note where this is the case by writing in the reason in the space provided. Please use a maximum of 6 pages of A4 (excluding diagrams and appendices). Your responses are required in the white spaces.</i>
Task 1: Basic information	
Name of the tool	Multi-Criteria Decision Analysis
Type of tool (list all that apply) <i>Learning and skills (pedagogic); participatory; regulatory; collaborative; mapping; valuation; modelling; decision; futures; financial; ecosystem services</i>	Participatory; valuation; decision
Group members <i>(minimum size 3 members, must include a BCU rep)</i>	<ol style="list-style-type: none"> 1. Althea Davies 2. Rosalind Bryce 3. Mark Reed 4. Charles Cowap 5.
Please provide a brief synopsis of the tool <i>This may include: background context, development (and ownership if appropriate), current use and applications etc.</i> <i>Please also note any desired outcomes of the tool so that you can make reference back to these in Task 7: SWOT analysis</i>	<p>MCDA (also called Multi-Criteria Evaluation/Analysis or Multi-Criteria Decision Modeling) is a decision-support tool for exploring issues and making decisions that involve multiple dimensions or criteria. It allows economic, social and environmental criteria, including competing priorities, to be systematically evaluated by groups of people. Both quantitative and qualitative data can be incorporated to understand the relative value placed on different dimensions of decision options (in an environmental context, often management options). The method was developed in the fields of operations research and decision theory, and this is reflected in the focus on algorithms and software support systems in much of the literature. However, the tool can also be used without software, to generate qualitative data about decision-making criteria, to rank decision options and discuss reasons for rank positions.</p> <p>Broadly, the process involves context or problem definition, representation of evaluation criteria and management options, and evaluation. When applied in a participatory and deliberative manner, this may involve any of a number of discreet stages, for example:</p> <ul style="list-style-type: none"> • Establish context and identify participants: This ensures the early identification of key issues, socio-environmental dynamics and selection of relevant/representative stakeholders for involvement in the multi-criteria decision-making process. Stakeholder mapping/analysis techniques may be used to systematically consider which stakeholders should be involved (Reed et al., 2009), and a combination of interviews, focus groups, workshops and document analysis can indicate perceived differences and views on the conflict, and help structure stakeholder involvement; • Define criteria: Criteria are defined that capture stakeholders' interests via

facilitated discussion and literature (e.g. research, policy documentation). Broad criteria, such as environmental, economic, institutional and social variables, can be broken down into more specific indicators;

- Rank or weight criteria: To reflect differing values and priorities, criteria are ranked to indicate their importance relative to the objective of process – this may be done individually and aggregated or facilitated as a group process;
- Define management options: Alternative management options are defined (e.g. using stakeholder mapping/analysis, literature such as policy documents, and/or 'expert' consultation). Options may for example represent current management types or possible future scenarios;
- Score management options against criteria: The performance of each management option is scored against each criterion. This may be completed by all stakeholders (individually), a subset of participants or by researchers. It may include evidence-gathering and/or deliberation to evaluate relationships between criteria and management options, including empirical data, expert opinion, scenarios and modeling;
- Multi-criteria evaluation: Algorithms are used to combine scores and ranks into a weighted value that describes the overall preference towards each option. Results can be presented per individual or aggregated for different groups. Statistical analyses can be applied to assess the robustness of the results and seek patterns amongst participant choices;
- Discuss options based on MCDA results: MCDA is a decision-support tool so outcomes may be deliberated with participants or amongst decision-makers to assess the degree of consensus, negotiate compromise and manage trade-offs.

MCDA has been applied in a range of natural resource management situations, including management of forest and water resources for multiple benefits, conservation planning, and to evaluate management sustainability. It has often been used to choose a management strategy that is optimal from a single user or single priority perspective. Participatory and deliberative approaches to MCDA, with greater emphasis on practical application and usability, have emerged more recently to deal with multiple stakeholders, ill-defined problems and competing objectives. Applications can include assessing the strengths/weaknesses of existing strategies or proposed strategies according to multiple goals and/or interests.

In development studies, MCDA has been adapted to be conducted with participants who may or may not be literate. Matrix Ranking, as it is called, typically represents options and criteria symbolically (e.g. with objects or images) and participants vote for each option against each criterion by placing counters (e.g. beans or stones) in the cells of a matrix in which each option is represented by a row of cells and each criterion is represented by a column of cells. The relative popularity of options can be assessed by gathering counters from each row (option) and comparing the size of each pile. Criteria may be weighted, though this is harder to visualize for participants.

Task 2: Use of the tool

Position / Use

If you can, please indicate which stage(s) of the decision / policy making process your tool is / could be used in (these stages were identified in the specification document)

Stage	Currently used	Could be used
Ideas	Local stakeholders may identify key factors relevant to the local level effectiveness and/or acceptability of management options.	
Survey	Problem definition: gathering criteria via stakeholder engagement helps establish the range of interests relevant to a particular issue. Early stage discussions to define the problem context can help identify the 'right' stakeholders, i.e. those with interest and influence	
Assess	Systematic method for assessing the potential or actual impacts of different management options on a range of interests; these may be multiple interests held by a single stakeholder or organisation, or the range of interests held by different stakeholders or user groups. Key strength is the ability to include qualitative and quantitative data in support of varied stakeholder interests, thereby potentially increasing legitimacy and fairness	
Policy / decision	This is a decision-support tool; the weighted scoring process indicates the preferences of individuals or groups towards the range of options on the table. These form a systematic and transparent basis for negotiation over decisions/policy	
Implement	N/A	
Evaluate	The method can be used to evaluate the performance of existing management or policy strategies according to multiple indicators or stakeholders' interests; this can be used to identify strengths and weaknesses of existing strategies, and bringing in additional stakeholders (e.g. with local knowledge) can indicate locally-relevant gaps or failing that need to be addressed to improve the effectiveness of current strategies.	Adaptive management: The process provides an 'audit trail' so the basis for decisions can be re-examined using the same protocol when new information becomes available

Please add any further comments here:

Task 3: Existing literature about the tool	
<p>Are you aware of any KEY policy and / or academic literature evaluating your tool? <i>(e.g. reports, journal articles, books)</i></p>	<p>DCLG (2009) Multi Criteria Analysis: a Manual. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/7612/132618.pdf</p> <p>Proctor W, Drechsler M, 2006, "Deliberative multicriteria evaluation" <i>Environment and Planning C: Government and Policy</i> 24: 169-190</p> <p>Linkov I, Satterstrom F.K., Kiker G., Batchelor C., Bridges T., Ferguson E. (2006) From comparative risk assessment to multi-criteria decision analysis and adaptive management: Recent developments and applications. <i>Environment International</i> 32: 1072–1093 http://www.lisdmp.org/MeetingMaterials/Resources/EnvIntl_1485.pdf</p>
Task 4: Your experience of working on the tool	
<p>Have you done any research/consultancy work on this tool in terms of its development, testing and/or evaluation? <i>If so, please provide an outline.</i></p>	<p>Based on our experience and responses from participants during workshops assessing the impacts on upland managers of a policy shift towards managing the land for multiple benefits (Scottish Land Use Strategy), we highlight numerous key considerations for future multi-criteria work in environmental conflict situations:</p> <ul style="list-style-type: none"> ▪ For MCDA outcomes to be useful there should be an appetite for change, a willingness to act on the results and opportunity for constructive dialogue, and stakeholders must be receptive to structured dialogue as part of a decision-making process. ▪ MCDA is best applied as part of a larger conflict resolution or management planning process. This can make policy makers or managers more aware of shortcomings in existing management effectiveness, trade-offs and how conflicts may be avoided. ▪ Sets of criteria that reflect the diversity of views and values amongst stakeholders should be drawn from stakeholders directly as well as from research and policy. Each criterion should be clearly defined to avoid ambiguity in understanding the differing views, including recognition that criteria can be either positive (e.g. maximising game numbers for harvest) or negative (e.g. minimal predator numbers). There should be similar numbers of economic, environmental and social criteria to avoid bias towards one particular dimension. ▪ The alternative management options that are evaluated during the process can represent current management types, possible future scenarios or a gradient of management activity and may be co-developed with stakeholders. ▪ Scoring the performance of management options against criteria requires stakeholders to make trade-offs between multiple values. It is critical that the questions put to stakeholders to derive these scores are clear and unambiguous in terms of context and scale. An iterative process with discussion and opportunities to re-score may improve the search for compromise. ▪ There are several methods of deriving a final 'value' for each management option. Aggregating individual responses may be a useful way of summarising views from groups or regions but no consensus should be inferred without allowing time for further deliberation. Transparency should be maintained and all conclusions and

	<p>interpretation should draw on discursive interpretation in addition to appropriate statistical analysis to avoid generating a false or unstable consensus.</p> <ul style="list-style-type: none"> Visual methods are useful for representing uncertainty and communicating differences of opinion and can form the basis for negotiating compromise and managing trade-offs in policy-making and environmental planning
Guidance	For Tasks 5-7, please also try to consider the future development and application of this tool in the TABLES project in your answers.

Task 5: Incorporating the ecosystem approach (EA) and ecosystem services (ES)

Please refer to the summary text about ES for concept clarification at the end of this template (appendix)

<p>Using examples (from practice, research or consultancy), explain how EA and/or ES are currently incorporated in/by the tool</p> <p><i>If neither approach is currently incorporated, please move to the next question</i></p>	<p>There is increasing interest in the use of MCA for ecosystem services management and decision-making, although many examples in the literature are theoretical or focus on a restricted set of services (e.g. Lester et al. 2012), often with limited or no participation. Therefore theoretical or conceptual recommendations of MCDA for ecosystem services management (e.g. Fish et al. 2011, Carpenter et al. 2009) generally lack practical testing. Similarly, the application of MCDA to more intangible non-market values (e.g. cultural or social values) is currently limited and refers mainly to practical aspects of cultural uses (e.g. recreation access).</p>
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<p>How <u>could</u> the ecosystem approach and/or ecosystem services be (further) incorporated within the existing tool?</p>	<p>The main difficulty lies in reducing the many interrelated aspects of ecosystem approach/services to a realistic but workable number of criteria or characteristics of options, since MCDA usually involves scoring the impacts of each option for each criterion. A list should provide a balance between completeness, with a risk of overwhelming detail, and conciseness, where oversimplification could increase uncertainty and mistrust. Highly complex settings, which seek to consider multiple ecosystem services or attributes may not be suited to MCDA. Threshold effects, high variability or multiple feedback loops between biological and management systems at local and wider (e.g. global market) scales may not be adequately managed using MCDA, unless the issue can be broken down into more manageable facets (potentially both to MCDA and to participants) without losing fundamental detail and connectivity.</p>
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Task 6: Situating the tool within priority questions/criteria arising from the scoping interviews

<p>Explain how the tool can be situated within the priority questions/criteria that arose in the</p>	<p>Priority question/criteria</p>	<p>Does your tool address/implement this question/criteria? Or does it have the potential if it was better integrated with an EA/ES approach? <i>Please explain how.</i></p>
	<p>Language and communication</p>	
	<p>1. Contribution to aiding the development of shared vocabulary within which</p>	<p>By breaking down key themes or complex issues into simpler, often measurable entities (sometimes called criteria and indicators), the process can help reduce</p>

scoping interviews <i>Complete as many boxes as required</i>	<p>principles of EA and ES can be shared with multiple stakeholders across built and/or natural environment</p>	<p>linguistic uncertainty and therefore help develop shared vocabulary. It can be an effective way of making the assumptions of different decision-makers explicit, thereby identifying common ground as a basis for developing a shared vocabulary to describe similar evaluation criteria</p>
	<p>2. Capacity of the tool to develop shared understandings of the many identities and values of places from the perspectives of multiple visitors, residents and businesses</p>	<p>Useful as structured, systematic and transparent tool for breaking down complex issues into component parts which can be more readily defined. This is useful for making explicit and recognising values held by different stakeholders, as well as the relative importance of these values in a particular context. See Task 5, however, for limitations in complex contexts, which applies when evaluating how stakeholder identities or values are affected by particular management options. Modelling may be useful for estimating interactions but uncertainties and 'black box' effects on transparency must be acknowledged.</p>
	<p>3. Capacity of the tool to improve or enable engagement across different publics so avoiding the usual suspect problem</p>	<p>Visual methods of representing the range of views are useful for communicating responses and soliciting input from different audiences. By enabling diverse publics to take complex decisions together, this tool has the capacity to enable diverse participants to engage effectively together around environmental decisions</p>
	<p>Learning from experience/pedagogy</p>	
	<p>4. Capacity of the tool to help reveal and value 'hidden' assets that are not recognised by communities or publics that use them</p>	<p>Not known</p>
	<p>5. Extent to which tool is building on other tools or EA/ES progress</p>	<p>Assessing impacts of options on criteria can draw on a wide range of existing tools since the method can incorporate qualitative and quantitative data, e.g. cost-benefit analysis, choice experiment, other (e.g. ecological) modelling. Deliberative approaches to MCDA typically build on a range of existing participatory approaches e.g. citizen's jury</p>
	<p>6. Extent to which tool is locally derived or grounded or can be adjusted to closely reflect 'local' context. Is the tool suitable for an open source approach?</p>	<p>Highly suited to incorporating local values – adapting criteria and options to local conditions is a strength of participatory application. The method can be/has been applied to cross-scale analysis, e.g. international, national and local perspectives can be assessed using similar framework. A range of open source software is available for conducting MCDA.</p>
	<p>7. Extent to which the tool is open to interpretation and</p>	<p>The general structure of MCDA (7 stages outlined</p>

<p>application in a variety of forms (that reflect 'cultural' differences)</p>	<p>above) can be conducted in a number of ways to reflect cultural needs/differences, e.g. accommodate non-literate participants (e.g. using Matrix Ranking). The final ranking or preferences towards management options could be misinterpreted as indicating consensus, which may be a false premise. Therefore, mathematical treatment and representation of responses require careful consideration. For this reason, many users emphasise the use of MCDA as a qualitative tool for structuring discussion around decision options (e.g. Reed et al., 2008).</p>
<p>Developing and selecting tools</p>	
<p>8. Is the tool dependent on a specific funding source? How onerous is the application procedure? What are the chances of success?</p>	<p>Software applications are available to support implementation of MCDA, but it is not dependent on these, and there are open source options available. However, careful method selection and process design are critical as these influence outcomes. 'Success' depends on definitions – whose perspective, whose goals. It is also a decision-support tool, so 'success' resides in the quality of the process rather than negotiated decisions that may result from use of MCDA outputs.</p>
<p>9. Does skills development (essential or optional?) and support exist for the tool or is there a body to ensure the optimal and correct use of it?</p>	<p>Skills development is essential to ensure correct/optimal use of this tool, especially if software is going to be used as part of the process. There is no obvious support system. Although much literature exists on the different methods and how to apply them, there is far less on the applicability of particular methods to specific contexts (i.e. which methods are likely to be most effective when). Therefore careful prior literature reading or training is critical to ensure effective process design and application.</p>
<p>10. Extent to which current statutory hooks can be exploited by the tool or will benefit the quality or application of the tool (e.g. NNPF's duty to cooperate, SUDS, ecol. networks)</p>	<p>The need to take into account multiple values provides a strong hook for use of MCDA although the absence of evaluation literature for MCDA means that there is limited guidance to draw on to ensure the quality of the application. This includes lack of existing applications and potential difficulties of applying MCDA to complex ES contexts.</p>
<p>Informing resultant policies effectively</p>	
<p>11. Extent to which the tool informs or improves policies/decisions. What does the tool cover? (full range of positive and negative economic, social and environment impacts /</p>	<p>Tool informs policies/decisions by representing a range of perspectives, including positive and negative environmental, social and economic impacts. This provides a basis for negotiated or deliberated compromise and potentially provides a transparent 'audit trail' for the decision-making process. Having</p>

tradeoffs?)	said this, the tool can only be used with relatively limited group sizes, meaning that to inform policy decisions it is essential to ensure effective representation of stakeholder interests in the MCDA workshop
12. How does the tool link into the planning system (applications and processes). At what cost / extra burden?	MCDA is likely to be most effective when applied as part of a wider planning process. It can incorporate various evaluation tools (e.g. cost-benefit analysis, choice experiments, risk assessment) to assist evaluation of how different options are likely to affect criteria of importance to participating stakeholders. Length of process and levels of participation can be varied to suit planning context, although implications for fair representation must be considered. The additional skills required to design/run MCDA within a broader planning process will incur costs in terms of skills and transaction costs (liaison with planners), but many parts of MCDA and traditional planning process may overlap/have mutual relevance, e.g. stakeholder identification and engagement. Therefore, MCDA can provide a structured process for undertaking various aspects of the planning process.
Delivering management objectives	
13. Suitability or capacity of the tool to assist with managing visitor needs and pressures within protected areas / the considered area? How?	Can be applied as a means of assessing possible impacts of different visitor needs and pressures on conservation goals, e.g. developing visitor facilities, impacts of permit/visitor quota management strategies
Local ownership/new governance	
14. To what extent can the tool assist in developing statutory plans (local and management plans) and improve ownership and use by publics?	The method is most effective when conducted as part of wider planning process, particularly by involving planning authorities and public to ensure that differing interests are transparently and systematically considered. This can allow consideration of trade-offs required to negotiate acceptable compromise between different interests.
15. To what extent does/could the tool contribute to a new form of community governance in management of the environment?	Useful as a tool to support decision-making processes, provided structured process is acceptable, relevant information and necessary skills are available, and methodological issues are considered, i.e. skilled facilitation is important.
Improved tools: understanding flows, interconnections and spatial issues	
16. Capacity to improve spatial understandings of the flows and interactions of various ecosystem services between	Consistent framework can be used to assess differences between sectors and scales, but the method is not ideally suited to highly complex situations, unless modelling (with appropriate

	sectors and at different scales	acknowledgement of uncertainty) is acceptable to represent and assess feedbacks between highly interconnected aspects of ecosystems, e.g. ecological interactions, cultural/management-ecological interactions, systems with high variability or uncertainty (see response to Task 5 above).
	17. Capacity of the tool to reconcile assessments of options and benefits across different scales (and sectors)	See response to no. 6 above.
	18. Extent to which the tool is capable or can be manipulated to work across sectoral and administrative boundaries	Well-suited to incorporating views and resource issues across boundaries, although see caveat re complexity in Task 5 and no. 16 above. Information needs must also be considered, e.g. spatial concentrations/gaps in information may prevent uniform assessment across scales/sectors.
	19. Extent to which the tool can handle data shortages and gaps (or is effectiveness considerably compromised?)	A strength of the method is that uncertainties and gaps in knowledge can be explicitly identified. Expert opinion or modelling can be used to address these, but wider acceptability of these approaches/inputs must be considered. Fuzzy MCDA approaches have been developed to accommodate uncertainty and knowledge gaps. Scoring can use a scale that explicitly requests participants to indicate how confident they are that particular options may have desired outcomes.
	20. To what extent has/could the tool put landscape/nature conservation and designated species/sites on the radar (positively or resulting in resentment?)	The method has been used in conservation planning and to manage conflicts between conservation and cultural interests. Conservation applications can be applied purely to design of management options that address conservation goals, or design that takes into account multiple environmental/social/economic interests.

Please add any further comments here:

Task 7: A SWOT analysis of the tool

Referring back to the relevant policy and academic literature (listed in Task 3), plus your own expertise (listed in Task 4) and the way in which the tool is

Strengths (of the tool in delivering intended outcomes)

- Supports complex decision-making processes with diverse groups of decision-makers
- Able to cope with incomplete or “fuzzy” data and make uncertainty explicit
- Makes the assumptions and decision criteria of different participants explicit and can facilitate an explicit discussion of individual/group priorities around the reasons for taking a particular decision
- Easily integrates into existing decision-making processes e.g. planning system and provides quantitative outputs that are attractive to policy-makers

<p>situated within the priority questions/criteria (listed in Task 6), please complete a summary SWOT analysis ensuring that each point is well justified</p> <p><i>Where possible, this analysis should reflect the tool's past and current application, as well as its effectiveness in policy and decision making processes</i></p>	<p>Weaknesses (<i>factors that detract from the tool's ability to deliver intended outcomes</i>)</p> <ul style="list-style-type: none"> • Struggles to cope with decisions that involve a large number of options or criteria – when considering the impact of a decision on a range of different ecosystem services, this may require more criteria than can effectively be managed as part of a workshop process • Struggles to cope with complex decisions in which different options or criteria are likely to interact with one another (e.g. trade-offs between ecosystem services) or where there are feedbacks in the system • The tool is often used in a highly quantitative manner to arrive at a false consensus that does not satisfy participants • MCDA has been criticised for failing to capture qualitative and subjective elements of decisions, and focussing too much on elements that can be easily made explicit and quantified 											
	<p>Opportunities (<i>consider opportunities for application of the ecosystem approach and services</i>)</p> <ul style="list-style-type: none"> • MCDA may be combined with computational modelling of ecosystem services to capture feedbacks and prioritise ecosystem services to include as decision criteria • MCDA may be used in a more qualitative way to structure discussion around decisions and decision criteria and ranked outputs from MCDA software may be used as the basis for group discussion rather than feeding directly into decisions 											
	<p>Threats (<i>factors which negatively affect the tool and its outcomes</i>)</p> <p><i>Classify these by their “seriousness” and “probability of occurrence” in the table below, and pay particular attention to the threats associated with potential use of ecosystem approach/ecosystem services.</i></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="background-color: #e0f2f7;">Threat</th> <th style="background-color: #e0f2f7;">Seriousness (high, medium, low)</th> <th style="background-color: #e0f2f7;">Probability of occurrence (high, medium, low)</th> </tr> </thead> <tbody> <tr> <td>False consensus reached</td> <td>High</td> <td>Medium</td> </tr> <tr> <td>Decision over-simplified in relation to ecosystem services</td> <td>Medium</td> <td>Medium</td> </tr> <tr> <td>Qualitative and subjective elements of a decision may be overlooked</td> <td>Medium</td> <td>High</td> </tr> </tbody> </table> <p>Please add further comments here:</p>	Threat	Seriousness (high, medium, low)	Probability of occurrence (high, medium, low)	False consensus reached	High	Medium	Decision over-simplified in relation to ecosystem services	Medium	Medium	Qualitative and subjective elements of a decision may be overlooked	Medium
Threat	Seriousness (high, medium, low)	Probability of occurrence (high, medium, low)										
False consensus reached	High	Medium										
Decision over-simplified in relation to ecosystem services	Medium	Medium										
Qualitative and subjective elements of a decision may be overlooked	Medium	High										
Guidance	<i>Please now use the remainder of the document (box below) to make any general comments, observations or analyses of the tool</i>											
Further comments												