

Economics in policy-making 6

Multi-criteria analysis

Multi-criteria analysis (MCA) evolved from critique of conventional cost benefit analysis and its variants, social cost–benefit analysis (CBA) and Social Return on Investment (SROI).

Where does multi-criteria analysis come from?

Both social CBA and SROI are based on the premise that both social and environmental wealth should, and can, be ‘monetised’ (translated into monetary terms) in order to be factored into conventional CBA. Equally, they work on the premise that societies should *always* opt for interventions that are optimal in terms of efficiency and effectiveness – i.e. the ones producing the most benefits compared to costs. At least that’s the theory. Both CBA and SROI are tools which help in decision-making because they give certain pieces of information. That does not guarantee those pieces of information are used in decision-making.

As touched upon in briefings 3 and 4 there are various major technical and ethical uncertainties surrounding these ideas:

- On the one hand, revealed preference methods – which use real market data (like house prices) to value intangible attributes (such as the value of proximity to beautiful landscapes) – can capture only *part* of the value of environmental and social wealth. On the other hand, Willingness To Pay (WTP) or Willingness To Accept (WTA) methods, which can potentially capture the total economic value (TEV) of nature and well-being, are based upon the subjective statements of individuals, and their relative wealth, and are therefore marked with uncertainties.

- Many people are ethically against putting a monetary price tag on nature in the first place, as evidenced by the high proportion of respondents who refuse to ‘bid’ for environmental and social goods when taking part in Willingness To Pay research. This highlights the question of ‘incommensurability’ of values – whether or not assets can all be valued on a single scale (see *briefing 3*).
- Finally, some argue that society is not necessarily a field where the main objective should be ‘efficiency maximisation’ (i.e. choosing the “best” policy option). Rather, it is a field of competing interests and values, where an intervention that is optimal for some stakeholders could be the worst possible outcome for others. For instance, banning the over-fishing of some species might be the worst possible outcome for some parts of the fishing industry while at the same being (a) an acceptable compromise for some fishing communities, and (b) the optimal solution for other stakeholders such as the tourism industry or environmental NGOs.

In light of this, the “right” policy option for society should be the one that the most people agree with.

MCA practitioners refute the idea that decisions should be based purely on the total balance of an action’s costs and benefits, without taking into account how these costs and benefits are distributed. They argue that different stakeholders have competing vested

interests in how resources are used, and will be affected in different ways by an intervention.

The aim of MCA is to bring to light these unavoidable conflicts and competing interests, rather than presuming that the technically 'optimal' solution is necessarily the best for society.

How does MCA differ from social CBA and SROI?

MCA practitioners subscribe to the following principles:

- 1 That society is a sphere of competing interests and values for competing stakeholders – and there is no such thing as 'best' policy option cutting across all stakeholders and values;
- 2 That 'monetisation' cannot adequately capture the value of nature for a variety of reasons, ranging from strictly technical issues to ethical premises;
- 3 That, in light of this, we cannot express nature and social values in monetary terms, so other means of capturing that value need to be investigated.

Based on these principles, MCA differs from social CBA and SROI in the following ways:

- It considers a range of possible interventions aiming to achieve the same end. For example, in order to reduce overfishing in British coastal areas, a range of interventions (reducing the number of vessels/ fishermen; or introducing quota or closed seasons for example) could be defined by different stakeholders. All the potential interventions would then be appraised/ evaluated.
- It considers all potential stakeholders affected by a given intervention and distinguishes them in a clear way. SROI does this to some extent, but does not usually consider a range of different options or consult stakeholders to find out which they prefer.
- It consults stakeholders in order to determine the criteria against which they think impacts should be assessed. Objective measurement indicators are then determined for each of the triple bottom line impact criteria (economic, social, and environmental).
- Stakeholders are asked to rank the criteria which seem more important to them – e.g. fishing communities might be more interested in economic and social / well-being criteria and less about environmental ones. Other stakeholders might have a different set of preferences reflected in the analysis. This does not happen in social CBA and SROI where all criteria (benefits) are assumed to have the same weight as each other, and to all stakeholders.
- The performance is assessed against indicators which do not need to be monetised. A biodiversity indicator might, for instance, be set as mean species' abundance (MSA) per hectare. All different indicators are then "harmonised" on a scale (e.g. % change) in order to create an overall score for each policy option.

- Finally, based upon (a) the score of each intervention against each criterion and (b) the ranking of stakeholders, a most preferred and least preferred option or intervention is determined for each stakeholder group. This means that, unlike social CBA/SROI, there is no 'single' ratio at the end of the process.

The fact that no single ratio is obtained, means that a negotiation process among stakeholders follows an MCA. The ultimate objective is to find the most 'acceptable solution' for as many stakeholders as possible by rationalising conflicts and competing interests. It is assumed that only by establishing the maximum possible amount of stakeholder support (and thus 'acceptability'), can an intervention be sustainable on the long run.

MCA: a viable alternative or a complimentary measure?

The main strengths of MCA are that it escapes the inherent uncertainties linked with monetisation and weighs up multiple options and competing interests. It is also a holistic exercise which can take into account numerous intangible criteria. The question, however, is the extent to which it should, and can, replace social CBA as a decision-making tool.

To start with, mainstream appraisal and evaluation has historically ignored MCA. This means that limited comparative data exists and there is also insufficient standardisation between data sets.

Further, whilst MCA is extremely useful in situations where there are competing interests at play, it is not necessarily capable of demonstrating the best possible option from an efficiency, equity or effectiveness standpoint. In light of this, social CBA and SROI may be better suited to situations where no stakeholder conflicts exist and an 'optimal' pathway needs to be defined.

Finally, as is the case for social CBA and SROI, MCA does not consider extreme risk or uncertainty. In particular, it is unsuitable for representing non-linear developments, e.g. the risk of a sudden collapse of fish stocks. As such, MCA does not necessarily work well with the 'precautionary principle' approach to environmental decision making.

Are there other alternatives?

One of the fundamental characteristics of climate change and biodiversity loss is radical uncertainty. Due to the unpredictable positive feedback systems present in the natural world, we often cannot accurately gauge what the probabilities of certain future events happening are (e.g. a sudden halt of ocean current circulation).

When it is not possible to assign robust probabilities to key future impacts – and in the presence of disagreements among experts – then both social CBA and MCA can become obsolete.

For these reasons some scholars as well as supra-national organisations (including the European Commission) have suggested that a precautionary approach should be used in conditions of radical uncertainty. This entails quantifying costs and benefits under 'best case' and 'worst case' scenarios. The existence of an 'extreme worst case' scenario (such as a complete collapse of fish stocks) should be enough to prescribe a set of policy options based on a precautionary principle; at least until the likelihood (probability) of an event happening (or not) can be assigned with some certainty.

CASE STUDY

You have now seen what Multi-Criteria Analysis (MCA) is, how it differs from other techniques and where MCA is useful. This case study (from the Buccoo Reef Marine Park (BRMP) in Tobago¹), shows MCA in practise and demonstrates how the analysis helps to build consensus and involve stakeholders in environmental management decision-making.

Coastal and marine resources demand management solutions which are holistic (due to the complexity in terms of ecology, patterns of use, and resource users). This case study outlines the approach used in the BRMP in Tobago, to discuss and decide on different options, which incorporate multiple objectives for protected area management. The decision-making framework is based on multi-criteria analysis (MCA), which involves stakeholders at all stages. This holistic approach helps for multiple-use, complex systems such as coral reefs, where many different users are apparently in conflict and where linkages and feedback between different aspects of the ecosystem and economy exist.

Why was the analysis undertaken?

Many marine protected areas (MPAs) in the region are declining. A lack of stakeholder involvement and a sense of being marginalised or excluded have been cited as a contributing factor in some cases of failure, as disaffected stakeholders then undermine the management of the MPAs. To avoid this happening in the BRMP, the impacts of four different development scenarios were evaluated and weighted by local stakeholders. MCA was used to explore different management options. The approach was effective as it enhanced stakeholder involvement in the decision-making process and developed consensus-based approaches to management of the MPA.

What was the process?

- **Identification:** stakeholder analysis and identification of social, economic and ecological criteria.
- **Evaluation** of the impacts of four different development scenarios.
- **Weighting** of different criteria by stakeholders and then using stakeholder weightings in MCA to explore different management options.

Scenarios: An important aspect of the scenarios is that they represent feasible and believable futures. They are based on the possibility of expansive or limited tourism development, with or without enhanced environmental management.

The four scenarios for the BRMP and the driving forces of change:

- A Limited tourism development *without* complementary environmental management
- B Limited tourism development *with* complementary environmental management
- C Expansive tourism development *without* complementary environmental management
- D Expansive tourism development *with* complementary environmental management

Criteria: Economic, social, and ecological criteria (and further sub-criteria) were also developed within the multi-criteria model, representing potential multiple impacts and the likely consequences of the development options on Tobago.

In the case of the BRMP, these criteria were predominantly related to the impacts of national and local economic growth on community development, social development, and cultural integrity as well as to environmental conservation.

Trade-offs: The trade-offs between expansive tourism development, which threatens the integrity of the key habitats (mangrove and seagrass removal for hotel building, etc., and especially to the coral reef through eutrophication/run-off), compared to more limited tourism development which maintains key habitats (fringing mangrove and seagrass areas) are very pronounced in this case study.

Further, although some uses of MPAs are non-consumptive, such as some recreational uses, all uses, whether consumptive or not, impact each other. For example, uses of the resources by fishers or tourists reduce the availability of the resource to others users. This limitation may be through congestion, pollution, or direct consumption. Thus the social and economic impacts of tourism-based development can be negative, particularly where there is major dependence on fisheries in the local economy.

CASE STUDY

The ecological complexity and multiple uses of many MPAs is made more complicated by diverse and complex systems of property rights, which require state, private, and collective decision-making, and diverse and often conflicting users (property rights are discussed in briefing 10).

Assessing the criteria under different development scenarios

Economic criteria

The economic criteria focus on macro-economic benefits and recreational user benefits, i.e. what will happen to income from tourism. In the assessment, many different economic approaches were used: recreational user benefits used contingent valuation (CV) surveys, willingness to pay (WTP), and consumer surplus studies, as well as revealed and expressed preference methods.

Social criteria

The social criteria reflect the distribution and social impact of the development scenarios, including local employment (i.e. formal and informal employment in tourism) and local access to the BRMP.

Ecological criteria

Water quality is used in this study as one of the major indicators of ecosystem health, as coastal run-off from the development of hotels, etc., and associated pollution have a negative impact on both seagrass and coral reef condition.

Table 1: The estimated impact of four development scenarios for the BRMP on economic, social, and ecological criteria

Criteria	Scenario			
	A	B	C	D
Economic				
1: Economic revenues to Tobago (US\$m)	9	11	17	19
2: Visitor enjoyment of BRMP (US\$m)	1.2	2.5	0.9	1.7
Social				
3: Local employment (no. jobs)	2,500	2,600	6,400	6,500
4: Informal sector benefits (score)	5	4	3	2
5: Local access (score)	6	5	6	7
Ecological				
6: Water quality ($\mu\text{g N/l}$)	1.5	1.4	2.2	1.9
7: Sea grass health (g dry weight/m ²)	18	19	12	15
8: Coral reef viability (% live stony coral)	19	20	17	18
9: Mangrove health (ha)	65	73	41	65

Table 2: Results of stakeholder preference ranking

Priority Areas	Bon-Accort Village Council	Buccoo Village Council	Depts of the THA*	Fishers	Recreational users**	Reef Tour Operators	Water Sports/ Dive ops.
Economic Growth (%)	22	25	19	18	9	27	23
Social issues (%)	32	35	29	40	32	32	15
Eco-system (%)	47	40	52	43	59	42	63

CASE STUDY

The MCA stage of the research described is an entry point to stakeholder-led negotiations on priorities for management. The weightings were derived through focused and structured discussions of the implications of the scenarios and options for management with different stakeholder groups.

Table 3 shows what a final MCA stakeholder ranking output looks like. Ranking tables of this type are a useful tool to solve stakeholder conflicts. They evaluate the 'best' option and ensure that resource users feel involved in the decision-making and subsequent management of the resources they depend upon.²

Table 3: Derived weights and rank orderings for development scenarios for six stakeholder groups.

	Equal weighting	Approximate consensus of local stakeholders	Regulatory agency	Recreational users
Weight	33:33:33	20:30:50	19:29:52	9:32:59
Scenario ranking (lightest ranking)	D: Expansive tourism development with complementary environmental management	B: Limited tourism development with complementary environmental management	B: Limited tourism development with complementary environmental management	B: Limited tourism development with complementary environmental management
	↓	↓	↓	↓
	B: Limited tourism development with complementary environmental management	D: Expansive tourism development with complementary environmental management	A: Limited tourism development without complementary environmental management	A: Limited tourism development without complementary environmental management
	↓	↓	↓	↓
	A: Limited tourism development without complementary environmental management	A: Limited tourism development without complementary environmental management	D: Expansive tourism development with complementary environmental management	D: Expansive tourism development with complementary environmental management
	↓	↓	↓	↓
(lowest ranking)	C: Expansive tourism development without complementary environmental management	C: Expansive tourism development without complementary environmental management	C: Expansive tourism development without complementary environmental management	C: Expansive tourism development without complementary environmental management

What difference does this type of approach/analysis make?

In practise this approach and analysis (Table 3) helped build trust and the movement towards co-management of the MPA.

By informing all stakeholders about the implications of resource use and likely changes/scenarios and by directly resolving conflicts between users of the resource (and thereby building trust between the stakeholders) it was possible for the stakeholders themselves to have an input into the management of the BRMP.

The ultimate result was the empowerment of local stakeholders. This represents a departure from traditional protected area management, but one that is necessary given the general failure of numerous protected areas which did not do so.³

The approach effectively incorporates both quantitative and qualitative indicators within the multi-criteria

framework. It demonstrates that it is *not necessary to derive monetary values to evaluate trade-offs*.

This framework is superior to extended cost benefit analysis in this context for a number of reasons:

- Whilst cost-benefit analysis can be effective when the objective is to maximise economic efficiency, when other issues, such as social implications, ecological and environmental conservation, or bio-physical impacts of decisions are also important to decision-makers, MCA is more appropriate.⁴
- It demonstrates that stakeholder views and values can be used in a rigorous framework which makes sense to politicians, regulators, and planners.
- The acknowledgement of MCA as a methodology by Defra (2011) makes this recognition of the advantages of MCA clear.⁵

Further reading and useful resources

Critique of cost-benefit analysis and alternatives
http://www.ase.tufts.edu/gdae/Pubs/rp/Ack_UK_CBACritique.pdf

Seven principles for valuing what matters
http://neweconomics.org/sites/neweconomics.org/files/Seven_principles_for_measuring_what_matters_1.pdf

The Economics of Ecosystems and Biodiversity: socio-cultural context of valuation
http://www.teebtest.org/wp-content/uploads/Study%20and%20Reports/Reports/Ecological%20and%20Economic%20Foundations/TEEB%20Ecological%20and%20Economic%20Foundations%20report/TEEB%20Foundations_Chapter%204.pdf

Multi-criteria analysis: a case study (marine protected area)
http://www.cserge.ac.uk/sites/default/files/gec_2000_02.pdf

Communication of the European Commission on the precautionary principle
<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2000:0001:FIN:EN:PDF>

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The project aims to build socio-economic capacity and cooperation between NGOs and aid their engagement with all sectors using the marine environment.

Economics in Policy-making briefings:

- 1** An overview of economics
Sagar Shah
- 2** How economics is used in government decision-making
Susan Steed
- 3** Valuing the environment in economic terms
Olivier Vardakoulis
- 4** Social CBA and SROI
Olivier Vardakoulis
- 5** Discounting and time preferences
Olivier Vardakoulis
- 6** Multi-criteria analysis
Olivier Vardakoulis
- 7** Beyond GDP: Valuing what matters and measuring natural capital
Saamah Abdallah
- 8** Markets, market failure, and regulation
James Meadway
- 9a** Finance and money: the basics
Josh Ryan-Collins
- 9b** What's wrong with our financial system?
Josh Ryan-Collins
- 10** Property rights and ownership models
James Meadway
- 11** Behavioural economics – dispelling the myths
Susan Steed

- 1 Brown, K., Adger, W.N., Tomkins, E., Bacon, P., Shim, D. and Young, K. (2000) *Trade-off analysis for marine protected area management*. Retrieval from http://www.cserge.ac.uk/sites/default/files/gec_2000_02.pdf
- 2 Brown, K., Adger, W.N., Tomkins, E., Bacon, P., Shim, D. and Young, K. (2000) *Trade-off analysis for marine protected area management*. Retrieval from http://www.cserge.ac.uk/sites/default/files/gec_2000_02.pdf
- 3 Brown, K., Adger, W.N., Tomkins, E., Bacon, P., Shim, D. and Young, K. (2000) *Trade-off analysis for marine protected area management*. Retrieval from http://www.cserge.ac.uk/sites/default/files/gec_2000_02.pdf
- 4 Furthermore MCA allows 'soft criteria' that cannot be expressed in monetary terms, or even quantitative measures, to be included in the analysis (van Huylenbroeck and Coppens, 1995).
- 5 Defra (2011) *Social impacts and wellbeing: multi-criteria analysis techniques for integrating non-monetary evidence in valuation and appraisal*. Retrieval from <http://www.defra.gov.uk/publications/2011/12/22/pb13695-paper5/>

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