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Value articulating institutions and changing social preferences

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Value articulating institutions and changing social preferences

Sigrid Stagl

Introduction

Governance for sustainable development struggles with complexity, uncertainty, path-dependence, ambivalence and distributed control. Reflexive governance is societal steering that is embedded in ongoing dynamics of socio-ecological change and that focuses on interactions and feedback relations for open-ended systemic learning rather than achieving defined ends and striving for control. Strategies for implementing reflexive governance are integrated knowledge production; iterative, participatory goal formulation; appraising options by anticipation of their possible indirect and long-term effects on system dynamics; interactive strategy development and adaptive strategies and experimentation. An important element of reflexive governance is the opening-up of governance processes for interaction with their context.

At the same time closing down is needed for collective action (Voß, et al. 2006).

When appraising more or less sustainable options and comparing them against each other, traditional economic techniques such as cost-benefit analysis turned out to be unsuitable (Munda 1996). Key reasons for this call for new tools and methods were: (1) the need to address uncertainty and to account for multiple framings resulting from the characteristics of complex adaptive systems; and (2) the increasing acceptance of the idea that preferences and institutions are intertwined; formal and informal institutions influence actors and shape preferences.

This chapter illustrates methodological options for sustainability appraisal that address uncertainty, capture the decision process as well as the outcome and account for social influence on decision-making. Viewing appraisal methods as value-articulating institutions moves them from technical detail to crucial policy choice (Vatn 2004).

For environmental governance we need institutions that are inclusive and deliberative, allow preferences to form and change, and we need to be reflective about the designs of value-articulating institutions. While participatory integrated appraisal tools are still being developed further, they

have been shown to be suitable for informing policy processes and governance for sustainable development more broadly.

This chapter maps different valuation and appraisal methods that have been used in multiple real world applications. The methods highlighted in this chapter are conceptually and practically particularly suited for appraising policies, programmes and projects for which sustainability is an important component. The chapter is organised as follows: The next section explores the implications of a complex systems perspective on appraisal methods and recent findings on the relationship between institutions and preferences. Section 3 reviews sustainability appraisal methods that combine analytical and participatory methods, account for different types of knowledge, provide opportunities for learning during the appraisal process and whose process is completely transparent. The methods discussed here are: deliberative monetary valuation, social multicriteria evaluation, three-stage multicriteria analysis, multicriteria mapping, deliberative mapping, stakeholder decision / dialogue analysis. Section 4 points to methodological and practical opportunities and challenges for the reflective governance approach.

Sustainability goal requires novel appraisal methods

As climate change, adverse ecosystem changes and vulnerable people rise in importance on the political agenda and the appraisal of policies, programmes and projects against sustainability criteria becomes more widespread, theorists and practitioners ask fundamental questions about the nature of appraisal and its role in the political process. (1) Sustainable development is a multidimensional concept: How can potentially conflicting impacts that are measured in different units (monetary / non-monetary) and in different ways (quantitative / qualitative) be brought together to aid decision-making (Martinez-Alier, et al. 1998)? (2) The interface between science and policy is complex: How can appraisal tools aid decision-making when the field of policy analysis increasingly rejects the concept of neutral, objective advice (Owens, et al. 2004)? (3) Natural and human systems are adaptive: How can valuation and appraisal tools account for the dynamic and uncertain nature of natural and human systems (Folke, et al. 2005)? Hence, the aim of sustainable development puts special demands on valuation and appraisal methods, which makes it necessary to test the applicability of existing valuation and appraisal tools in this context.

It is often argued that for the environment to be taken seriously in government and business decisions, it must be assigned a monetary value. Environmental economists have developed and used a range of methods including travel cost, hedonic pricing, production function analysis, contingent valuation and choice modelling (Hanley and Spash 1993) to attribute monetary values to the 'environment' in decision-making processes. This approach has been successful in that many national and international agencies are performing monetary valuation exercises as part of their overall assessment of projects. However, there has also been criticism of the monetary valuation of environmental goods and services. Critiques can be broadly grouped into those concerned with the theoretical foundations of economic valuation, and those looking at the validity of the specific numbers produced and the tools employed.

Cost-benefit analysis claims that benefits and costs can be expressed in monetary terms and hence made comparable or commensurable. A significant literature in ethics, political philosophy and economics has arisen which doubts this assumption. For example, market boundaries should exist because trading children, certain drugs or weapons of mass destruction is morally wrong. The mix of moral and economic in these choices is just what critics of cost-benefit analysis claim characterizes environmental policy.

Hence, the surrogate markets of cost-benefit analysis are regarded as similarly unacceptable in these contexts (Anderson 1993; O'Neill 1993; Sunstein 1997; Vatn and Bromley 1994). If CBA is inappropriate for political decisions concerning say, abortion policy, then it is argued to be inappropriate for much environmental policy too. Another strand of academic literature argues that incommensurability arises when a rational agent is unable to attach a monetary value to certain "goods" (e.g. environmental assets) for legitimate reasons (see Aldred 2006 for a more comprehensive review of these issues). It is widely recognized that the incommensurability problems facing monetary valuation are particularly noticeable, and particularly acute, in environmental contexts. Thus David Pearce acknowledged, ''the issue of 'incommensurables' grew to be the single most controversial issue in cost-benefit analysis, and it remains so today'' (Pearce 2000: 51). These concerns from the academic arena have so far had limited impact on the practice of sustainability appraisal.

In another area of critical analysis, cost-benefit-analysis, along with mainstream microeconomics, has been criticised for building upon axioms of choice which are inconsistent with theories of modern psychology and empirical evidence. Kahneman and Tversky's (1979) prospect theory revealed that people value gains and losses asymmetrically, which can explain the

observed gap between willingness-to-pay and willingness-to-accept measures. Knetsch (1995) showed the frequent occurrence of behaviours that are inconsistent with accepted economic norms but commonly dismissed by economic models. The refusal to make trade-offs has been shown to arise in cost-benefit-analysis studies, both amongst those who protest against the use of monetary valuation of the environment and also those prepared to acknowledge that it can make a contribution (Spash 2000).

Bateman and Mawby (2004) illustrated that practical matters such as interviewer appearance (interviewer wearing either formal or more casual clothing) have a significant impact upon stated willingness-to-pay for an environmental good. Alvarez-Farizo and Hanley (2006) found that preferences change significantly when people were given more information, and time to think and discuss, compared to individuals taking part in a conventional valuation survey. Hence, valuation and appraisal tools that do not require monetary valuation of all aspects are more suitable for issues of sustainable development.

Another challenge to cost-benefit analysis arises from the long-term perspective that is necessary in sustainability valuation. It has been argued that with all but very small discount rates, long-term consequences are left out of decisions. When applying the long-term discount factors that are

recommended in the UK government guidance (Green Book) over a period of 100 years (3.5% for years 0-30, 3% for years 31–75 and 2.5% for years 76–100), costs or benefits that are worth £100 today, have a value of merely £5 in 100 years. The result raises issues of inter-generational equity. This concern was addressed in the recent Stern Review (Stern 2006, esp. section 2A.2) by using a discount rate of 0.1%. Hence, valuation and appraisal tools that use very small or no discount rates are more suitable for issues of sustainable development.

Researchers and policymakers are increasingly recognising that the interface between science and policy is complex. The old technical-rational model of appraisal in which `objective assessment' was assumed to lead straightforwardly to better decisions, has proved theoretically, politically, and practically inadequate. Instead, attention has been drawn to the complexities of appraisal practices, and to the different, sometimes subtle, ways in which they might secure legitimacy, influence outcomes, and lead to the adjustment of policies. Owens *et al.*, (2004) argue that an important objective for appraisal should be to foster learning of more than one type and, potentially, to modify the belief systems and behaviour of individuals and organisations over time. Hence, valuation and appraisal tools that support social learning processes have more potential to aid decision-making for sustainable development.

In the field of policy analysis the concept of neutral, objective advice is increasingly rejected. Instead it is increasingly acknowledged that the interface between 'science' and policy is complex. In this context the framing of problems is of fundamental importance. For example, in the quest to identify which energy (or agricultural, or transport, or waste management) system is the 'most sustainable', answers are invariably contingent (Stirling 1999). When dealing with complex systems there is no uniquely rational way to aggregate different dimensions of value along a single metric (Munda 2004; Stirling and Mayer 2001). Under these circumstances public and stakeholder engagement as well as transparency of the decision-process is essential for increasing legitimacy of decisions.

Natural and human systems are adaptive and impacts of changes in the systems are characterised by uncertainty (Allen 2001; Anderson, et al. 1988; Folke, et al. 2005; Pimm 1984). All these factors redefine the role of experts, the meaning of knowledge and how decision processes need to be designed to make more effective policy. Post-normal science argues that under these circumstances we should shift away from the sole focus on outcome towards the quality of decision processes (Funtowicz and Ravetz 1990). They have also called for more transparent, deliberative, and inclusive processes for informing policy and decisions. Hence, valuation and appraisal tools that

include public and stakeholder engagement and that are transparent tend to perform better in decision-making for sustainable development.

The characteristics of adaptiveness and uncertainty also lead to difficulties in the measurement all impacts in quantitative terms. In situations where important impacts can only be measured in qualitative terms, methods are needed that can make use of both types of knowledge and bring them together in a systematic way. Hence, valuation and appraisal tools that can draw on both quantitative and qualitative data and bring them together in a systematic way are more suitable for issues of sustainable development.

In the last 10 years researchers and practitioners working in the fields of ecological economics, institutional economics, sustainability science, decision analysis and policy appraisal have sought to address the various challenges laid out above and developed an alternative toolbox to aid more sustainable decision-making and the articulation of public values. Most prominently, the 'hybrid methodologies' combine interpersonal deliberation and quantitative methods.

However, sustainability appraisal is not merely a methodological issue. The type of evaluation and the institutional structures in which the appraisal is embedded influences the outcome. Therefore the choice of valuation and appraisal methods is a process one of 'institutionalising social choice'.

The method of inclusion of environmental resources and ecosystem services in decision processes determines how far the environment is taken into account with results affecting the quality of our lives and those of future generations; the same applies to social aspects of sustainability. Valuation and appraisal methods determine who participates in the decision-making process, how they participate and in what capacity (consumer, stakeholder, citizen), what counts as data, which data processing and aggregation procedures are used. Therefore valuation methods can be seen as 'value-articulating institutions' (Jacobs 1997; Vatn 2004). The type of valuation and the institutional structures in which the appraisal is embedded influence the outcome. For example, if an appraisal framework requires impacts to be measured in quantitative terms only, aspects such as landscape aesthetics or community development are likely to be excluded from the analysis. Another example is the extent to which respondents of a valuation study are given time and resources to learn about the issue at hand. More generally, which (methodological or substantive) issues are considered and possibly taken into account depends (i) on the level of familiarity of appraisers with the whole toolbox from which they can draw when conducting an appraisal and (ii) on how results from different appraisal tools would – in their view – be received by their peers and management.

The process of 'institutionalising social choice' would be helped by (i) in-depth familiarity with different appraisal tools by those responsible for devising rules for appraisal, (ii) an organisational culture of curiosity to identify the appraisal method that is most suitable for the issues at hand, and (iii) more academic research which compares and contrasts different appraisal tools for specific problem situations.

Alternatives to the 'technical-rational' model of appraisal attempt to deal with the problem of 'institutionalising social choice' and to establish a 'socially robust' (Gibbons 1999) framework for appraisal. Hence, all the methods reviewed in this chapter build on the following principles: (1) accounting for different types of knowledge (monetary and non-monetary; quantitative and qualitative data); (2) considering seriously the issue of inter-generational equity; (3) providing opportunities for learning during the appraisal process; (4) ensuring transparency of each step of the appraisal process; and (5) having a strong element of public and stakeholder engagement.

Socio-ecological systems

The evolution of social and ecological systems is not predictable. Hence, it is difficult to anticipate innovation and the actual impact of the depletion of social or environmental resources. The analysis and steering becomes even

more difficult with coupled socio-ecological systems, which are integrated systems in which people interact with natural components. They are characterised by nonlinear dynamics with thresholds, reciprocal feedback loops, legacy effects and time lags, resilience, heterogeneity, and surprises (Liu, et al. 2007).

In coupled human and natural systems, people and nature interact reciprocally and form complex feedback loops. System behaviors shift from one state to another over time (temporal thresholds) and across space (spatial thresholds). When complexity is not understood, people may be surprised at the outcomes of socio-ecological couplings. Legacy effects are impacts of prior human-nature couplings on later conditions. The ecological and socio-economic impacts of human-nature couplings may not be immediately observable or predictable because of time lags between the human-nature interactions and the appearance of ecological and socio-economic consequences. Coupled systems have different degrees of resilience—the capability to retain similar structures and functioning after disturbances for continuous development. Human-nature couplings vary across space, time, and organizational units (Liu, et al. 2007). As we understand the characteristics of socio-ecological systems better, we need to adapt our methodologies for analysing them and for appraising their impacts.

Martinez-Alier, et al. (1998) argue that in such systems we can only hope for weak comparability, i.e. there is an irreducible value conflict when deciding what measure should be used to rank alternative actions. This acknowledges that different stakeholders can exhibit different 'rational choices' when facing the same specific situation. Weak comparability does however not imply that 'rationality' cannot be pursued when deciding. Rather it implies that 'substantive rationality', which requires strong comparability, must be replaced by 'procedural rationality'. Procedural rationality is based on the acknowledgement of ignorance, uncertainty and the existence of multiple legitimate perspectives (Faucheux, et al. 1997; Simon 1976).

Uncertainty and indeterminacy cause severe problems for the ability to know consequences and thus for the role of science. If facts are uncertain, values in dispute, stakes are high and decisions urgent, decisions need to be supported by Post-Normal Science (Funtowicz and Ravetz 1990). This includes the introduction of extended peer-communities, i.e. the involvement of laypersons through participatory processes. This provides a convincing case for participation.

Institutions and preferences

Institutions[1] shape the structure of social interactions in a population, which in turn affects the awards accrued from distinct behaviours. Because this feedback influences which behavioural patterns will be adopted, restrained or abandoned, institutions affect decisions and following actions. Thus, changes in the mix of institutions affect cultural evolution by altering the structure of social interactions.

These impacts of institutional settings on the behaviour of individuals have been a focus of experimental research by psychologists, political scientists and economists during the last 20 years or so (for example Caporael, et al. 1989; Fehr, et al. 1998; Ostrom 1990). In general, these experiments confirmed the rather strong influence of institutional settings on individual behaviour and point to a prominent role of reciprocal behaviour.

A number of the experiments found that contributions to public goods are mainly the result of reciprocity. Testing the effects of social approval on cooperation and free-riding, experimental evidence suggests that among complete strangers, social approval has no significant effect on participation behaviour. But if subjects have some social familiarity with each other, the opportunity to express social approval generates a strong increase in participation levels (Gächter and Fehr 1999). The authors conclude: "Under

appropriate conditions the exchange of approval for participation is thus capable of significantly weakening free-riding incentives" (Gächter and Fehr 1999:344). The marginal approval gains were higher, if the average participation level of other people was higher. Hence there may be no- or low-participation equilibria; if subjects are not capable of co-ordinating at a high-participation equilibrium approval, incentives may have no behavioural effects. Based on their research results, Fehr and Gächter (1998) developed a theoretical framework which is based on a 'Homo reciprocans' rather than the 'Homo economicus'.

Ledyard (1995) found that heterogeneous payoffs and resources, complete and detailed information particularly about the heterogeneity, anonymity from others and experimenter, experience and no possibility for punishment, and low marginal payoffs cause a reduction in rates of contribution. Under these conditions it is possible to provide an environment in which at least 90 percent of subjects will behave selfishly. On the other hand, homogenous interest, little or uncertain information, face-to-face discussions in small groups, possibility for punishment, no experience and high marginal payoffs cause a significant increase in contributions (Ostrom 1998). Thus, whether individuals are ready to contribute will depend on the situation, individuals' experience and the institutional settings (in contrast to assumptions of

conventional economic theory, which expects free-riding in all cases). These findings were confirmed by Caporael and her team (Caporael, et al. 1989; Caporael 1987), who found that people routinely behave cooperatively in situations where the rational actor model predicts non-cooperative behaviour.

In a game setting, group-beneficial behaviour is often the outcome when realistic conditions are allowed. Games such as The Ultimatum Game (Güth, et al. 1982), The Public Goods Game (Isaac, et al. 1994), and The Public Goods Game with retaliation (Dawes, et al. 1986) consistently show that cooperative, group-beneficial behaviour is common among human individuals (for surveys see Davis and Holt 1993; Ledyard 1995; for surveys see Sally 1995). Hence, if co-ordination for collective action is allowed, efficiency increases substantially relative to a baseline with no opportunity for collective choice (Walker, et al. 2000).

Identifying another person decreases social distance. Two-way identification contains the potential for future social sanctions (see Sell and Wilson 1991) for prisoners' dilemma games, (Roth and Murnigham 1982) for ultimatum games, and (Forsythe, et al. 1991) for dictator games). In such situations, subjects are ready to give away substantial amounts of money even without the threat of punishment. Hence mutual identification enhances cooperation in prisoners' dilemma games and fairness in dictator games (Bohnet and Frey 1999).

The means of communication also seem to matter. Both, face-to-face and electronic communication, can largely overcome the traditional dilemmas. But electronic communication is less effective than face-to-face communication where cooperation is most problematic, namely where moral questions are involved.

In sum, Bohnet and Frey (1999) found that communication enhanced cooperation through reciprocity and closeness. They show that silent identification suffices to induce a larger degree of cooperation than under anonymous conditions.

These experiments, however, do not capture how learning and institutional change take place. How does learning occur? Bowles (1998) directs attention to another fact, namely that institutions do not leave individuals unchanged. In contrast to Schultze (1977) and Hayek (1948) who praise markets because they make fewer demands on people's elevated motivations, Bowles (1998) considers the experiments described above as evidence that institutions (including markets) affect not only the demand for, but also the supply of cultural traits. Hence, framing effects may not only confuse people in pursuit of stable underlying preferences, but "'frames' may in fact partially *determine* a person's preferences" (Rabin 1998:37).

The institutional context influences actors' behaviours. This poses challenges for valuation studies affecting large-scale survey-based studies as well as in-depth workshop-based studies. The position which participants are put in, the way how information is introduced and how questions are posed influences the outcome. The hope is that in-depth deliberation will expose some of these issues and offer a more robust outcome.

Sustainability appraisal methods

Deliberative monetary valuation

Cost-benefit analysis was developed for the appraisal of infrastructure projects. Deliberative monetary valuation differs from cost-benefit-analysis primarily in that preferences are constructed during the deliberation process. Deliberative monetary valuation is most suitable for the appraisal of projects whose impacts are rather well understood, where the impacts are relatively short-term, and which do not affect complex ecosystem services such as biodiversity. The results of a monetary valuation study can be presented with a focus on the calculated net present value or with a focus on explaining the underlying ethics, belief structures and conflicts that were potentially explored in the deliberative process.

The combination of monetary valuation with deliberative processes was advocated by several authors (Brown, et al. 1995; Jacobs 1997; Kenyon and Nevin 2001; MacMillan, et al. 2002; McDaniels, et al. 2003; Ward 1999) to account within monetary valuation more explicitly for the fact that preferences are socially constructed. The notion of value construction suggests that respondents do not have well-defined preferences for many complex environmental goods prior to the elicitation process, but that these preferences are constructed during this elicitation process itself (Gregory, et al. 1997; O'Connor 2000; Payne and Bettman 1999). Otherwise the assumptions are similar to those of cost-benefit analysis.

A group of citizens are selected and meet to discuss information about environmental damages associated with the proposed development. Known costs and benefits (discounted) are presented, while those pertaining to environmental damages are deliberated. The citizens form a jury aiming to provide a monetary value for environmental damages which might be in terms of an individual willingness-to-accept to allow the project to proceed. The result would then be incorporated into a net present value calculation to determine the viability of the project.

Alternatively, deliberative processes can be used to complement monetary valuation techniques. For example, (1) group deliberation can help test the

monetary valuation survey design (e.g. wording and comprehension of questions), validate the information content and help identify design biases; (2) deliberative methods can be used for determining the policy options or the institutional context, upon which the valuation survey will be based; or (3) outcomes of an environmental valuation can be validated by a participatory process (Kallis, et al. 2004).

A criticism of deliberative monetary valuation, which applies in particular to the combined use (rather than the complementary use) of deliberative and monetary techniques, refers to the fundamental differences between deliberative forums (e.g. citizens' juries) and monetary valuation (e.g. contingent valuation) (Niemeyer and Spash 2001). These include the different approaches taken to theoretical foundations (individual and social ontology, preference basis, rationality theory), practical issues (justification, framing, value representation, institutional setting), and political issues (manipulation, representation, social impact). In short, there are significant difficulties in incorporating the views of the public from the deliberative process into the monetary valuation part of the exercise. Whether the combined version of deliberative monetary valuation could therefore be described as an improvement on the contingent valuation approach is currently contested (O'Brien 2003).

Social multicriteria evaluation

Social multicriteria evaluation was developed to address complex issues and to deal with uncertainty in the context of sustainable development. It is the combined use of participatory techniques and multicriteria analysis to aid decision making about a number of policy options while taking conflicting interests and multiple criteria into account. It highlights transparency and social learning during the appraisal process (Munda 2004). This method is most suitable for the appraisal of policies, programmes or projects whose impacts are not yet well understood and therefore benefit from a multidisciplinary modelling of impacts. The results include a ranking of options (policies, projects or technologies) as well as an analysis of the different perspectives about the options held among respondents. Depending on the application and requirements of decision-makers, the ranking may be complete or partial; the latter includes the natural avowal of incomparable alternatives (e.g. one policy option being much better in the social criteria than another which is much better in the environmental criteria).

A social multicriteria evaluation consists of six main steps: (1) characterising a wide range of relevant alternative ways to achieve a particular policy aim ('options'); here social multicriteria evaluation emphasizes the need for

institutional analyses to understand well the decision-making context and the need for stakeholder and public participation in order cover the main option as well as ensuring 'buy-in' from relevant groups of society; (2) developing a set of 'criteria' to represent different viewpoints on the issues that are relevant to the appraising of those options; (3) evaluating options against each criterion based on models or expert judgement from various disciplines (impact matrix) and specifying the preference function for each criterion; (4) assigning a quantitative 'weighting' to each criterion, in order to reflect its relative importance under the viewpoint in question; (5) calculating an overall performance rank for each option under all the criteria; this can be presented either as an overall ranking based on group weights or separate rankings for particular viewpoints or individuals; and (6) analyzing the potential for conflicts and coalitions between participating stakeholders ('equity matrix').

Deliberation among citizens or stakeholders over alternative development options has the potential to generate new ideas. The iterative process of social multicriteria evaluation is flexible and allows for new options to be added as the social learning process proceeds.

There are a number of multicriteria algorithms and corresponding software packages available. For a discussion of the different types of algorithms and their respective advantages and disadvantages see for example Dodgson *et al.*,

(2000) or De Montis *et al.* (2005). Most algorithms require the definition of indifference or gradual degrees of preference and these have to be associated to the deviations observed between the evaluations. This is a challenging task for which it is difficult to obtain evidence. Another challenge which is common to most multicriteria algorithms is the establishment of criteria weights; a range of interpretations of weights and corresponding weighting procedures exist (Choo, et al. 1999).

The main weakness of sophisticated methods such as NAIADE[2] is their lack of transparency which may lead to difficulties of acceptance among the citizens and stakeholders participating in the MCA process.

Three-stage multicriteria analysis

Three-stage multicriteria analysis is the combined use of participatory techniques and multicriteria analysis to aid decision making about policy options while taking conflicting interests and multiple criteria into account. Stakeholders select the evaluation criteria, experts present information and measure impacts, and citizens explore values (1998; Renn, et al. 1993). The results include a ranking of policy options as well as an analysis of the different perspectives about the options held among citizen participants and possibly among stakeholders and experts. The calculated ranking is

complete, but this result is compared with a more holistic appraisal. The final recommendations are always based on a holistic judgement by individuals or groups and include a ranking and the reasoning for this ranking.

This method is most suitable for the appraisal of policies, programmes or projects whose impacts are reasonably well understood by experts and which contain a signficant technical element. Three-stage multicriteria analysis was developed for the social appraisal of technologies with particular emphasis on the role of risk and uncertainty.

The sequencing and choice of participants is based on Renn's and Webler's (1998; 1993) 'co-operative discourse' model. First, concerns and evaluative criteria are identified and selected. All relevant stakeholder groups are asked to reveal their values and criteria for judging different options. It is crucial that all relevant value groups be represented and that the value clusters are comprehensive and include economic, political, social, cultural, and religious values. A value-tree analysis is used to elicit the values and evaluative criteria used for judging different options (von Winterfeldt 1987). The purpose of a value-tree is to elicit and represent the concerns of all relevant stakeholder groups. It structures the elicited values, criteria, and corresponding attributes in a hierarchy, with general values and concerns at the top, and specific criteria and attributes at the bottom. The aim is to

represent the concerns of all affected parties in a list of hierarchically structured values. Depending on the political context and the nature of the decision to be made, the values of the various stakeholder groups may vary considerably. By giving each group the right to assign a weight of zero to each criterion that they regard irrelevant, it is possible to construct a joint or combined value-tree that accounts for all viewpoints and that can be verified by all participants. To avoid strategic behaviour by stakeholders, Renn (2006) argues that the actual measurement of impacts should be left to a group of independent experts and weighting to an unbiased jury of uncommitted citizens. However, stakeholder groups may inform the experts about potential impacts they expect as a result of any one option and they can contribute their evaluation of these options to the citizen panel in their testimony.

Second, the impacts and consequences related to different policy options are identified and measured. The research team or an external expert group operationalises and transforms the evaluative criteria derived from the value-tree into indicators. The participating stakeholder groups review these operational definitions and indicators. Once approved by all parties, the indicators are used to evaluate the performance of each policy option on all value dimensions. Experts from relevant academic disciplines and with

diverse perspectives on the topic of the discourse are asked to judge the performance of each policy option on each indicator. Webler *et al.,* (1991) developed a modified Delphi method for this purpose. This method deviates from the original Delphi format by replacing written responses by group interactions. The objective is to reconcile conflicts about factual evidence and reach an expert consensus via direct confrontation among a heterogeneous sample of experts. The desired outcome is a specification of the range of scientifically plausible and defensible expert judgements and a distribution of these opinions among the expert community with verbal justifications for opinions that deviate from the average (median) viewpoint. This information is used to complete the impact matrix.

Third, conducting a discourse with randomly selected citizens as jurors and representation of interest groups as witnesses. The final step is the evaluation of potential solutions by one group or several groups of randomly selected citizens (Dienel 1989; Dienel and Renn 1995). These panels are asked to evaluate and design policy options based on knowledge of the likely consequences and their own values and preferences. The participating citizens are informed about the options, evaluative criteria, and performance profiles of options. Their involvement helps to elicit values and assign relative weights to the different value dimensions. The procedures used for

this purpose are derived from Multiattribute Utility Theory (von Winterfeldt and Edwards 1986). The participating citizens are first asked to use the criteria of the joint value-tree to rate each decision option on each criterion. Participants are free to add new values to the tree, but they may not delete any of the criteria elicited from the stakeholder groups. They can also modify the presented options or add options to the list. The rating of each option then proceeds on the basis of the profiles that the experts generated during the Group Delphi. Finally, each criterion is weighted against all other criteria resulting in a matrix of relative weights and utility measures for each option and each criterion. Both tasks, the transformation of the expert data in utilities and the assignment of trade-offs, are performed individually and in small groups. Deviating from the established MAU (multiattribute utility model) procedure, the numerical results (i.e. for each option the sum over the utilities of each dimension multiplied by the weight of each dimension) of the decision process are not used as expression of the final judgement of the citizen participant, but as a structuring aid to improve the participants' holistic and intuitive judgement (Renn and Webler 1998). Instead of breaking the options down into specific attributes, the options are assessed as a whole. By pointing out potential discrepancies between the numerical model and the holistic judgements, the participating citizens are forced to reflect upon their

opinions and search for potential hidden motives or values that might explain the discrepancy. The final recommendations are always based on a holistic judgement by individuals or groups. The process of this stage is similar to a jury trial with experts and stakeholders as witnesses and advisers on procedure as 'professional' judges (Crosby, et al. 1986). The representatives of interest groups and the experts take part in the process as witnesses; they provide their arguments and evidence to the panels who ultimately decide on the policy options. This deliberation process takes time; citizen panels are conducted as seminars over three to five consecutive days or over a longer period of up to six months. All participants are exposed to a standardised programme of information, including hearings, lectures, panel discussions, videotapes, and field tours.

The main strengths of utility-based multicriteria appraisal methods are their simplicity and strong theoretical grounding. However, being based on utility theory and rational expectations, these algorithms are subject to the same critique as the theories on which they are built (strong assumptions about preference functions and commensurability of values). Initially utility-based MCA algorithms were applied for production planning and financial portfolio choices and geared towards individual decision-makers. More

recently they have also been applied in environmental decision-making and extended to group decision-making (Beinat and Nijkamp 1998).

Multicriteria mapping

Multicriteria mapping is an interview-based multicriteria analysis whereby individual specialists and stakeholders are invited to appraise the performance of core and discretionary options against their own sets of criteria. It focuses on eliciting and documenting detailed technical and evaluative judgements concerning the performance of alternative policy options. It devotes particular attention to the systematic exploration of uncertainties and the sources of variability between diverse viewpoints (Stirling 1997). The results include rankings of options either per stakeholder, per perspectives (i.e. groups of participants), or averages of all pessimistic (left-hand end of bar) and of all optimistic (right-hand end of bar) ranks (i.e. combined weighted scores for all criteria) for core options and for additional options. The interpretation of the rankings is helped by the textual analysis of statements recorded in the software during the interview and from the interview transcripts. This method is most suitable for the appraisal of policies, programmes or projects to which stakeholders had some exposure and where views not only about data, but also about options and criteria, are

controversial. Multicriteria mapping was developed to address complex issues and to deal with uncertainty in the context of sustainable development. Multicriteria mapping consists of six main steps: (1) characterising a wide range of relevant alternative ways to achieve a particular policy aim ('options'); (2) developing a set of 'criteria' to represent different viewpoints on the issues that are relevant to the appraisal of those options; (3) evaluating each criterion in turn with numerical 'scores', to reflect the performance of each option under each criterion for a given viewpoint; (4) exploring uncertainties in the data (by asking respondents for scores under optimistic and pessimistic conditions) and ambiguities in the assumptions (by analysing qualitative data collected during the interviews); (5) assigning a quantitative 'weighting' to each criterion that reflects the relative importance of their criteria to the interviewee. In contrast to the relatively technical business of scoring, this weighting process reflects intrinsically subjective judgements over priorities and values; (6) calculating an overall performance rank for each option under all the criteria taken together for a particular viewpoint.

Multicriteria mapping uses the 'linear additive weighting' procedure, in which the rank simply represents the weighted sum of normalised scores.

After seeing the ranking of options, participants are free to alter their weightings or scores in the light of this, with the objective of arriving at a final

overall pattern of ranks, which they feel comfortable accurately represents their personal perspective. Sometimes, this review prompts participants to define new options or criteria, or even to reconsider aspects of scoring. In such cases, the interviewer should encourage the participants to justify their reasons for any changes.

One of the advantages of multicriteria mapping is the simplicity of the algorithm and the subsequent transparency of the analysis process. Multicriteria mapping avoids the distinction between impacts and preference functions, which simplifies the algorithm and might increase the 'buy-in' of participants.

Rather than seeking to produce a single aggregate 'answer', the multicriteria mapping tool is used to explore how differing assumptions, priorities and value judgements shape participants' individual appraisals. Depending on the viewpoint, this additional feature of multicriteria mapping may be seen as an advantage or as a disadvantage.

Deliberative mapping

Deliberative mapping is the combined use of participatory techniques and multicriteria analysis to aid decision making about policy options while taking conflicting interests and multiple criteria into account. Besides

measuring the specific performance of each option against the criteria, it highlights the need for exploring the arguments participants used to justify their judgements. Specialists and small groups of citizens follow the same assessment process (Davies, et al. 2003). The results include a ranking of policy options as well as an analysis of the different perspectives about the options held among citizen participants and among experts. The interpretation of the rankings is helped by the textual analysis of statements recorded in the software during the interview and from the interview and group transcripts. This method is most suitable for the appraisal of policies, programmes or projects where views are controversial and where value judgements are particularly important. Deliberative mapping was developed to address complex issues and to deal with uncertainty in the context of sustainable development.

First, the team of researchers conducts open-ended interviews with specialists and stakeholders for being able to understand the biophysical system and the socio-economic context of the proposed project. The team of researchers develops a set of core evaluation criteria and core options, which all participants are asked to consider. Then, facilitated group discussions with small groups of citizens help to clarify, discuss and then agree meanings, definitions and implications of the options to be appraised. The groups

discuss and agree a shared set of criteria to be used by the citizen panel to judge the pros and cons of the different options. Citizens score options under the chosen criteria; the panel reviews the performance patterns, and decide what issues to take to joint workshop. In parallel, multicriteria mapping interviews are conducted with specialists. Specialists are guided by a researcher through their own individual analysis in separate 2-3 hour sessions. As part of this session the specialists is asked to consider whether they would like to add any criteria or options that might be relevant for them for appraising the project of the road through the wilderness area. During the session the researcher works interactively with a piece of computer software to explore the performance of options, against their criteria, under different assumptions. In addition to the quantitative and textual documentation recorded using the software package, the interviews are also audio-recorded for later transcription and analysis. In a joint workshop, specialists exchange views with citizens and respond to questions. In a further group meeting, panellists discuss workshop outcomes, re-score options, weigh criteria to reflect priorities, and discuss individual and full panel results. The specialists go through a second multicriteria mapping interview after the joint workshop to elicit any changes in their appraisals. In a specialist workshop, specialists reflect on the various perspectives and emerging findings and evaluate the

process. From the outset, the aim is not to achieve a consensus on how to proceed on the road proposal, but to expose the variety of views among and between specialists and citizens and to try to understand where the differences are most marked and why.

Like multicriteria mapping it does not seek to primarily deliver a ranking of options, which may be viewed as an advantage or a disadvantage.

Stakeholder decision / dialogue analysis

The combined use of group deliberation techniques and (a qualitative form of) multicriteria analysis to aid decision making about policy options while taking conflicting interests and multiple criteria into account. It highlights the framing of problems, scoping options, eliciting criteria and making judgements through facilitated deliberation (Burgess 2000). The results include a ranking of (groups of) policy options as well as an analysis of the different perspectives about the options held among stakeholders. The interpretation of the rankings is helped by the analysis of the qualitative data collected during the workshops. The results should also include a sensitivity analysis and a clear view of the conflicting character of the criteria and the influence of a particular set of weights. This method is most suitable for the appraisal of policies, programmes or projects where it is important to work

first on a common problem understanding and for which a rough impact assessment is sufficient as input in the decision process. Stakeholder decision analysis was developed to address complex issues and to deal with uncertainty in the context of sustainable development.

In a series of four workshops stakeholders are provided with relevant information about the proposed project and asked to come through a carefully designed combination of individual and collective processes to a ranking of options. The main steps (e.g. final rankings) must be agreed by all group members. The process allows for reconsideration and revision of results in a transparent manner.

Stakeholder decision / dialogue analysis consists of nine main steps: (1) Recruitment of stakeholder group from amongst key stakeholders having a professional interest or responsibility, or a local knowledge of, the issues. The stakeholder group is briefed in some detail about the background of the problem at hand and the purpose of the tasks to which they are to be applied. Each member of the stakeholder group is given a draft document in which the key issues identified or draft recommendations are set out. (2) Each stakeholder group member individually assesses gains, losses and the probability of an adverse impact occurring of each issue/recommended action or option. (3) Organisers convene a workshop at which all stakeholder group

members discuss the draft document and discuss any omitted issues/options. The group then collates their individual lists of positive and negative impacts, and agrees a fully-inclusive list of benefits, costs and risks, as identified by the collective stakeholder group, for every issue/option presented. (4) At the end of the workshop group members are briefed about the next stage. They are asked to consider individually before the next workshop what sort of criteria might be helpful for prioritising the courses of action (options). (5) In a second workshop the stakeholder group produces a fully inclusive list of final criteria, based on the ones they thought of individually and brought to the workshop. Group is briefed for the next task. (6) Each group member must individually give each of the final criteria a ranking from 1-100 for its utility in assessing the priority issues/option. These rankings are sent to the organisers, who calculate the top 10 criteria from the group and calculate the score (weighting) for each. (7) In a third workshop group members work in small sub-groups and, using the top 10 criteria, assess each presented issue/option against each criterion. They agree a assessments on a scale 'high' (3), 'medium' (2), 'low' (1) and 'not applicable' (0). The scores are totalled for each issue, multiplied by the criterion weighting and a total score produced for each issue/option. The issues/options can then be ranked (prioritised) according to their scores. Options are placed into groups, a group being

defined by a split between any two adjacently-ranked actions that have total scores differing by more than 10. The group is briefed for the final workshop. (8) Organisers send a final copy of the prioritised issues/options to each group member, for them to consider prior to the final workshop. (9) In a fourth workshop group members discuss the final prioritisation and work in small groups to agree the ranking. The exact rank order is not significant, but moving an issue/option between groups is. Members may decide to move an issue/option up or down to a new priority group, but if they do so, must move another one back in the opposite direction. All small-group members must agree to any changes. The full stakeholder group reassembles to discuss their decisions and the entire group must agree to any changes.

Clark, et al. (1998) recommend to use this method on no more than 24 issues/options and to involve the stakeholders in the process as early as possible. If possible, they should be involved in the generation of the list of issues/options to be prioritised.

Stakeholder decision / dialogue analysis uses a range of qualitative tools for facilitating and interpreting in-depth discussion groups, enabling consultation to transcend conventional emphasis on scientific knowledge and rational, utilitarian argument and to complement this with moral, aesthetic, emotional and local ways of knowing and valuing.

The group members work interactively with one another and use low-tech pen and paper techniques to record their judgements about the performance of options against criteria. The focus is on empowering participants and not so much on using latest modelling and presentation techniques.

[Table 12.1 about here]

Methodological and practical implications for governance approach

The aim of sustainable development puts special demands on valuation and appraisal methods. Given that sustainable development is (i) a multidimensional concept, (ii) crucial for human survival, and (iii) a long-term issue, makes it necessary to test currently used valuation and appraisal tools for their fitness for this context. A range of new sustainability valuation and appraisal methods have been developed and road-tested over the last 10 years. They combine interpersonal deliberation with quantitative methods. These methods build on the following principles: accounting for different types of knowledge (monetary and non-monetary; quantitative and qualitative data); taking inter-generational equity seriously; providing opportunities for learning during the appraisal process; ensuring transparency of each step of the appraisal process; and having a strong

element of public and stakeholder engagement. While the new sustainability valuation and appraisal methods show some differences between them and their application is suitable for slightly different problems, the main difference lies between this group of methods and monetary environmental valuation on the one hand and deliberative methods on the other hand.

The type of evaluation and the institutional structures in which the appraisal is embedded influences the outcome. Therefore the choice of valuation and appraisal methods is not wholly a technical question, but one of 'institutionalising social choice'.

Since there is no one method which is best suitable for appraising all types of policies, programmes and projects, a more differentiated approach would produce better outcomes. Developing cultures, which support the search for the best suitable methods for specific applications, requires that departments are familiar with the different methods at hand and provide if-then type guidance to appraisers for choosing the most appropriate method.

While significant advances in the fields of decision analysis, ecological economics, psychology, science and technology studies and sustainability science have led to novel methods of sustainability appraisal which are ready for use, significant challenges remain: (1) The interface between participatory decision-aid and policy making. We have found that participatory

workshops offer an excellent opportunity for social learning, which participants tend to use effectively. However, the link from these workshops to the policy arena is weak. (2) The challenges for implementing high quality participatory workshops have been acknowledged and many initial pitfalls and problems of early applications eliminated. However, the rigour of applications still varies enormously and quality standards for participatory processes are only slowly being developed. (3) Very few studies so far have compared different appraisal methods systematically for specific areas of application. (4) Knowledge about new appraisal methods is only slowly making its way into the policy arena. This is as much a task for researchers to offer information as it is for policy-makers and civil servants to acquire new skills.

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Notes

[1] An institution may be defined as "a social organisation which, through the operation of tradition, custom or legal constraint, tends to create durable and routinized patterns of behaviour" (Hodgson 1988).

[2] NAIADE was developed by Munda (1995). NAIADE stands for "Novel Approach to Imprecise Assessment and Decision Environments" and is a discrete multi-criteria method, based on the partial comparability axiom and uses pairwise linguistic evaluation of alternatives.