

## Legitimacy and Quality of Multi-Criteria Environmental Policy Analysis: A Meta Analysis of Five MCE Studies in Norway

FRED WENSTØP<sup>a,\*</sup> and KNUT SEIP<sup>b,c</sup>

<sup>a</sup> Norwegian School of Management BI, Sandvika, Norway

<sup>b</sup> Høgskolen i Telemark, Skien, Norway

<sup>c</sup> SINTEF, Oslo, Norway

### ABSTRACT

This paper argues for multi-criteria decision analysis (MCDA) as a tool in environmental policy analysis. From an ethical point of view, neither rule-based methods, nor benefit–cost analyses (BCA) are sufficient. Multi-criteria decision analysts need, however, to be concerned about the legitimacy and quality of their applications. Neuro-physiological evidence indicates that a necessary, but not sufficient, criterion for quality is that the decision-makers experience emotions in the valuation process. Without emotions, and in contrast to popular belief, its valuation part is liable to be out of proportion with the range of values held by reasonable selections of the society. This paper proposes criteria for evaluation of legitimacy and quality, reviews five applications in Norway of MCDA for environmental policy, but finds that there is no clear relationship between the legitimacy and quality of the studies and their significance for decision-makers. Copyright © 2001 John Wiley & Sons, Ltd.

**KEY WORDS:** benefit–cost analyses; emotion; environmental policy analysis; multi-criteria decision analysis; rationality

### 1. INTRODUCTION

The objective of this paper is to discuss the legitimacy and quality of multi-criteria environmental (MCE) analyses. We compare the ethics of multi-criteria decision analysis (MCDA) with two other candidates for decision-making: (i) rule-based methods and (ii) benefit–cost analysis (BCA) with the valuation step performed through willingness-to-pay (WTP) or related techniques (Cropper and Oates, 1992). Within this framework, efficiency calculations determine the outcome of the BCA. We link the question of ethics to the concepts of legitimacy and quality. Thereafter, we examine five Norwegian MCE analyses with respect to the way they satisfied criteria for being legitimate, and to which degree they satisfied quality criteria. Although important, we do not discuss citizens participation in other formats, e.g. Ravetz (1999).

The five analyses discussed all refer to societal decisions. Society is assumed to be represented by

elected bodies, like the parliament. However, governments and other representative bodies also affect environmental decisions by contributing to the environmental agenda of the society, by framing the decision situation by giving criteria values and establishing guiding principles, or directly by participating in specific decision processes.

The prospect of using MCE analysis as a tool in environmental policy questions is often met with scepticism because it includes elements of subjectivity. For this reason, MCE is perceived as wanting legitimacy. Instead, civil servants tend to look for rules to guide their actions, or if rules are not available, analytic tools that appear to provide objective answers. We argue that, although rule-based methods and BCA can provide useful information, they are limited in their applicability, and can therefore only serve as supplementary methods. Behind any environmental policy decision by a civil servant, there is an element of value judgement, which cannot be avoided, and which should be addressed and expressed openly. Consequently, MCDA has an important and legitimate role to play in environmental policy analysis.

\* Correspondence to: Norwegian School of Management BI, PO Box 580, N-1302 Sandvika, Norway. E-mail: fred.wenstop@bi.no

The paper is structured as follows:

1. We first propose a framework for evaluating the legitimacy and quality of MCE analysis. This framework function as our hypothesis of how MCE analyses should be conducted to obtain significant impacts on societal environmental decisions.
2. We discuss rationality, that is a major criterion for decision analytic methods. The notion of rationality must include well foundedness of values. We propose a four-dimensional definition of rationality that is suitable for environmental policy analysis.
3. Thereafter, we review ethical principles for environmental policy-making, and conclude that both rule-based ethics, which tend to be favoured by environmentalists, and BCA, which is favoured by economists, are partly deficient. The deficiencies make it necessary to supplement them with methods that distinguish sharply between beliefs and values in the Humean sense. MCDA is a prominent example of such methods.
4. We examine the role played by emotions in decision-making, and review neuro-physiological findings that indicate that for values to be well founded, they must be anchored in emotions. The conclusion is that a quality MCE requires that the selection of decision criteria and the value trade-off process elicit emotions in the decision-maker. To some, this conclusion may be counterintuitive.
5. Lastly, we review five MCE applications in Norway.

## 2. A FRAMEWORK FOR EVALUATING APPLICATIONS

MCE analyses can be divided into two major parts. The first part is the factual investigation of feasible decision alternatives, the search for criteria that describe the end-point goal sufficiently,

and the scientific, or technical, scoring of the decision alternatives versus the criteria. The second part is the valuation part in which criteria are given relative weights. Although there may be elements of subjectivity in both parts, the last part requires decision-makers in the role of valuers (Table I). For the applications in this paper, we believe that the legitimacy and the quality of the 'factual' parts were adequate. The discussion will therefore concentrate on the task of valuation.

### 2.1. Legitimacy of valuers

We assume that the final decision-maker is the government or parliament but that high-level civil servants, which are responsible to these governing bodies, actually make the decision or the arrangement for the decision. Based on our experience in working with high-level civil servants, we believe that valuers that are *unbiased responsible experts* have great legitimacy in this respect.

#### 2.1.1. Unbiased

They should understand, or represent, important public and private interests, but not emphasize their own interests out of proportions to their role as citizens.

#### 2.1.2. Responsible

The valuers participating in the trade-off process should be representative of knowledgeable and responsible citizens.

#### 2.1.3. Expert

They should understand the choice of the criteria of the analysis, and they should understand the implications of the scoring on all criteria. One method to achieve this is to use decision panels of several people involved in discursive sessions (cf. Føllesdal's (1982) notion of convergent consensus).

### 2.2. Quality of valuation

For the valuation procedure to be of high quality, it is of paramount concern that the valuers

Table I. Characterization of legitimacy and quality of the two major tasks in multi-criteria decision-making

Task	Legitimacy	Quality
Factual investigation	Scientific credibility	Scientific documentation, well-founded beliefs
Valuation, preference expression	The valuers represent the values of the responsible decision-makers, e.g. civil servants	Well-founded values

become emotionally involved, but in a balanced and informed way. To achieve that, the scenarios used in the trade-off process should be vivid, balanced and clear.

#### 2.2.1. Vividness

The presentation of scenarios should be vivid in the sense that they depict the real values that are at stake in the decision problem. They should be designed to make the valuers emotionally involved in the trade-off process, inducing them to make heartfelt judgements.

#### 2.2.2. Balance

Well foundedness of values also requires that the selection and description of scenarios be balanced in a way so that further information will not change the attitudes of the valuers.

#### 2.2.3. Clarity

Care should be taken to ensure that information about scope, probability, uncertainty, and hazard is understood properly, as such information is particularly difficult to process.

### 3. RATIONALITY

Rationality is often perceived as an important element of a high quality decision, but the concept of rationality is elusive and many different definitions have been offered. Because MCDA puts emphasis on value judgement, we need a notion of rationality that incorporates that dimension. This is provided by Føllesdal (1982), who in his discussion of the status of rationality as an explanation of action, identifies four kinds of rationality. These are rationality as logical consistency, rationality as well foundedness of beliefs, rationality of action, and rationality as well foundedness of values.

Logical consistency pertains to both beliefs and values. In MCDA, value or utility functions ensure that there are no internal contradictions. Logical consistency means that those beliefs are non-contradictory.

Well foundedness of beliefs is stronger than logical consistency and requires that our beliefs be well supported by the available evidence, so that no competing world model is better supported. Well foundedness concerns not only what beliefs we should hold given a certain amount of evi-

dence, but also how much more evidence we should gather before our beliefs become fixed.

Rationality of action, according to Føllesdal, can be obtained through the application of decision theory. This is an essential element in MCDA where one tries to maximize expected utility.

Føllesdal finds it noteworthy that we usually do not include well foundedness of values in our concept of rationality. To achieve well founded values, Føllesdal recommends that we employ Rawls' (1973) method of reflective equilibrium. It means, essentially, that we systematically build a set of judgmental principles by taking more and more issues into account until we reach a stable set of convictions that is relevant for the decision situation.

#### 3.1. BCA

BCA is a standard method for resolving conflicts in public undertakings. It is basically presented as a rational method. It derives its values for traded goods from observations of market behaviour by assuming a perfect market, and using market prices as an expression of how much the consumers are willing to pay for the good. Market prices exist only for goods that are traded, while many environmental goods and services are not bought and sold, the water of a river and the services that the water offer to the public being one notable example. Such goods are called market externalities. To include market externalities in BCA, they must be valued in the form of WTPs. Common tools are, for example, stated and revealed preference methods and conjoint analysis (Cropper and Oates, 1992). BCA seeks to maximize the population's WTP. Thus, BCA appears to be a tool that makes value judgements on the part of civil servants unnecessary.

There are three main criticisms of BCA. The first refers to its emphasis on criteria that are easy to measure at the expense of 'soft' values. The second refers to the methods for finding the WTPs for environmental goods. Revealed preference methods observe people's behaviour and infer how great is their WTP for externalities, like improvement in the environment (Adamowicz *et al.*, 1994). Methods that attempt to estimate WTP are subject to considerable problems with regard to validity and reliability.

Kahneman and Knetsch (1992) argue that stated preference methods are virtually worthless,

as people do not actually state their WTP, but instead quote a convenient number to express social responsibility. In support of this, Boyle *et al.* (1994) found no statistically significant differences in WTP to prevent 2000, 20000 or 200000 migratory waterfowl deaths, all numbers less than 2% of the waterfowl population. Other studies addressing the validity of the WTP method are Seller *et al.* (1985), Hausman (1993), Seip and Hem (1993), Smith and Huang (1995), Halvorsen *et al.* (1998) and Spash (2000).

A third criticism is that when the issues are of complex ethical and philosophical nature, it is wrong to rely on the consumer alone to guide public planning decisions (Cowen, 1993). Butters *et al.* (1981) acknowledge the practical difficulties of applying BCA, but maintain that it is a necessity, because it can provide the policy-makers with consistent information about public values. We accept the arguments of Butters *et al.*, but find it necessary to qualify them with Cowen's concern that it is not always ethically defensible to let the market decide. For example, market mechanisms do not supply incentives for sustainable harvesting in an 'open access' economy; it does not protect species that have growth rates much less than current interest rates (May, 1976) and it does not provide categorical exclusions from use of, for example, natural wonders. Our conclusion is that BCA may provide important information for the decision-makers, but it must only be used as a component of the input to a decision-making process.

#### 4. ETHICAL PRINCIPLES

We now let our outline of rationality function as a background for our discussion of ethics in decision-making. Historically, there are two competing ethical principles for public policy, deontological—or rule-based ethics and teleological—or consequential ethics. Rule-based ethics relieves decision-makers from the burden of making value judgements as their task is to identify the rules that apply, while consequential ethics requires that the values of the consequences are taken into account.

We first discuss rule-based decision-making, where the civil servants apply given rules without apparent value judgement and without considering consequences. Second, we consider consequen-

tialistic decision-making, where civil servants consider all relevant information and include personal value judgement as well.

##### 4.1. Rule-based decision-making

Kant argued for the use of non-consequential ethics where decision problems are resolved by applying universal maxims—or rules—without considering consequences. Kant was aware of inherent problems with the scheme, and observed that general rules will, in many cases, be in conflict, but maintained that rule-based ethics is preferable to the arbitrary subjectivity implied in Hume's consequential ethics.

Rule-based ethics has deep traditions in environmentalists movement, where one often maintains that animals and even lifeless nature have rights on their own that may not be violated by man, no matter what benefits that might accrue. Notable philosophers have tried to solve the philosophical and practical problems that arise when one ascribes intrinsic value to nature by distinguishing between its source and locus (Lee, 1996). In this view, intrinsic values remain with nature, while human consciousness is their source. This, however, leads to Humean projectivism and rules out Kantian analysis for practical decision problems.

The generic problem with application of Kantian ethics to environmental decision-making is that it becomes untenable when the consequences are so overwhelming that they simply cannot be overlooked. Sen (1995) discussed this in depth, and concluded that it is impossible to conceive of any moral principle for public policy that does not consider the consequences of that policy. Our conclusion is, therefore, that consequential analysis is required, at least as a supplement to Kantian rule-based ethics.

##### 4.2. Consequential ethics

Hume (1748) was preoccupied with the apparent 'gulf' between beliefs and values and between reason and action. He defines 'belief' as a vivid or lively idea regarding matters of fact, being the product of cause-effect reasoning. Moral decisions, on the other hand, are grounded in moral sentiment or feelings. Sympathy, according to Hume, is a fact of human nature underlying social life and personal happiness. He noted that reason can show us the best way to achieve our ends, but it cannot determine our ultimate desires: 'Tis not

contrary to reason to prefer the destruction of the whole world to the scratching of my finger'. Hume observed how writers of morality will make observations of the human nature and the existence of various goods—all statements about facts. They then switch to statements about what ought to be done. Hume says that he cannot conceive how this new relationship of 'ought' can be deduced from the preceding statements that were related by 'is'. This point concerning a gulf between facts and values, between 'is' and 'ought', has since been called *Hume's Law* (Singer, 1987). Hume's own answer to the paradox is that beliefs about what 'is' are created through reasoning processes, but action is prompted by feelings. If true, this is an important correction since our habit is to trust reason as the only process that will lead to a decision, while we try to suppress feelings as irrational and misleading. Regardless of the exact process, policy-making based on consequential ethics requires active use of the values of the policy-makers. MCDA is a step in that direction, and the question is how it can be best applied. A theory of the somatic processes involved in human decision-making provided by Damasio (1994) gives support to Hume's law, as well as guidance to how weighting processes in MCDA should be conducted. We will discuss this theory below in the section on emotions.

#### 4.2.1. *Alternative WTPs*

Consequential ethics applied to public policy, then, entails that the responsible, and knowledgeable, civil servants endeavour to consider all available information, including possible consequences and values, before they choose policy. Supposedly, their values will be influenced by their interpretation of the values held by government or parliament majority as well as their own values. Sen (1995) supports this view of ethics in public policy. He observes that the objective functions of the agents of public actions are important, and that discussions and exchange of opinions, and even political arguments, contribute to the formation and revision of values. Individual values can, and do, change in the process of decision-making. Kahneman and Ritov (1994) take this a step further. They propose a more complete decision process with a scaling method based on public ranking of scenarios combined with expert judgement. Monetary values would then be arrived at through a negotiation process where measures of

judged importance and political support would be used. This view is supported by Kelman (1981) who proposes that one adopt an ethical system that balances conflicts between certain unspecified duties and rights according to deliberate reflection.

## 5. EMOTION

The conclusion so far is that quality in decision-making requires well-founded values. The next question is how values should be included when we know that the use of pure reason is not sufficient. What then, are emotions? Emotion and feeling are often used interchangeably in common speech, but we shall find it useful to distinguish between them. Following Damasio (1994), the term emotion denotes physical phenomena in the body, while feeling is reserved for the experience of such emotions. Neuro-physiology, it turns out, tells us that emotion is an important marker of well foundedness, both for beliefs and values. The medical literature reports cases where persons with certain types of sustained brain damage to the prefrontal lobes become incapable of making adequate decisions (Godefroy and Rousseau, 1997). The dysfunction is especially noticeable in decision contexts that are complex in the sense that conflicting values, as well as uncertainty about future consequences, must be taken into account. As reported by Damasio (1994), such patients tend to function normally in almost all respects, including intellectually. The only exception is that they make irrational decisions that fail to promote their goals when facing important questions in their professional or personal life. The decisions can be identified as bad if the foresight of other people told them that this decision was bad and the decision-maker in hindsight agrees.

### 5.1. *Effects of prefrontal lobe damage*

Damasio conducted a series of experiments with several subjects; some suffered from prefrontal lobe damage, while others were normal. Emotions that might arise in the course of an experiment were monitored by a skin conductance meter. It is known from other studies that when normal people are exposed to stimuli with high emotional content, the skin conductivity will increase.

### 5.1.1. Experiments

In one experiment, persons in turn played a card gamble, where the goal was to gain a certain amount of money when the game stopped. The player did not know when this was to occur. The player would gain or lose money by turning cards from the top of a deck. Before each turn, the subject must select a deck of cards from one of four decks. Two of the decks would regularly give an appreciable gain, but occasionally, incur a substantial loss, which resulted in a negative expected outcome in the long run. The two other decks were more prudent, with smaller gains and losses. Here, the expected gain was positive. The player did not know the properties of the four decks when the gamble started, but was supposed to find out the best strategy during the play. After a few big losses, normal persons soon stuck to the more prudent decks. The players with prefrontal lobe damage also correctly inferred which decks were the prudent ones, but they would still more often turn cards from the more risky decks and, thus, lose money rather than gaining. In both groups, the skin conductivity increased *after* they had turned a card and were awarded money or had to pay. *Before* a card was turned, the skin conductivity increased noticeably in normal people, but no such effect appeared in those with prefrontal lobe damage.

### 5.1.2. Explanations

According to Damasio, the reason for the results of the experiment is that stimuli are passed directly to a centre in the brain called the amygdala, which is an evolutionarily old 'alarm central'. The stimulus is compared with *innate* archetypal representations. If the stimuli are found alarming, signals go directly to the body where a state that prepares for quick action is produced. This is called a *primary emotional response*. The result may be reaction before thinking. Its information chain is apparently not impaired by prefrontal lobe damage. Before a card is turned, the stimuli are not sufficiently alarming to provoke a primary emotional response. Instead, higher cortices are given time to process them through conscious reasoning. At a subconscious level, the prefrontal cortex responds involuntarily and automatically, and compares the signals with *acquired* dispositional representations. The result is unconsciously signalled to the amygdala, which again produces an emotional response in the body. Damasio calls

this a *secondary emotional response*. Its pathway appears to be impaired by prefrontal lobe damage.

The experiment indicates that persons with prefrontal lobe damage are poor decision-makers in the face of uncertainty combined with value-laden outcomes. The somatic response mechanism is adapted through bad—and perhaps good—experiences. Because their reasoning power and conscious knowledge about values are intact, it appears that they lack ability to *apply* values in the decision process.

### 5.2. Damasio's theory and Hume's law

Damasio's theory says that we are, in fact, hard-wired according to Hume's law. Damasio's work suggests that a decision-maker who is faced with a complex decision problem with uncertain outcomes, needs prediction of the size of the outcomes (beliefs), as well as an appreciation of how good—or bad—the outcomes are (values). The required information is furnished through two different processes in the body. The predictions are made through conscious and subconscious reasoning processes. Values, on the other hand, are attributed to the outcomes through a somatic process, which actively involves bodily emotions. There is, therefore, an interesting duality in the way beliefs and values are handled when decisions are made.

Thus, Damasio's findings refute the hypotheses that we can apply rules in a Kantian fashion, or reasoning alone, when we make multi-criteria decisions.

## 6. REVIEW OF NORWEGIAN APPLICATIONS

MCE reports do not comment consistently on whether the valuers were representative for the actual decision-makers, and if the values were well founded. In particular, they do not report on whether the valuation process elicited emotions. To assess legitimacy and quality, therefore, one needs inside information. The authors were facilitators at the five applications to be reviewed, and the scores we assign to the criteria are according to our best judgement.

The factual parts of the studies were probably close to state of the art with respect to scientific methods. Models helped to make the scoring