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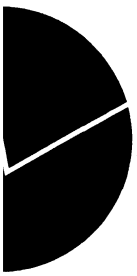

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Documents

Environmental Valuation, Cost-Benefit Analysis and Policy Making: A Survey

1. Introduction

Monetary valuation of environmental goods has by now become the subject of numerous economic books and articles. Interest in the topic seems to be increasing in the economics profession, and both theoretical insight, methodological improvements and the number of empirical findings are expanding rapidly.

The aim of such valuation is usually to incorporate environmental concerns into a cost-benefit-analysis. Another purpose is to construct environmentally adjusted national income measures (UN, 1993). Environmental value estimates have also been combined with macroeconomic models, e.g. to estimate welfare effects of a climate treaty (Brendemoen and Vennemo, 1994). Further, estimated willingness to pay is now accepted in the USA as a basis for legal compensation claims for damages to natural resources caused by spill of hazardous substances.

In this paper, I will review some of the literature on environmental valuation, with a particular view to the relevance of such valuation for environmental policy making. In line with this purpose, much emphasis will be put on interpretation issues and on the controversies in the valuation literature. No extensive summary of the more technical parts of the literature on empirical estimation methods will be provided. Moreover, I will concentrate my attention to the intended use of environmental value estimates for inclusion in *cost-benefit analysis*.[1]

Thus, I will start in sectore 2 with a look at cost-benefit analysis in general, and its relevance as information background for policy making. In section 3, a brief overview of some currently used methods to value environmental changes in monetary units is provided. Section 4 reviews the professional debate following the *Exxon Valdez* accident in 1989, while section 5 discusses some distributional issues relating to environmental valuation. Finally, section 6 points out some philosophical objections to environmental valuation, which may be of importance for their use in a policy making process.

2. Cost-benefit analysis

Cost-benefit analysis is a way of assessing the consequences of public projects and reforms, in which the estimated benefits are weighed against the costs. For this purpose, all consequences must be measured in the same unit, and the traditional choice of unit is money. To be explicitly included in a cost-benefit analysis, then, environmental changes must be valued in monetary terms.

Drèze and Stern (1987) provide a standard reference for the theory of cost-benefit analysis. As they point out (p. 911), the two basic ingredients of cost-benefit analysis are *the ability to predict consequences* (a model) and *the willingness to evaluate them* (an objective function). The *shadow price* of a good is defined as the net impact on social welfare of a unit increase in the supply of that good. Accordingly, the shadow price of wilderness, for example, is defined by the change in social welfare when the amount of wilderness changes by one measurement unit (for example one m^2). The terms *value* (or *social value*) and *shadow price* are frequently used interchangeably.

For policy purposes, an important consideration is whether normative premises are embedded in the analysis, and if so, which ones. One can hardly expect a policy maker to be interested in the economic analysis if one employs *a priori* assumptions which run counter to the policy maker's political goals.

Drèze and Stern's theoretical approach is fairly general, allowing for various specifications of the social welfare function. However, they emphasise that shadow prices cannot generally be estimated

[1] For a discussion of environmentally adjusted national income measures, see Aaheim and Nyborg (1995).

without an explicit model and a specific choice of welfare function. For applied, numerical analysis, this means that in addition to a proper description of how the economy works, normative premises for the analysis must also be chosen.

Some economists have argued that this is not necessary, and that efficiency and distribution are two distinct concerns which could and should be dealt with separately (Hicks, 1939, Frank 1992). Drèze and Stern, on the other hand, discuss several arguments for the view that distributional concerns can be disregarded in the analysis, and reject all of them.[2] They conclude that the analyst should present results involving a selection of possible social welfare functions. Since the environment affect different people in different ways, changing the specification of the social welfare functions will generally imply that shadow prices for environmental goods change as well. Thus, the social value of the environment cannot be defined in an «objective» way; it depends crucially on the chosen social welfare function.

Drèze and Stern further suggest that one may use «the inverse optimum method» to assess welfare weights which reflect the government's value judgement. This implies estimating implicit welfare weights, either by calculating the welfare weights implied by previous policy decisions, or asking decision makers more directly about their judgement concerning trade-offs between income to different groups or individuals. The former version of this method requires the assumption that previous decisions (or direct statements from politicians) originate from optimising behaviour.

In applied cost-benefit analysis, however, one is usually concerned with the maximisation of some concept of aggregate income or well-being, disregarding its distribution entirely. Within the formal framework of Drèze and Stern, then, this can be defended in two ways. The first is to assume that the government is capable of redistributing income costlessly. In that case, the government can maximise aggregate income when choosing public projects, and then subsequently distribute income among individuals in any way it wishes. Distributional concerns need then not be addressed in the project analysis.

Such an assumption clearly seems somewhat unrealistic. Drèze and Stern actually claim that this «represents a mistaken understanding of second-best welfare economics. It may be true that policy instruments exist - e.g. income taxes - which allow a more direct influence on the distribution of income than public projects; and the planner's model should include them. However, in general, redistributing income using these instruments will have social costs, and therefore the implications of projects for income distribution should not be ignored» (Drèze and Stern, 1987, p. 958). The assumption that costless lump-sum redistribution is possible is common in economics, but the frequency with which this assumption is made does not make it more plausible. Indeed, Hammond (1979) shows that in the presence of private information, lump-sum redistribution based on anything else than unalterable identifiable individual characteristics (such as age or sex) is generally infeasible in large economies, due to incentive compatibility constraints.

2.1 Normative premises

The alternative justification of disregarding distributional concerns in the applied project evaluation is to introduce a utilitarian social welfare function. In addition, one must make the assumption that every individual has the same marginal utility of income, regardless of income or personal characteristics[3]. This amounts to assigning an equal welfare weight to all individuals' income changes, which means

[2] See also Auerbach (1985) and Quiggin (1995).

[3] Alternatively, and equivalently, one might assume that the marginal utility of income varies, but let the weight attached to any single individual's utility vary disproportionally with her marginal utility of income. Under the assumption that rich people have a lower marginal utility of income than poor people, this is equivalent to systematically giving rich people's utilities more weight. Such a normative premise may seem unethical, but is, nevertheless, perhaps a fairly good description of actual policies in some countries.

that explicit welfare weights are not needed in the cost-benefit calculations. This is of course still a quite explicit normative premise; it allows us to disregard distributional concerns simply because we have chosen the normative view that distribution issues are not socially important.[4]

The ethical aspects of utilitarianism has been the subject of much debate both in economics and philosophy; see, for example, Sen and Williams (1982). John Harsanyi (1955) argued that individuals who are maximising their own expected utility will prefer a social welfare function corresponding to utilitarianism, provided that their evaluations are made in a situation where they do not know their own position in society. On the other hand, others have argued strongly against the utilitarian moral philosophy; for example on the grounds that it attaches no weight to concepts such as rights and duties (Sen, 1985). Note, however, that even if one accepts utilitarianism, the assumption of equal marginal utilities of income remains controversial.

This obviously represents a problem for cost-benefit analysis as information background for policy decisions: The distributional preferences of the current government become irrelevant to the analysis; distributional weights are determined *a priori*. The analyst has implicitly chosen a specific social welfare function quite independently of the political views of the government.[5] This is clearly a quite controversial point of departure for a policy analysis, and has indeed prompted a lot of dispute (e.g. Kelman (1981), Blackorby (1990), Blackorby and Donaldson (1990), Hammond (1990), Bromley (1990)). In fact, it poses two distinct problems: Firstly, whether equal weight on all income changes can be defended ethically, and secondly, whether decision makers will find the analysis useful at all if their answer to the first question is «no».

2.2 Some views on cost-benefit analysis as a basis for policy recommendations

Authors differ a lot with respect to their confidence in the ability of cost-benefit analysis to identify optimal provision levels of environmental goods (or, less ambitiously, welfare-increasing marginal changes). Navrud (1992, p. 37) seems to be on the optimistic side:

«There are two main arguments for putting a price on environmental goods such as water and air quality, biodiversity and natural environments. First, we need to know the marginal value of environmental goods to find the socially «right» (optimal) quantity/quality of different environmental goods. Second, if environmental goods are not valued explicitly, they will still be valued implicitly through policy decisions. Since the decision makers are often not aware of that they make these valuations, this procedure produces an arbitrary and inconsistent set of prices.»

Navrud advocates the idea that a socially optimal level of environmental goods can indeed be identified, without discussing that the optimal solution will depend on which policy goals one is aiming for, i.e. which social welfare function is chosen. Furthermore, he seems to be on the pessimistic side regarding the quality of the political decision process, since he argues that the implicit values deduced from such processes are likely to be not only inconsistent, but even arbitrary. This latter view is clearly inconsistent with the «inverse optimum method» advocated by Drèze and Stern, for example.

Freeman (1993, pp. 9-12) is somewhat more modest on the cost-benefit methodology's behalf, regarding the extent to which it can provide «final answers» in a world of political disagreement. He points out that decision makers may have other objectives besides economic efficiency, such as equity considerations and intergenerational effects. Freeman does not regard advocating cost-benefit analysis

[4] More precisely, utilitarianism implies that the distribution of utility is not important, only their sum; and the additional assumption of equal marginal utility of money ensures that the income distribution is not important either.

[5] Moreover, quite in contrast to the practice in most of modern economics, he is employing a cardinal utility concept, based on the view that a dollar can be interpreted as a unit of utility.

as a simple decision rule as being particularly useful. Rather, he argues that the main value of cost-benefit analysis lies in its ability to organise and simplify information.

Bromley (1990) takes a much more sceptical standpoint regarding the political usefulness of cost-benefit analysis, arguing as follows: «Economists who have persevered in this tradition seem content to overlook the logical inconsistencies in welfare economics, this obduracy apparently being justified on the grounds that a little economic analysis - even if indefensible on theoretical grounds, and therefore bogus - is better than a political process left to its own devices.» Vatn and Bromley (1994, p. 144), discussing environmental valuation, argue that «...the necessity claim for such valuation (...) must rest on clear proof that the values (prices) derived from hypothetical valuation studies capture all of the information pertinent to a particular environmental choice. In the absence of such proof, values (prices) from hypothetical valuation studies carry no more normative significance than do competing claims expressed by self-proclaimed interest groups on either side of any particular decision. Evidence would suggest that a great many «enlightened» choices concerning the environment have been taken in the absence of pricing.»

2.3 Practical use of cost-benefit analysis in environmental decision making

While there is disagreement regarding whether environmental values and cost-benefit analysis *should* be used for policy prescriptions, there also seem to be somewhat diverging opinions on whether such analysis have actually been used in policy formation. The discussion below focuses on environmental policy making, i.e. questions where the environmental issue is a major concern. Several of the references below are collected in Navrud (1992).

The use of cost-benefit analysis as a part of environmental policy making differs quite a bit between countries. In the United States, cost-benefit analysis is frequently carried out by federal agencies, and this is at least partly due to political decisions. In 1981, President Reagan issued an executive order requiring all federal agencies to prepare a Regulatory Impact Analysis before undertaking any major regulatory action. Following this, the Environmental Protection Agency (EPA) developed its own manual of cost-benefit analysis. Later, Executive Order 12291 issued by President Reagan and Executive Order 12866 issued by President Clinton confirmed this (Hanemann, 1992, Portney, 1994). However, the fact that cost-benefit analysis are frequently carried out in the USA does not necessarily mean that they have had a large impact on policy. There seem to be diverging opinions on this point. One reason why cost-benefit analysis may have had a limited influence on actual decisions is that some of the laws governing the use of environmental regulations, such as the Clean Air Act, actually do not permit balancing benefit and costs (Portney, 1990).

Another important development in the USA was the pass in Congress of CERCLA, the Comprehensive Environmental Response, Compensation and Liability Act, in 1980. It established a liability on the potentially responsible parties to pay damages for the injuries to natural resources resulting from the spill or release of hazardous substances, in addition to the costs of clean-up, removal, remediation and any other necessary responsible costs (Hanemann, 1992). Although CERCLA was not particularly concerned with cost-benefit analysis, it prompted a renewed interest in valuation of natural resources and environmental goods. The interest reached a peak after the *Exxon Valdez* oil spill in 1989. A summary of the debate following this event is provided in section 4 below.

Environmental values in cost-benefit analysis (and indeed, cost-benefit analysis altogether) seem to have been less used in Europe than in the USA. Kuik et al. (1992) discuss environmental decision making in Europe, and conclude that «benefit estimates play a role in environmental decision making, not only in the United States but also in Europe. (...) The extent and purpose of use of benefit estimates varies across countries. The extent to which benefit estimates are used in Europe to

influence environmental policy decisions is negligible. However, they are used at the project level in some sectors in a number of European countries.» [6]

Navrud and Strand (1992), discussing experiences from Norway, conclude as follows: «So far the benefit estimation studies seem to have been useful for providing support for decisions involving the environmental goods they valued, but they have not played a crucial role in the decision making process.» Thus, the valuation exercises appear to be used as *arguments for decisions which had already been made*, rather than serving as informational background for such decisions.

Similarly, Johansson and Kriström (1992), commenting on the Swedish experience, conclude: «The general impression, however, is that these social cost-benefit evaluations have played a minor role in the actual outcome of the decision making process. Even if a cost-benefit analysis shows that a project is highly profitable to the entire society, the project is not necessarily (or even generally) undertaken, and vice versa.»

A discussion of the situation in the Netherlands is provided by Hoevenagel and Kuik (1992). They maintain that the interest in environmental valuation is much larger among Dutch researchers than among their sponsors, and that all four government departments which are directly involved in environmental policy seem to show little interest in the subject. They explain this by a lack of confidence in welfare-theoretic approaches based on the concept of willingness to pay.

In the United Kingdom, the Department of the Environment issued a specific set of guidelines of economic appraisals in 1991, which «openly embraced valuation techniques» (Turner et al., (1992)). Turner et al. claim that monetary valuation of environmental goods is currently enjoying a revival in the UK. One of the explanations they provide for this is that a decade of Conservative government brought with it a concern for efficiency in government, while politicians at the same time faced a large demand for environmental improvements. Turner et al. do not, however, analyse the impact such valuation might have had on actual decisions, and they maintain that monetary valuation remains controversial in the UK.

3. Some methods for estimating environmental values

Individuals' willingness to pay for environmental goods is a central concept in environmental cost-benefit analysis, but empirical data on this is not readily available from market prices. Several estimation methods have been proposed, however. Some focus on market data, while others use interview techniques. Some are «direct» in the sense that individuals are asked directly about their valuation. Others are «indirect», meaning that valuation of the environmental good is deduced from other information, for example by using specific assumptions about the nature of the relationship between demand for a private market good and the environmental good in question.[7]

In this section, I will give a brief overview of the most commonly used methods for estimating environmental values. Special emphasis is put on the contingent valuation method, since this method has been the focus of much debate lately. A thorough presentation of measurement of environmental values can be found in Freeman (1993). See also Hanley and Spash (1993), Braden and Kolstad (1991), and Johansson (1993, 1987).

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[6] It should be noted here that Kuik et al. seem to define «policy decisions» as choices between general policies on a macro level, not including, for example, the adoption of a particular project.

[7] The distinction between direct and indirect method is not quite equivalent to the distinction between market based and interview-based techniques; for example, conjoint analysis (see the description below) is an indirect method which is based on data from individual interviews.

3.1 Methods based on market prices

Although most environmental goods are not bought and sold in markets, the *use* of an environmental goods is often connected to consumption of private, traded goods and/or services. The private good may be complementary to the environmental good, as in the case of a cross-country skiing area and a pair of skis, or they may be substitutes, for example clean water from the tap and bottled drinking water. Information about the demand for such private goods (or services) can be used to estimate the latent demand for the associated environmental good. Such estimation depends, of course, on the plausibility of the assumptions made about the relationship between demand for the market good and the environmental good.

The travel cost method has frequently been used to value recreational sites. A crucial assumption is that consumers regard the journey to and from the site as a cost, not as part of the recreation. The travel costs incurred may then be regarded as a price to visit the recreational site. Using information about visitors' travel costs, and studying the relationship between the number of visits to the site and individual' travel costs, one can estimate a demand function for the recreational services of the site. For a discussion of the method, see Bockstael et al. (1991).

Hedonic methods are based on the fact that some goods or services, although serving approximately the same purpose, are not perfectly homogeneous. For example, two living houses may differ with respect to the number of rooms, the view from the house, and local environmental features, such as air pollution. By comparing the prices of houses with varying characteristics, and using econometric techniques such as multiple regression analysis, it is possible to estimate a market valuation of those characteristics.

Similarly, hedonic methods have been used to estimate how much larger wages workers demand to accept risky work, and this have been used to deduce valuations for a statistical life. However, this application requires an assumption that individuals behave in accordance with expected utility theory when faced with risk; an assumption which has been questioned by several scholars (Kahneman and Tversky, 1979, Rubinstein, 1988).

A large number of studies have been conducted using hedonic methods, particularly in the USA However, such methods are less reliable if the relevant markets are heavily regulated, since in such cases, prices may not reflect marginal willingness to pay for the commodity or service in question. In several European countries, this is the case, or has been so until recently, for the housing and/or labour market. This is perhaps one reason why such methods have not been used much in Europe. A closer description of hedonic methods can be found in Freeman (1993).

In some cases, environmental goods can be valued by using information about the demand for *private good substitutes*. For example, a filtering device to purify tap water may diminish or even abolish the problems connected to contaminated drinking water. In such cases, demand for the private substitute can give an indication of the underlying demand for the environmental good. Usually, it is not possible to find a *perfect* substitute for an environmental good. Purifying equipment does perhaps not clean the tap water good enough, or consumers may prefer to know that their drinking water originates from a pure water source.

3.2 The contingent valuation method

The methods mentioned above are based on market prices, while other methods involve, instead, asking people directly how they evaluate environmental goods. The most prominent of these is the *contingent valuation method* (CVM). This method has been extensively used in recent years, and a huge body of empirical and methodological research has developed. A brief summary of the method is provided below, while a review of the recent debate concerning the method is given in subsequent sections. A detailed presentation of CVM can be found in Mitchell and Carson (1989).

In contrast to the previously mentioned valuation methods, CVM is capable of measuring so-called *non-use values* or *existence values*. *Use value* is the value someone attaches to his or her actual use of the good in question. In addition to the use value, a person might be willing to pay something to secure *someone else's* use of the environment, for instance members of future generations. A person may also be willing to pay something just to *know* that an amenity is not being explored, or that a species is being preserved. Several CVM studies have found that a large proportion of reported willingness to pay relates to other motives than one's own use. For example, in Stevens et al. (1991), only 7 percent of respondents' willingness to pay for the protection of four wildlife species was assigned to a current use or option category. Respondents allocated 34 percent of their willingness to pay to a bequest value category, while 48 percent was reported to be motivated by the view that «animals have a right to exist independent of any benefit or harm to people».[8]

The distinction between use values and non-use values is not clear-cut, since some authors include the value of others' use (for example future generations) in the concept of use value, while others regard this as part of the non-use value. Some authors also maintain that e.g. the pleasure obtained by looking at pictures of a beautiful scenery in a book is a kind of use value. In this latter case, estimated values obtained by using e.g. the travel cost method clearly do not provide estimates of all kinds of use value associated with that site.

Indeed, some critics have claimed that the concept of existence value cannot be defined in an operationally meaningful way (Larson, 1991, Cummings and Harrison, 1995). The distinction between «use value» and «existence value» further touches upon a fundamental issue raised by Sagoff (1988) among others; namely, whether willingness to pay for environmental goods can reasonably be interpreted as expressions of individuals' personal, exogenous preferences at all. I will return to this discussion in section 6.

In a contingent valuation survey, one asks people directly about their willingness to pay to secure (avoid) a change in the provision of some specified good, or, alternatively, what compensation they would require in order to give it up (accept it). The questions are usually of a hypothetical character, such that no actual payments are made. Responses to such questions are naturally contingent upon the hypothetical circumstances under which respondents are told that the good is to be provided, which means that one must be careful to use the estimated values in another context that the one in which they were originally obtained.[9]

The hypothetical nature of the questions also imply that misunderstandings between interviewer and respondent may easily occur. Much methodological research has recently focused on how to avoid such misunderstandings. Further, the unfamiliar situation of being asked to trade personal income against a public good may create ambiguities; respondents may, for example, never have considered such a trade-off before, so that their responses may not be thoroughly considered. Mitchell and Carson (1989, pp. 236-237) provide a list of potential sources of bias in contingent valuation studies. They also suggest several procedures which can be used to reduce the occurrence of such bias. See also the summary of the NOAA Panel's recommendations in section 4.4 below.

3.3 Other methods

3.3.1 Conjoint analysis

Conjoint analysis is quite similar to the CVM in that the analyst asks people about their judgements, rather than using market data or other revealed choices. Like CVM, conjoint analysis is based on hypothetical choices. However, people are not asked directly about their willingness to pay or

[8] See also the discussion in Mitchell and Carson (1989), p. 291-292.

[9] This is nevertheless frequently done. A discussion of such «benefit transfers» is found in Navrud (1994).

willingness to accept, but are instead asked to compare situations which vary in several respects, and state which one they prefer. For example, an individual could be asked to choose between travelling by train from A to B in 40 minutes, with a view of the sea, paying 10 USD, or travelling the same distance in 30 minutes with no view, paying 12 USD. A series of such questions is asked. The analyst can then apply econometric estimation techniques and infer consumers' implicit valuation of time and of a nice sea view. Conjoint analysis thus has similarities with hedonic methods as well as contingent valuation. For a further discussion of this method, see Louviere (1988).

3.3.2 Implicit valuation

The term «implicit valuation» is frequently used to describe a method which is very similar to the «inverse optimum method» recommended by Drèze and Stern (1987) (see section 2) to obtain welfare weights. Rather than estimating distributional weights, however, one is concerned with decision makers' implicit revealed willingness to pay (on society's behalf) for environmental goods. If, for example, Parliament decides to choose the most expensive of two alternative projects because it has more desirable environmental effects, and this is the only difference between the two projects, the cost difference provides a minimum estimate of Parliament's implicit willingness to pay for the corresponding change in environmental quality. Note that this method does not measure *consumers'* preferences, so that values estimated by this method have quite another interpretation than value estimates obtained by the methods mentioned above. Carlsen et al. (1993), who estimated implicit environmental values in connection with the Norwegian Master plan for Water Resources, provide one example of applied implicit valuation.

The method rests on an assumption that previous policy decisions are the result of optimising behaviour on the government's part. Chase (1968) pointed out that there is an element of circular reasoning involved in using this method as input into a cost-benefit analysis, and then use the resulting net benefits estimates to guide policy makers about optimal policy decisions. This argument may be less relevant if the cost-benefit analysis is intended as a device of guiding purely administrative decision processes, not processes involving the government itself.

However, in a democracy, implicit values cannot be expected to be constant, neither over time, nor between different decisions made at approximately the same time. Discrepancy between values estimated at different occasions may well occur even if decision makers are rational, well-informed, and do not change their preferences: When decisions are made through democratic procedures of collective decision-making, there is of course no «central planner» with dictatorial power. Generally, one cannot expect *collective* decisions made by a set of rational individuals to follow the same patterns as decisions made by a single rational individual. For example, it is well-known that majority voting can produce intransitive choices (see Feldman, 1980).

In politics, it may vary from case to case which interests are given priority by decision makers. Consequently, implicit values will vary too. Requiring constancy of such values would imply that those groups or interests who succeeded in gaining political priority last year should succeed in doing so this year, and next year as well; while those who failed last year, should continue to fail. Probably, an important feature of a stable democratic system is precisely that there usually comes another chance for losers; it is not the same interests that win every time (Buchanan, 1954, Miller, 1983).

3.3.3 Expert panels

An obstacle for reasonable estimation of people's preferences for environmental goods is that the population may be poorly informed about the nature of the good in question. For instance, a project may have effects on a rare biotope, in which case the willingness to pay is perhaps not really connected with the area as such, but with preserving biodiversity. Most people, however, have little knowledge of the probability that different species will survive under various circumstances, the prevalence of species which are very similar to the ones which are threatened, the probability that those species will become commercially useful in the future, and so forth. In such cases, willingness

to pay is not just based on individual preferences, but also subjective probability judgements and judgements concerning highly complicated cause/effect-relationships. These judgements may correspond poorly to the opinion of better informed experts.

Some researchers have proposed using so-called *focus groups* to investigate the public's understanding and knowledge of the issue prior to performing a contingent valuation study (Hutchinson et al., 1995). In a focus group, people discuss the issue in an informal manner, while the analyst observes the discussion. If there are common misunderstandings, ambiguities or lack of knowledge of a subject, this may become apparent during the discussion, and the analyst can make sure to provide information about these things to the respondents in the ensuing contingent valuation survey.

However, providing such information in a satisfactorily way may sometimes be exceedingly difficult or time-consuming.[10] It has therefore been proposed to study the preferences or views of a group of *experts,* rather than estimating the *population*'s preferences. For a discussion of this method, see Keeney and Raiffa (1976). For such expert values to be interpreted as *representing the population's values* (if they were better informed), one must assume that the chosen experts' preferences do not differ from the preferences of the rest of the population, at least not in a systematic way. However, it seems quite plausible that the process of recruitment to a profession involves some selection of people according to interests and preferences; also, working with a particular issue for a long period of time, as experts do, could presumably change their judgements of the importance of their own field compared to other issues.

The use of expert panels in environmental valuation stem from the view that consumers' judgements are not made on a well-informed basis, and thus cannot be trusted. This is to some extent inconsistent with the theoretical foundations of cost-benefit analysis, where consumer sovereignty is a central concept.

A general argument for using market prices or monetary evaluations in project evaluations is that prices provide highly aggregated information. If expert panels are used, the evaluation of the good in question is made by a few experts, in which case it might be fairly easy to sum up the judgements anyhow. The usefulness of monetary values simply as a means of aggregating information then becomes less relevant. Moreover, the process of transforming professional scientific judgements into monetary estimates is probably difficult, particularly since most natural scientists are not educated economists as well. One might thus question whether translating experts' views into monetary values is really worth the exercise, compared to the alternative of simply presenting expert views as part of an impact assessment (without measuring them in monetary units).

4. Controversies: The debate following *Exxon Valdez*

Economists have been discussing valuation of environmental goods for a long time, but in recent years, the debate has intensified. The single event contributing most to this was probably the *Exxon Valdez* accident in 1989, when the tanker *Exxon Valdez* ran aground in Prince William Sound in Alaska, spilling vast amounts of oil and contaminating a huge area. According to CERCLA (see section 2.3), Exxon was liable to pay damages for the resulting injuries to natural resources. Since the physical damages were enormous, large economic interests were clearly at stake; and since there was no consensus on how to measure the damages in monetary terms, both Exxon, the State of Alaska and federal authorities spent a lot of resources trying to establish new arguments and knowledge about valuation methods.

[10] In addition to making respondents better informed, such discussions may change respondents' attitudes towards the issue at hand; thus influencing the value estimates in a way which was not intended.

The debate which followed was particularly concerned with the contingent valuation method and its ability to provide reliable estimates of existence value. Some of the controversies which emerged are discussed below. Portney (1994), Hanemann (1994) and Diamond and Hausman (1994) provide (together) a good and considerably more detailed overview of this debate.

4.1 What does contingent valuation really measure?

Many economists have expressed doubts as to whether responses in a contingent valuation study can actually be interpreted as measuring preferences for the environmental good in question. Diamond and Hausman (1994), for example, conclude that «contingent valuation is a deeply flawed methodology for measuring non-use values, one that does not estimate what its proponents claim to be estimating». Among the arguments used for this is that CVM values seem to be very sensitive to whether the valuation question is asked by itself or with other questions, and, if several questions are asked, the sequence they are asked in. Another phenomenon is the finding in some studies that willingness to pay is more or less constant even when the valued good is changed in quite significant ways. The phenomenon that values lack responsiveness to changes in the valued good, but are sensitive to the sequencing of questions, is frequently called *embedding*. Further, sceptics have used as an argument the fact that willingness to accept (or the compensation demanded by consumers to accept a change) is frequently several times higher than reported willingness to pay.

4.1.1 «Warm glow»

Kahneman and Knetsch (1992) have suggested that responses to CVM studies measure the «purchase of moral satisfaction» rather than economic value in the usual sense. This is frequently called the «warm glow» hypothesis, since according to this idea consumers are actually reporting their willingness to pay for a private good: The «warm glow» one feels inside when giving money to a worthy purpose.

This hypothesis has been supported by some empirical analyses, demonstrating that large changes in the quantity or inclusiveness of the environmental good may be associated with very small (or no) changes in willingness to pay. This is to be expected if people are not concerned about the particular environmental good, but are rather looking for good causes to allocate their «purchase of moral satisfaction»-contribution to. Kahneman and Knetsch (1992) themselves found that when each sample was asked only one valuation question, willingness to pay varied surprisingly little with the inclusiveness of the valued good: Mean willingness to pay for improved availability of equipment and trained personnel for rescue operations did not differ significantly from mean willingness to pay for improved preparedness for disasters more generally; which did not, in turn, differ significantly from mean willingness to pay for improving all environmental services.

A much cited study is Desvouges et al. (1993), where respondents were asked about their willingness to pay to avoid the death of a certain number of migratory waterfowl. Respondents who were asked about their willingness to pay to avoid the deaths of, respectively, 2,000, 20,000 or 200,000 birds did not give significantly different answers.

«The warm glow» hypothesis is not the only plausible explanation of this phenomenon, however. It is possible that respondents have a tendency to misconceive the valuation question, interpreting it as being more general than was intended by the researcher. For example, respondents to the study by Desvouges et al. may have reported their willingness to pay to save animals' lives in general, not specifically the birds affected by the project they were asked to value.

Other studies, however, have found that willingness to pay does vary with the scope or scale of the good in question in the expected way. Smith (1995) provides one example. Hanemann (1994) gives references to a number of such studies. He concludes that the results of Kahneman and Knetsch and Desvouges et al. do not represent the majority finding in the CVM literature regarding the variation of

willingness to pay with scope. Further, he is critical to several methodological aspects of these two studies.

Many studies have demonstrated that the *number of valuation questions* asked in one interview, and *the order the questions are asked in*, are important factors to determine individuals' willingness to pay for each of the goods. This observation seems to be much less controversial than the claim that values lack sensitivity to scope. One example of values' sensitivity to the sequencing of questions is the study of Kahneman and Knetsch (1992) referred to above: When people were asked about the most inclusive category (all environmental services) first, and then asked what part of this contribution should be allocated to the more specific purposes, mean willingness to pay for the latter dropped quite dramatically, as compared to the case when each sample of respondents were asked only one valuation question.

This phenomenon can partly be explained as an income effect: When you have paid for one environmental good, you have less money left to pay for another (although these payments are, of course, hypothetical). However, Diamond and Hausman (1994) claim that the income elasticities which can be estimated from such data cannot reasonably be explained as a result from income effects.

If two goods to be valued are close substitutes, the value of one of them may depend crucially on whether the other is already available. Under such circumstances, one would expect value estimates to be sensitive to the sequencing of questions, and aggregation of *independently* derived willingness to pay estimates would overstate total willingness to pay (see Mitchell and Carson, 1989, p. 44-47). Thus, the observation that values are indeed sensitive to the sequence of questions may indicate that different environmental goods are regarded as close substitutes, and should hence not necessarily be interpreted as evidence for the «warm glow» hypothesis. On the other hand, the «warm glow» hypothesis provides one explanation *why* environmental goods may be close substitutes: If respondents pay for the pleasure of giving to a good cause, rather than their own benefit from this particular environmental change, one environmental purpose may be just as good as another to obtain this goal.

Under the «warm glow» hypothesis, extensive use of contingent valuation as background information for political decisions is hardly a good idea. If one conducts a CVM study each time a new project proposal is to be evaluated, only asking about the valuation of one good at a time, respondents might report all or most of their planned contribution to «good causes» every time, since the contributions are hypothetical. Thus, the «warm glow» hypothesis is, as Arrow et al. (1993) note, «potentially a very damaging criticism of the method». Under this hypothesis, willingness to pay cannot be interpreted as a welfare measure for the specific good to be valued; which brings up the question of why the reported values ought to be aggregated in a cost-benefit analysis at all.

4.1.2 «Reasonable» payment

When asked to report their willingness to pay for an environmental good, it is also possible that people report an amount of money which they perceive as a *reasonable* or fair payment, rather that the *maximum* amount of money they would be willing to pay to achieve the good. When making such judgements, they take into account such elements as the total costs of supplying the good, how much each would have to pay if everybody paid their share, whether it is reasonable that they should pay anything at all if the blame is really on someone else, and so on (Schkade and Payne, 1993). Such value statements can be regarded as the results from a kind of intuitive cost-benefit analyses, rather than an individual marginal benefit.

A somewhat similar critique is that of Kahneman et al. (1993), who claim that willingness to pay for public goods measures *attitudes* rather than economic values. They maintain that if one primarily wants to investigate people's attitudes, money is hardly the most natural unit to use; one could

instead, for instance, simply ask people more directly what they think.

The proponents of the contingent valuation method have responded to these critiques by pointing out methodological weaknesses in their critics' analyses (Hanemann 1994, Smith 1992). Due to the many possible biases and sources of error, CVM surveys are very expensive to conduct if one adheres to the most strict standards. Thus, most studies have methodological weaknesses to some extent. Further research is probably needed to draw more firm conclusions about the nature of CVM value estimates.

4.2 Willingness to pay or willingness to accept?

In CVM studies, respondents are asked about their *willingness to pay* (WTP) or *willingness to accept* (WTA) for a given change in the quantity or quality of an environmental good (or bad). The WTP and WTA format correspond to the two theoretical welfare measures of the Hicksian *compensating variation* and *equivalent variation*[11]. The correspondence between the two question formats and the two theoretical welfare measures depends on whether the environmental change to be valued is a good or a bad.

WTP is the maximum amount of money the respondent is willing to pay to secure, or avoid, the proposed change. If the change is an improvement, WTP to secure the change measures the compensating variation. If the change is considered as a deterioration, however, WTP to avoid the change is the equivalent variation.

WTA is the amount of money a person must at least have to be willing to accept a change, or to be willing to forego it. If the change is an improvement, WTA measures the equivalent variation. If, on the other hand, the change makes things worse from the respondent's point of view, WTA measures the compensating variation.

Until recently, it was believed that equivalent and compensating variation measures ought to be fairly close, due to Willig (1976) and Randall and Stoll (1980). However, a lot of CVM studies have reported large discrepancies between WTA and WTP values (references to several such studies are provided in Knetsch, 1994). This has been used as one argument that CVM studies do not measure economic values in a reliable way. However, Hanemann (1991) demonstrated that when the analysis is concerned with the welfare effects of quantity changes rather than price changes, the difference between the compensating and equivalent variations may actually be infinitely large. This means that it may matter a lot which of these measures one employs.

It is not always obvious whether the compensating and equivalent variation measures should be chosen in a cost-benefit analysis. The equivalent variation of a single consumer will rank alternatives in accordance with his utility function even when more than two alternatives are compared; the compensating variation, on the other hand, may fail to do so (Johansson, 1993, p.30). However, frequently one is really only interested in comparing only two alternatives, namely the situations with and without the implementation of a certain project. Apart from such technical features of the measures, they do however have different interpretations in terms of *rights*.

When asking someone of her willingness to pay to achieve something, there is an implicit assumption that she does not really have a property right to it; she might have to pay to get it. On the other hand, if one asks her of the compensation she would need to give it up, there is an implicit assumption that she does have some kind of property right to this good. Now, CVM is frequently applied to public goods, where property rights are usually not clearly defined, or at least not assigned to individuals.

[11] See, for example, Johansson (1993). Some authors use the term «surplus» instead of «variation» when a quantity change is concerned, while the term «variation» is used when welfare effects of a price change is analysed.

This means that it is sometimes not obvious whether the respondent actually has a right to the good to be valued. One possible approach is to take the status quo as a point of departure concerning rights; regarding as the consumer's what she has got presently, not what she would have had if the project was implemented. For a discussion of variation measures and rights, see Bromley (1995).

Whether one chooses to use the compensating or equivalent variation as the relevant individual welfare measure, it is hard to find a theoretical justification for using different welfare measures when the change is welfare-improving and when it is not. Nevertheless, this is exactly what is recommended by several CVM theorists (and also by the NOAA Panel (Arrow et al., 1993), see section 4.4). The reason is that when faced with WTA questions, a large number of respondents usually refuse to co-operate, or they report values which are regarded by the researchers as implausibly large. This has lead many researchers to prefer the willingness to pay-format, regardless of property right considerations. Since WTP corresponds to the compensating variation in the case of an improvement, but to the equivalent variation in the case of a deterioration, this amounts to changing the preferred underlying theoretical welfare measure, depending on whether the change is welfare improving or not.

4.3 Non-use values and altruism

In empirical studies, non-use values frequently account for large parts of the estimated total values. Some scholars have questioned whether non-use values should actually be included in cost-benefit analyses at all. This question is closely related to the issue of altruism, since non-use values may to a large extent be motivated by concern for others, either present or future people[12].

Milgrom (1993) maintain that willingness to pay which is motivated by altruistic concerns should not be included in a cost-benefit analysis. This reasoning is discussed in more detail by Johansson (1992, 1994). The main argument is as follows. If person *A* is concerned about person *B*'s utility, *A* will be willing to pay something to secure *B*'s access to the public good. But *A* will also be concerned about *B* having to pay his share of the costs. Thus, counting *A*'s altruistic concerns on the benefit side, but not on the cost side of the calculations, gives rise to an inconsistency. However, if *A* is only concerned about *B*'s access to the public good, not his utility in general, the inconsistency vanishes.

Johansson (1994) concludes that the problem cannot be treated satisfactorily by simply ignoring altruistically motivated willingness to pay. He points out, however, that if the question about willingness to pay is posed in a particular way, the problem can be avoided. The idea is to ask respondents to indicate their willingness to pay, *provided that everybody else pay just enough to be exactly as well off as before*. In practice, however, such a scenario is likely to seem implausible to respondents. It might also make valuation questions exceedingly difficult to understand for some respondents.

4.4 The NOAA Panel

As a result of the large professional disagreement on this issue, and the huge economic interests involved in the legal case following the Exxon Valdez accident, the American Department of Commerce's National Oceanic & Atmospheric Administration (NOAA) convened an expert panel in 1992. The Panel was headed by the two Nobel laureates Kenneth Arrow and Robert Solow, and its mandate was to evaluate the use of CVM in determining non-use values. The Panel's report was released in January 1993 (Arrow et al., 1993), concluding that «CV studies can produce estimates reliable enough to be the starting point of a judicial process of damage assessment, including lost passive-use values». Further, they put forward a set of guidelines for conducting CVM studies in a methodologically satisfactory way, and argued that to be acceptable for the purpose referred to above, these guidelines should be adhered to.
The NOAA Panel's guidelines have been much referred to, and now serves as a «best practice

[12] That is, at least if «existence value» is defined to include others' use of the environmental good.

standard» by which the quality of CVM surveys can be compared, although several of the recommendations have been criticised by other economists (see, for example, Bromley, 1995). One must also take into account that the NOAA Panel was concerned with the situation in the USA, meaning that the reasoning behind the recommendation may not be valid elsewhere. The guidelines include the following recommendations, among several others:

- One should generally choose a «conservative design»; that is, when alternative instruments of eliciting willingness to pay are available, one should choose the alternative which is likely to yield the lowest estimate.
- One should ask for willingness to pay, not willingness to accept measures.
- One should use a «referendum format»: The questions should be asked yes/no-questions («would you be willing to pay x USD to secure the provision of...»).
- The environmental program or policy that is offered must be described accurately.
- Both «yes» and «no» responses should be followed up by questions of «why».
- The questionnaire should include questions about features such as income, prior knowledge and interest in the site, attitudes towards the environment and «big business», and belief in the scenarios.
- The instrument must not be so complex that it poses tasks which many respondents are not able to or willing to perform.
- Respondents must be reminded of alternative expenditure possibilities.
- The survey should be designed to minimise «warm glow»-effects, as well as views such as «it's big business' fault, so they should pay, not me».

Note that the Panel started from the premise that «passive use-loss - interim or permanent - is a meaningful component of the total damage resulting from environmental accidents». The main concern of the Panel was CVM as a means of estimating non-use values in the context of a judicial process; hence, it did not, for instance, discuss whether non-use values (or «passive-use values») should be included in a cost-benefit analysis, or whether aggregating willingness to pay is generally a desirable way to estimate changes in social welfare.

5. Distributional effects and interest group bias

Whether CVM or other methods are used to measure environmental effects in a cost-benefit analysis, the disregard of distributional effects in such analyses is controversial. This is common to all cost-benefit analyses, whether they are primarily concerned with environmental issues or not. Below, I will discuss some distribution-related issues which I think are particularly relevant to cost-benefit analysis of environmental change.

5.1 Consumers with different preferences

Public goods differ from most private goods in that the available amount of public goods must be regarded as *exogenously given* for the individual consumer. In competitive markets with private goods, individuals will generally consume different amounts of the private goods, while marginal rates of substitution between different goods will be equal across individuals. The opposite is true for pure public goods: The amount available is equal for everybody, while marginal rates of substitution are generally different. Thus, consumers' marginal willingness to pay for public goods will differ between individuals.

Brekke (1993) demonstrates that the accounting unit matters when willingness to pay for a public good is aggregated across individuals. The problem arises because individuals have different willingness to pay, which can happen even if they have exactly the same income, provided that they have different tastes. Imagine, for example, two persons with the same income, where one (the

materialist) is relatively more concerned about money, while the other (the environmentalist) is more concerned about the environment. If an environmental change is measured in monetary units (i.e. willingness to pay in dollars), the environmentalist is favoured; he does not care much about money, and can afford to give away much of it without losing too much utility. If the change is measured in units of the environmental good, however (for example m^2 of wilderness), the materialist is favoured; he does not care much about wilderness, and so he can afford to give up much of it without getting a lot worse off.

Aggregation using the two different units puts different emphasis on the interests of these two persons. The two methods correspond to assuming, respectively, that everybody has the same marginal utility of income (monetary units) or that everybody has the same marginal utility of the environmental good (environmental units). It is difficult to see that one of these assumptions is generally more plausible than the other. Brekke applied both methods to calculate aggregate willingness to pay for a change in air in Norway, using data from Strand (1985). After converting both aggregate numbers to monetary units, he found that aggregate WTP was 22 times (!) higher when monetary units were employed in the aggregation process.

The implication of Brekke's finding is that the choice of measurement unit determines which interest groups will be favoured by the analysis, a result which must be said to be quite troublesome. This is really just an illustration of a more general problem. If lump-sum transfers are not feasible, cost-benefit analysis requires a cardinal and interpersonally comparable utility concept. Since we do not know much about marginal utilities, one usually adopts the assumption that everyone has the same marginal utility of income, which simplifies the analysis considerably. But this introduces a kind of arbitrariness into the analysis, since we do not know anything about the plausibility of this assumption. Brekke's result demonstrates that this may have significant implications, since another, equally plausible assumption yields benefit estimates of quite a different magnitude.

Many people seem to think that poor people have a larger marginal utility of income than rich people do. If this is actually so, cost-benefit analyses will generally tend to favour rich people's interests. If public goods have income elasticities above one, the effect described by Brekke will also contribute to a such «bias against the poor».

5.2 Sustainability issues and intergenerational equity

Another dimension of the income distribution issue is the question of intergenerational equity. Many environmentalists seem to think that putting a monetary value on the environment, hence making it visible in the economic analyses and political decision process, is a way to ensure that the interests of future generations are properly taken care of.

However, this is not necessarily the case. The value that is attached to environmental goods will itself depend on whether the economy is following a sustainable path or not. For example, if the current generation regards environmental resources as theirs to spend freely, without any regards for future generations, environmental resources will be regarded as less scarce than if they had to be shared with future people. Hence, a lower value will be attached to them, and inclusion of these low values in cost-benefit analysis may not be of much help for future generations.

More generally, using aggregate willingness to pay as the central indicator of social welfare presupposes that the initial distribution of income (or wealth) is socially acceptable. This is true whether one is concerned with the intra- or intergenerational distribution. Thus, Howarth and Norgaard (1992) point out that «incorporating environmental valuation per se in decision-making will not bring about sustainability unless each generation is committed to transferring to the next sufficient natural resources and capital assets to make development sustainable».

Environmental valuation and intergenerational equity have been discussed in a large number of papers. Most of these concentrate on discussions of the discount rate (for some recent examples, see Hanley, 1992, Azar and Sterner, 1995, Beckerman, 1993). Although discounting and intergenerational equity are obviously important when it comes to the applicability of environmental cost-benefit analysis for policy purposes, I will not go further into those issues here, since that would clearly require a separate paper. The reader can be referred to Dasgupta and Heal (1979), Lind (1982) and Broome (1992) for discussions of discounting.

6. Environmental values and philosophy

Most of the recent debate about valuation of environmental goods, and contingent valuation in particular, has rested on the premise that the sum of individuals' willingness to pay is a relevant and acceptable measure of changes in social welfare. This premise has been the subject of much debate in other branches of economics (for example, see Sen, 1985, Hammond, 1990, Pauwels, 1993), but in the valuation literature, it seems to be accepted without further questions to a quite surprising extent. The debate following the Exxon Valdez accident, for instance, was largely concerned with CVM's ability to measure non-use values in a sufficiently accurate way, while few (although there were some) posed the question of whether willingness to pay should really be a major concern in the determination of environmental policy.

Recently, however, several scholars has focused on ethical and philosophical aspects of environmental valuation and/or its use in cost-benefit analysis (Vatn and Bromley, 1994, Sagoff, 1994, Berrens and Polasky, 1995, among others). Concerning the *political* aspects of the issue, I believe that much still remains to be done; but some of the philosophically oriented critique seems quite relevant for political purposes as well.

6.1 Does valuation reduce the value?

One early, and harsh, critic of both cost-benefit analysis and environmental valuation is Kelman (1981). Kelman claims that there are good reasons to oppose efforts to put dollar values on non-marketed benefits and costs. According to Kelman, putting a price on a benefit may reduce the value of that benefit: «The disgust that accompanies the idea of buying and selling human beings is based on the sense that this would dramatically diminish human worth». If your beloved estimated a monetary value of his/her relationship to you, this valuation exercise would probably itself reduce the value of the relationship.

This line of thought is developed more formally in Frey (1992). Frey assumes that behaviour is motivated by two factors; intrinsic (environmental ethics) and extrinsic (external factors, such as economic incentives). He demonstrates that under certain conditions, pricing of environmental goods (or bads) may actually be counterproductive; the intrinsic motivation to behave in an environmentally friendly way is «crowded out». This may perhaps be explained by a hypothesis of the following kind: Individuals are raised to adhere to certain moral norms regarding their attitudes to public goods. These norms differ from the norms governing market behaviour, where looking after one's own interests is allowed to a larger extent. When an environmental good is priced, people may begin to regard it more in line with a market good, and thus place less strict moral restriction on their behaviour towards it.

6.2 Social welfare judgements or individual utility?

Kelman (1981) further points out that using willingness to pay-figures to provide guidance for public decisions implies an assumption of «no difference between how people value certain things in private individual transactions and how they would wish those same things to be valued in public collective decisions». He argues that people might have what he calls «higher» and «lower» preferences, the latter coming to fore in private decisions, while people want the former to come to the fore in public

decisions. For example, precisely because we fail to give live-saving the value in everyday personal decisions that we in some general terms think we should, social decisions may be regarded as an opportunity to correct this.

Sagoff (1988) similarly argues that when environmental policy issues are concerned, people behave as «citizens», which means that they consider the benefits to *public interests* when evaluating a proposal. In contrast, when acting as consumers, individuals pursue their own, personal interests. Sagoff argues against using aggregate willingness to pay as a central criterion for environmental policy decisions, since a simple aggregation of people's judgements as «citizens» does not have room for the important process of public discussion and deliberation: Political decisions ought to be guided through search for the *best argument*, not the highest willingness to pay.

Kelman's idea of «higher» and «lower» preferences does perhaps bear some resemblance to Amartya Sen's notion of an *agency aspect* of individual utility (Sen, 1985). Sen points out that the action taken by an individual is not necessarily motivated only by his self-interest. This is not really the same as altruism (see section 4.3): Altruism is usually modelled such that other people's utilities enter the utility function of the altruistic individual. Then, other people's utility contributes to one's own, so that a person acting out of altruistic motivations is in one sense also acting out of self-interest. Sen does not, however, accept the idea that any individual choice can ultimately be explained by self-interest. There are cases where individuals, out of duty, go to personal sacrifices to fulfil their perceived duty towards someone else to a degree which is difficult to explained as self-interest; the extreme example being the wartime soldier who is willing to sacrifice his life. Sen (1977) maintains that the traditional description of individuals as utility-maximisers is too simple; he argues that every individual could, alternatively, be seen as having several preference orderings, corresponding to different motives.

When people report their willingness to pay for an environmental good, the motivation behind the answers is usually not known to the researcher. Perhaps willingness to pay-statements are mixtures of purely selfish interests, altruistic concerns, and agency behaviour. If we do not know how to interpret the responses, however, simply summing them up and interpreting the result as an indicator of social welfare may yield a social welfare concept of which no-one understands the ethical implications properly.

6.3 Intrinsic values

Many authors have been concerned about the question of whether or not the environment has some kind of intrinsic value; that is, a value distinct from the individual utility human beings can derive from it (Nelson, 1995, Norton, 1986, 1995).

A claim that cost-benefit analysis is not capable of taking «nature's own interests» into account at all would not be true: When willingness to pay for environmental goods is included in the analysis, such considerations are taken into account to the extent that individuals are prepared to pay for it. After all, willingness to pay for «non-use values» is what much of the debate about CVM has been about. However, this does not necessarily imply that aggregating individual willingness to pay accounts for «nature's interests» in a satisfactory way. The manner in which such values are included in cost-benefit analysis depends, among other things, on whether individuals respond to WTP questions as «consumers» or «citizens» in the sense of Sagoff (1988). It is quite possible that the procedure of aggregating individual willingness to pay, regardless of the underlying motives, implies taking nature's intrinsic value into account in a way which no respondent would regard as appropriate.

Common et al. (1993) comment as follows: «We find it difficult to see how value can exist independently of a valuer, and it seems more reasonable to regard claims for such intrinsic value as claims that altruism be extended to embrace non-humans.» However, the fact that it is hard to define

value without a valuer does certainly not imply that individual well-being is the only relevant concern for environmental policy making. Considering Sen's argument that people may be acting out of duty, it seems quite possible that people may be acting out of duty *to a cause* rather than another person. Taking care of the environment can be a such cause. This means, firstly, that that willingness to pay may not necessarily reflect individual well-being. Secondly, however, it is quite possible that individuals want environmental policy to take such moral duties into account.

For example, some people's religion may say that it is wrong to treat nature as if it belonged to the human race, because this is to put humans in the place of God (or the gods). The view that nature has an intrinsic value seems quite consistent with a pantheistic religious view, for example, and could probably be justified by several other religious views as well.[13] It seems to me that such views do not need any other justifications than belief.

Goodin (1994) suggests a view of the value of nature which does not involve «a value without a valuer», but which nevertheless seems to imply that the value of the environment can hardly be expressed in monetary units. He argues as follows: «The value of natural processes is to provide a context, outside of ourselves (individually, or even collectively), in which to set our lives (...) What is wrong with environmental despoliation is that it deprives us of that context; it makes the external world more and more one of own (and perverse) creation. That is ultimately a wrong to humans, rather than to nature as such, to be sure. It is, nonetheless, a wrong that cannot be recompensated by cash payments.»

7. Concluding remarks

Some economists have argued that environmental valuation, combined with cost-benefit calculations, can indicate the socially optimal level of environmental goods provision. According to this view, analyses of the value of specific environmental changes ought to have a larger impact on policy decisions than is presently the case.

However, what is best for society is a controversial issue. Individuals with different political and ethical views would presumably not agree on this, even if they managed to agree on a description of the situation. The sources of such disagreement may be distributional issues, differing views on the importance of non-utility information such as rights and duties, and different judgements on which factors are important for a good life.

To identify the preferred policy alternative from a social point of view, then, one must make controversial choices regarding which interests and values are to count the most. This means that the preferred alternative will not be the same for different policy makers. Cost-benefit analysis is one way of weighing various kinds of concerns against each other, but not the only one. Hence, environmental valuation cannot by itself provide any objective answer to the question of how much we should protect the environment.

Well-founded environmental policy decisions requires that accurate and understandable information about the issue is available for policy makers. However, it is not obvious that monetary valuation is always the most suitable format for such information. One alternative is to present policy makers with environmental indicators measured in physical units, verbal descriptions, or pictures. Contingent valuation practitioners have put much emphasis on developing methods for providing survey respondents with accurate and understandable information about the goods they are asked to value. Such methods could, of course, be used to provide information to policy makers as well.

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[13] Discussions of various religions' views on nature can be found in Bratton (1993), Hallman (1994), and Tucker and Grim (1994).

When choosing how to provide information, it is important to take into account *how policy makers are likely to use this information.* If one believes that environmental issues will not be taken into consideration by policy makers at all without including them in a cost-benefit analysis, this is clearly an argument for valuing the environment in monetary terms. On the other hand, it is possible that inclusion of too many considerations makes the cost-benefit analysis so complicated, and so controversial, that policy makers are not liable to use it anyway. Hence, it does not seem possible to draw unambiguous conclusions about the desirability of environmental valuation for policy purposes.

References

Aaheim, A., and K. Nyborg (1995): On the Interpretation and Applicability of a 'Green National Product', *The Review of Income and Wealth* **41**, 57-71.

Arrow, K., R. Solow, E. Leamer, P. Portney, R. Radner, and H. Schuman (1993): Report of the NOAA Panel on Contingent Valuation. National Oceanic and Atmospheric Administration, Federal Register/Vol. 58, no.10, 4602-4614.

Auerbach, A. J. (1985): «The Theory of Excess Burden and Optimal Taxation», in A. J. Auerbach and M. Feldstein (eds.): *Handbook of Public Economics*, vol. I, Amsterdam: Elsevier Science Publishers B.V. (North-Holland), 61-128.

Azar, C., and T. Sterner (1995): Discounting and Distributional Considerations in the Context of Global Warming. Paper presented at the Sixth Annual Conference of the European Association of Environmental and Resource Economists, Umeå, Sweden, June 1995.

Beckerman, W. (1993): Environmental Policy and the Discount Rate: Philosophy or Economics? CSERGE Working Paper 93-12.

Blackorby, C. (1990): Economic Policy in a Second-Best Environment, *Canadian Journal of Economics* **XXIII**, No. 4, 748-771.

Blackorby, C., and D. Donaldson (1990): A Review Article: The Case Against the Use of the Sum of Compensating Variations in Cost-Benefit Analysis, *Canadian Journal of Economics* **XXIII**, No. 3, 471-494.

Bockstael, N. E., K. E. McConnel, I.E. Strand (1991): «Recreation», in Braden, J. B., and C.D. Kolstad (eds.) (1991): *Measuring the Demand for Environmental Quality.* Amsterdam: Elsevier Science Publishers B.V. (North-Holland), 227-270.

Braden, J. B., and C.D. Kolstad (eds.) (1991): *Measuring the Demand for Environmental Quality.* Amsterdam: Elsevier Science Publishers B.V. (North-Holland).

Bratton, S. P. (1993): *Christianity, Wilderness, and Wildlife: The Original Desert Solitaire,* Scranton: University of Scranton Press.

Brekke, K. A. (1993): Do Cost-Benefit Analysis Favor Environmentalists? Discussion Paper 84, Oslo: Statistics Norway.

Brendemoen, A., and H. Vennemo (1994): A Climate Treaty and the Norwegian Economy: A CGE Assessment, *The Energy Journal* **15**, 77-93.

Bromley. D. W. (1990): The Ideology of Efficiency: Searching for a Theory of Policy Analysis, *Journal of Environmental Economics and Management* **19**, 86-107.

Bromley, D. W. (1995): Property Rights and Natural Resource Damage Assessment, *Ecological Economics* **14**, 129-135.

Broome, J. (1992): *Counting the Cost of Global Warming,* Cambridge, UK: White Horse Press.

Buchanan, J. M. (1954): Social Choice, Democracy and Free Markets, *Journal of Political Economy,* 114-123.

Carlsen, A. J., J. Strand and F. Wenstøp (1993): Implicit Environmental Costs in Hydroelectric Development: An Analysis of the Norwegian Master Plan for Water Resources, *Journal of Environmental Economics and Management* **25**, 201-211.

Chase, S. B. (1968): *Problems in Public Expenditure Analysis,* Washington D.C.: Brookings Institution.

Common, M. S., R. K. Blamey and T. W. Norton (1993): Sustainability and Environmental Valuation, *Environmental Values* **2**, 299-334.

Cummings, R. G., and G. W. Harrison (1995): The Measurement and Decomposition of Non-use Values: A Critical Review, *Environmental and Resource Economics* **5**, 225-247.

Dasgupta, P. S., and G. M. Heal (1979): *Economic Theory and Exhaustible Resources,* Cambridge: Cambridge University Press.

Desvouges, W. H., F. R. Johnson, R. W. Dunford, S. P. Hudson, K. N. Wilson (1993): «Measuring Natural Resource Damages With Contingent Valuation: Tests of Validity and Reliability», in Hausman, J. A. (ed.): *Contingent Valuation. A Critical Assessment,* Elsevier Science Publishers B.V., 91-164.

Diamond, P. A. and J. A. Hausman (1994): Contingent Valuation: Is Some Number Better than No Number? *The Journal of Economic Perspectives* **8**, 45-64.

Drèze, J., and N. Stern (1987): «The Theory of Cost-Benefit Analysis», in A. J. Auerbach and M. Feldstein (eds.): *Handbook of Public Economics*, vol. II, Amsterdam: Elsevier Science Publishers B.V. (North-Holland), 909-990.

Feldman, A. M. (1980): *Welfare Economics and Social Choice Theory*, Boston: Kluwer-Nijhoff Publishing.

Frank, R. H. (1992): Melding Sociology and Economics: James Coleman's «Foundations of Social Theory», *Journal of Economic Literature* **XXX**, 147-170.

Freeman, A. M. (1993): *The Measurement of Environmental and Resource Values. Theory and Methods,* Washington D.C.: Resources for the Future.

Frey, B. S. (1992): Pricing and Regulating Affect Environmental Ethics, *Environmental and Resource Economics* **2**, 399-414.

Hallman, D. C. (ed.) (1994): *Ecotheology: Voices From South and North,* Maryknoll: Orbis Books.

Goodin, R. (1994): Selling Environmental Indulgences, *KYKLOS* **47**, 573-596.

Hammond, P. J. (1979): Straightforward Individual Incentive Compatibility in Large Economies, *Review of Economic Studies* **46**, 263-282.

Hammond, P. (1990): Theoretical Progress in Public Economics: A Provocative Assessment, *Oxford Economic Papers* **42**, 6-33.

Hanemann, M. W. (1991): Willingness To Pay and Willingness To Accept: How Much Can They Differ? *The American Economic Review* **81**, 635-647.

Hanemann, M. W. (1992): «Preface» in S. Navrud (ed.): *Pricing the European Environment.* Oslo: Scandinavian University Press, 9-35.

Hanemann, M. W. (1994): Valuing the Environment through Contingent Valuation, *The Journal of Economic Perspectives* **8**, 19-44.

Hanley, N. (1992): Are There Environmental Limits to Cost Benefit Analysis? *Environmental and Resource Economics* **2**, 33-59.

Hanley, N., and C. L. Spash (1993): *Cost-Benefit Analysis and the Environment,* Edward Elgar.

Harsanyi, J. C. (1955): Cardinal Welfare, Individualistic Ethics, and Interpersonal Comparisons of Utility, *Journal of Political Economy* **63**, 309-21.

Hicks, J. (1939): The Foundations of Welfare Economics, *The Economic Journal* **49**, 696-712.

Hoevenagel, R., and O. Kuik (1992): «The Netherlands», in S. Navrud (ed.): *Pricing the European Environment,* Oslo: Scandinavian University Press, 100-107.

Howarth, R. B., and R. B. Nordgaard (1993): Intergenerational Transfers and the Social Discount Rate, *Environmental and Resource Economics* **3**, 337-358.

Hutchinson, W. G., S. M. Chilton, J. Davis (1995): Measuring Non-use Value of Environmental Goods Using the Contingent Valuation Method: Problems of Information and Cognition and the Application of Cognitive Questionnaire Design Methods, *Journal of Agricultural Economics* **46**, 97-112.

Johansson, Per-Olov (1987): *The Economic Theory and Measurement of Environmental Benefits,* Cambridge, UK: Cambridge University Press.

Johansson, Per-Olov (1992): Altruism in Cost-Benefit Analysis, *Environmental and Resource Economics* **2**, 605-613.

Johansson, Per-Olov (1993): *Cost-Benefit Analysis of Environmental Change.* Cambridge: Cambridge University Press.

Johansson, Per-Olov (1994): Altruism and the Value of Statistical Life: Empirical Implications. *Journal of Health Economics* **13**, 111-118.

Johansson, P.-O., and B. Kriström (1992): «Sweden», in S. Navrud (ed.): *Pricing the European Environment,* Oslo: Scandinavian University Press, 136-149.

Kahneman, D. and J. Knetsch (1992): Valuing Public Goods: The Purchase of Moral Satisfaction, *Journal of Environmental Economics and Management* **22**, 57-70.

Kahneman, D., I. Ritov, K. E. Jacowitz and P. Grant (1993): Stated Willingness to Pay for Public Goods: A Psychological Perspective, *Psychological Science*.

Kahneman, D., and A. Tversky (1979): Prospect Theory: An Analysis of Decision Under Risk, *Econometrica* **47**, 263-291.

Keeney, R. L., and H. F. Raiffa (1976): *Decisions with Multiple Objectives: Preferences and Value Tradeoffs,* New York: Wiley.

Kelman, Steven (1981): Cost-Benefit Analysis. An Ethical Critique, *Regulation*, January/February.

Knetsch, J. L. (1994): Environmental Valuation: Some Problems of Wrong Questions and Misleading Answers, *Environmental Values* **3**, 351-368.

Kuik, O., S. Navrud, and D. W. Pearce (1992): «Benefit Estimation and Environmental Decision Making», in S. Navrud (ed.): *Pricing the European Environment.* Oslo: Scandinavian University Press, 274-287.

Larson, D. M. (1991): On Measuring Existence Value, Mimeo, Dept. of Agricultural Economics, University of California, Davis.

Lind, R. C. (1982): *Discounting for Time and Risk in Energy Policy,* Washington D. C.: Resources for the Future.

Louviere, J. J. (1988): *Analyzing Decision Making; Metric Conjoint Analysis,* Beverly Hills: Sage.

Milgrom, P. (1993): «Is Sympathy an Economic Value? Philosophy, Economics, and the Contingent Valuation Method», in J. A. Hausman (ed.): *Contingent Valuation: A Critical Assessment.* New York: North-Holland, 417-435.

Miller, N. R. (1983): Pluralism and Social Choice, *The American Political Science Review* **77**, 734-747.

Mitchell, R. C., and R. T. Carson (1989): *Using Surveys to Value Public Goods.* Washington: Resources for the Future.

Navrud, S., and J. Strand (1992): «Norway», in Navrud, S. (ed.): *Pricing the European Environment.* Oslo: Scandinavian University Press, 106-135.

Navrud, S. (ed.) (1992): *Pricing the European Environment.* Oslo: Scandinavian University Press.

Navrud, S. (1994): «Economic Valuation of External Costs of Fuel Cycles. Testing the Benefit Transfer Approach», in A. T. de Almeida et al. (eds.): *Integrated Electricity Planning*, Kluwer Academic Publishers, 49-66.

Nelson, J. L. (1995): Health and Disease as 'Thick' Concepts in Ecosystemic Contexts, *Environmental Values* **4**.

Norton, B. (1986): On the Inherent Danger of Undervaluing Species, in B. Norton (ed.): *The Preservation of Species,* Princeton: Princeton University Press.

Norton, B. (1995): Objectivity, Intrinsicality and Sustainability: Comment on Nelson's 'Health and Disease as Thick Concepts in Ecosystemic Contexts', *Environmental Values* **4**, 323-332.

Palmquist, R. B. (1991): «Hedonic Methods», in Braden, J. B., and C.D. Kolstad (eds.): *Measuring the Demand for Environmental Quality,* Amsterdam: Elsevier Science Publishers B.V. (North-Holland).

Pauwels, W. (1993): The Implicit Welfare Weights Used When Maximising Aggregate Surplus, *Journal of Economics* **57**, 261-277.

Portney, P. R. (1990): *Public Policies for Environmental Protection,* Washington D.C.: Resources for the Future.

Portney, P. R. (1994): The Contingent Valuation Debate: Why Economists Should Care, *The Journal of Economic Perspectives* **8**, 3-18.

Quiggin, J. (1995): The Suboptimality of Efficiency, *Economic Letters* **47**, 389-392.

Randall, A., and J. R. Stoll (1980): Consumer's Surplus in Commodity Space, *The American Economic Review* **71**, 449-457.

Rubinstein, A. (1988): Similarity and Decision-Making Under Risk (Is There a Utility Theory Resolution to the Allais Paradox?), *Journal of Economic Theory* **46**, 145-153.

Sagoff, M. (1988): *The Economy of the Earth,* Cambridge: Cambridge University Press.

Schkade, D. A., and J. W. Payne (1993): «Where Do the Numbers Come From?», in J. A. Hausman (ed.): *Contingent Valuation: A Critical Assessment.* New York: North-Holland, 271-303.

Schulze, W. D., D. S. Brookshire, E. G. Walther, K. K. MacFarland, M. A. Thayer, R. L. Whitworth, S. Ben-David, W. Malm and J. Molenar (1983): The Economic Benefits of Preserving Visibility in the National Parklands of the Southwest, *Natural Resources Journal* **23**, 149-173.

Sen, A. K. (1977): Rational Fools: A Critique of the Behavioural Foundations of Economic Theory, *Philosophy and Public Affairs* **6**, 317-344.

Sen, A. K. (1985): Well-being, Agency and Freedom. The Dewey Lectures 1984, *The Journal of Philosophy* **LXXXII**, No. 4.

Sen, A. K., and B. Williams (eds.) (1982): *Utilitarianism and Beyond,* Cambridge: Cambridge University Press.

Smith, V. K. (1992): Comment: Arbitrary Values, Good Causes, and Premature Verdicts, *Journal of Environmental Economics and Management* **22**, 71-89.

Smith, V. K. (1995): Can Contingent Valuation Distinguish Significant from Trivial Public Goods? Discussion Paper 95-24, Washington: Resources for the Future.

Stevens, T. H., J. Echeverria, R. J. Glass, T. Hager, and T. A. More (1991): Measuring the Existence Value of Wildlife: What Do CVM Estimates Really Show? *Land Economics* **67**, 390-400.

Strand, J. (1985): Verdsetting av reduserte luftforurensninger fra biler i Norge (Valuation of Reduced Air Pollution from Cars In Norway), Memorandum 1, Department of Economics, University of Oslo.

Tucker, M. E., and J. A. Grim (eds.) (1994): *Worldviews and Ecology: Religion, Philosophy and the Environment,* Maryknoll: Orbis Books.

Turner, R. K., I. Bateman, and D. W. Pearce (1992): «United Kingdom», in S. Navrud (ed.): *Pricing the European Environment,* Oslo: Scandinavian University Press, 150-176.

United Nations (1993): *Integrated Environmental and Economic Accounting.* Interim Version. Handbook of National Accounting, Series F, No.61. New York: UN Department of Economic and Social Development, Statistical Division.

Willig, R. (1976): Consumer's Surplus Without Apology, *The American Economic Review* **66**, 589-597.

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