

***Individual Preferences, Expert Opinion and Environmental Decision Making:
An overview of the issues***

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Abstract

The aim of this survey paper is to address the question of the extent to which individual preferences or expert opinion are suitable in guiding policy and damage assessment decisions related to environmental resources. The criteria used for "suitableness" are conceptual soundness of the notion of economic value and the moral and/or legal relevance of individual preference for policy and damage assessment decisions respectively. The paper will conclude with a discussion of the 'role of information'. The questions to be addressed concern the optimal role of information that individuals require in order to be able to make rational/valid choices on environmental issues and the conditions under which public and expert opinion may converge or diverge.

1. Introduction

Legislators, policy makers, and courts make decisions on the management of environmental resources utilising a broad range of political, economic, and scientific criteria or decision making processes. These include costs benefit analysis techniques, multi-criteria methods, expert panel approaches and direct or indirect citizen participation processes. *One* way of classifying this broad array of approaches to environmental decision making is on the basis of the role and importance they place on *individual preference based values*. These refer to *economic* values and should not be confused with other types of value. Table 1 in the Appendix presents a spectrum of environmental decision making processes that varies with the degree and the role played by individual preferences. On the left end of the spectrum we can discern environmental making processes such as stated and revealed preference techniques that place individual preference at the forefront of their analysis while at the other end are classified approaches that elude direct use of individual preferences and rely on input from policy makers, expert panels, and stake-holder groups.¹

Evidently a multitude of 'mixed' decision making approaches exist that combine information from individual preferences and expert/interest group opinion (e.g. citizen juries, valuation workshops etc). Yet, if both such inputs are to be utilised by policy makers and courts how should this be done and what is the relative role, weight and importance we should assign to each?

An initial reaction to these questions would be that in liberal democratic societies preferences ought to have some weight in the decision making process. But would any 'type' of preferences be appropriate? Would, for example, the preferences of individuals over the management of complex environmental ecosystems of which they have very little or even inaccurate information be of any merit? This leads to the familiar argument that it is the preferences of *informed* individuals that are to be used as inputs in the decision making process. Yet, this raises further issues as to the exact role of information in the formation of individual preferences and on the role of information in policy and damage assessment decisions.

¹ Throughout the paper we will be referring to preference based approaches as cost-benefit analysis (CBA) while input from policy makers, expert panels or stake-holder groups will be labelled 'expert opinion'.

The *aim of this survey paper* is to address the question of the extent to which individual preferences or expert opinion are suitable in guiding policy and damage assessment decisions related to environmental resources. The criteria used for "suitableness" are conceptual soundness of the notion of economic value and the moral and/or legal relevance of individual preference for policy and damage assessment decisions respectively. The paper will conclude with a discussion of the 'role of information'. The questions to be addressed concern the optimal role of information that individuals require in order to be able to make rational/valid choices on environmental issues and the conditions under which public and expert opinion may converge or diverge.

2. Organisation of Debate.

The role of individual preferences and CBA in environmental decision making has been extensively debated by economists (e.g. Kopp 1991, 1992 Freeman 1993), lawyers (e.g. Daum 1993, Shavell 1993, Boudreaux et al 1999) and philosophers (e.g. Hubin 1994, Sagoff 1994). Yet, despite the voluminous size of the literature it remains disordered and confused. One reason for this is the entanglement of distinct issues. For example, commentators typically confuse issues of measurement - e.g. 'Are estimates of individual values valid?' -with conceptual issues - e.g. 'Is the economic concept of value coherent?' or with moral/legal questions - e.g. 'Are decision makers morally obligated to consider individual preferences or do economic values adhere to the current legal framework of damages?'. Hence, in some cases discussion about the validity of the *concept of economic value* for environmental resources transgresses into a debate of specific non-market *valuation techniques* primarily the contingent valuation method. This can be explained by the general belief that the total economic value (including use and non-use values) for environmental resources can only be captured using stated preference techniques. It is far beyond the limits and scope of this paper to comprehensively present and review all the various aspects of the debate. Yet, in attempt to clarify some of misunderstandings present in the literature it is best to structure the discussion in a way that attempts to disentangles the quite distinct issues involved. Table 2 presents a hopefully more fruitful exposition of the arguments involved in the debate over the role of individual preference in environmental decision making. The table divides the issues into *two main sections*. The *first* addresses questions raised in Section 1 with respect to

environmental *policy* decisions while the *second* with respect to environmental *damage* assessment decisions. The reason for this dichotomy reflects the general debate in the existing literature that acknowledges that individual preferences and expert opinion may have differential roles or varying degrees of validity in policy as opposed to damage assessment decisions (e.g. Foster 1996, Kopp 1992; Bishop and Welsh 1992).

In addition, these sections will be discussed at *three fundamental levels*: conceptual, moral/legal and the role of information.² The *conceptual issues* that are most relevant to this discussion have to do with the notion of 'value' as understood in economics. Within an economic context individual *preferences* over environmental goods and services are manifested through individual *choices* which in turn are used by the economist to infer individual *economic values*. Thus, the discussion on the role of individual preferences in environmental decision making ultimately falls back on discussions on the concept of economic value as applied to environmental resources. Further, most economists agree that individuals make choices from which we can infer both so called 'use' and 'non-use values' for environmental resources.³ The conceptual issues related to the definition of non-use values have been the topic of considerable debate (see for example Quiggin 1998, 1993) and impact on the discussion undertaken in the current paper. That is, is the economic conception of non-use value sufficiently coherent to be used in environmental policy and damage assessment or is it fundamentally flawed and unsuitable?

Beyond conceptual considerations the role of individual preferences in environmental decision making will be discussed on *moral and/or legal grounds*. The main question of this discussion investigates whether the concept of economic value is compatible with the *moral* basis of environmental public decision making (for policy decisions) or with the *legal* conceptual framework of environmental damages, namely tort law (for damage assessment decisions).

² We acknowledge that there is considerable over-lap between the three levels of the discussion (conceptual, moral/legal, and information). Yet, the issues involved in each level are sufficiently different that a separate discussion is warranted. In fact, the main source of the misunderstandings found in the literature that discusses the role of individual preference in environmental decision making can be traced to the failure to distinguish between these levels.

³ Very generally/roughly, the former refer to values associated with the direct in-situ use of the services provided by environmental resources (e.g. recreation) while the latter refer to individual values that are not associated with any current, potential or future personal use of any such services

Finally, the role of information in validating the use of individual or expert opinion in environmental decision making is discussed. If preferences of informed citizens are desirable inputs into environmental decision making, what is the optimal level of information to be provided and will informed citizens have preferences that are in-line with the prescriptions given by expert groups? Further, if public and expert opinion on the importance and value of environmental resources diverge do these reflect differences in the quantity/quality of information the each group has or it is an indication that these groups have distinct preferences over environmental resources?

One last note on the organisation of the issues. We have intentionally left out of the discussion the issues on measurement. These refer to the general question on whether individual economic values (as expressions of the intensity of individual preference) for environmental resources are validly and adequately measured. If so would these valid estimates include non-use values for environmental resource or should our estimates be limited to use values alone? No doubt these issues are very important.⁴ Yet, they are not the most fundamental ones. For the sake of argument the discussion that follows accepts that economic values are readily and validly measurable. Instead, we proceed with the more fundamental issues of the debate over the use of individual preferences which concern the conceptual and moral/legal validity of preferences as well as the role of information.

The organisation of the paper is as follows: The following Section briefly classifies and reviews types of decision making processes in accordance to the manner and degree they rely on individual preferences or expert opinion. Section Four deals with various objections that have been raised with respect to the adequacy of the concept of economic value as applied to environmental policy decisions. Section Five turns to the moral and legal issues surrounding the debate on the use of individual preference based techniques for environmental policy and liability decisions. Section Six discusses the optimal role of information that individuals require in order to be able to make rational/valid choices on environmental issues and the conditions under which public and expert opinion may converge or diverge

⁴ A striking illustration of the range of results produced by CBA techniques is given by Stirling (1997). The author analysed over thirty published CBA studies of the external environmental costs of coal-fired power stations whose individual results were often express with a high degree of precision. But taken as whole the results were so varied that they had to be expressed on a log scale table, with the highest values

3. Classification of Approaches to Environmental Decision Making

One way of classifying environmental decision making approaches is in accordance to their degree of reliance on individual preference based values. Table 1 depicts such a classification where a 'preference reliance' spectrum is depicted by the shaded arrow. As we move from left to right on the spectrum the reliance (i.e. importance) on individual preferences and economic values in each decision making process is diminished. A very schematic account of these methods is presented in the following sections.

3.1. Preference Based Valuation Methods.

Preference based valuation methods can be split into formal valuation methods and environmental pricing techniques.⁵ The former are used to assess standard (neo-classical) *welfare measures* while the latter focus on market prices that are assumed to reflect economic scarcity and thus are in essence *efficiency* or *market prices*.

Valuation techniques are classified into revealed and stated preference techniques. *Revealed preference* valuation techniques (including travel costs, hedonic pricing and wage differential approaches) rely on information from individual consumption/purchasing behaviour made in markets related to the environmental resource in question (surrogate markets). The price differential of the good (purchased in the surrogate market), and once all other variables that affect choice apart from environmental quality have been controlled for, will reflect the purchaser's valuation of that particular level of environmental quality. The methods have the appeal of relying on actual/observed behaviour but their main fundamental drawbacks are the inability to estimate non-use values⁶ and the dependence of the estimated values on the assumptions made on the relationship between the environmental good and the surrogate market good.⁷ *Stated Preference techniques* (including contingent valuation, choice experiments, and contingent ranking) are used in situations where both use and non-values want to be estimated and/or when no surrogate market exists from which environmental (use) value

some 50,000 times the lowest. One message for policy makers is at least to be aware of the uncertainties involved, and to be clear about underlying assumptions.

⁵ For an introductory discussion of these techniques see Bateman (1999), Freeman (1993) and Dixon *et al* (1988)

⁶ See Larson (1992) for an alternative view.

can be deduced. These techniques construct questionnaires in which they develop a hypothetical market through which they elicit values (both use and non-use) for the environmental good under investigation. Stated preference techniques do not suffer from strict assumptions about the relationship between marketed complements or substitutes and the environmental good and can also estimate total economic value (use and non-use value). Yet, the hypothetical nature of the market constructed has raised numerous questions on the validity of the value estimates. (Navrud 2000).

Turning to pricing techniques we can see from Table 1 that we have three categories of environmental pricing techniques. The first set relies on the use of market prices of directly related environmental goods and services as surrogate values for these environmental amenities. The quality of the environmental good is treated as an input into the production function of various goods and services (outputs). Changes in these environmental inputs may lead to changes in productivity or production costs which, in turn, may lead to changes in prices and output levels which can be observed and quantified (Dixon *et al* 1988). These approaches are also referred to as 'dose-response' techniques. Three such techniques have been widely used: '*changes-in-productivity*' approaches where impacts on environmental quality are reflected in the changes in the productivity of the systems involved and these, in turn, are used to assign values. The physical changes in productivity (e.g. crop yield) are valued using market prices for inputs and outputs; 'loss of earnings' approaches measure the impacts on environmental quality from changes in human productivity. The value of loss earnings and of medical costs created from the degradation in the quality of some environmental resource (e.g. water poisoning) is used under such approaches as a proxy for environmental value (Freeman 1979); '*opportunity cost*' approaches are based, as the term suggests, are based on the concept of opportunity costs: the value of using an environmental resource for a particular purpose is approximated with the value in forgone income from alternative uses of that resource. (Dixon *et al* 1988).

The second set of pricing techniques relies on data from *actual* costs of maintaining or preventing environmental degradation as a proxy for environmental value. This set includes '*cost-effectiveness*' analysis where a predetermined goal or objective regarding the quality of an environmental asset is set and then the most cost effective means of

⁷ See Freeman (1993) for a thorough discussion.

achieving it are chosen and '*preventive or mitigation expenditure*' approaches where the value of an environmental recourse is approximated by the cost of the preventive measures that people are willing to pay to avoid any damage to it or from the cost savings obtained from a reduction in maintenance cycles due to reduced damage rates.

The third set of pricing methods is similar to above but relies on *potential* (as opposed to actual) costs as proxies for environmental value. These include '*replacement cost*', '*relocation cost*' and '*shadow-project*' approaches.

Pricing techniques have been widely used since they mostly rely on real price data and can provide useful information for appraisal purposes. Yet they suffer from serious limitations. The dose response approaches do not account for neither behavioural adaptations nor price responses (Navrud 2000) which can lead to over or underestimation of environmental damage. Potential cost approaches produce ad-hoc values that may bear little relationship to true social values. Actual and potential cost techniques entirely disregard the benefits of change in the quality of environmental resource and only provide cost information. This is inadequate for a complete cost benefit analysis (Lovett *et al* 2001). Despite its initial appeal cost-effectiveness approaches suffers from the inevitable problem of having to assign 'weights' or 'degrees of importance' to the indicator of effectiveness.

Overall both valuation and pricing techniques rely in individual preferences (through hypothetical or surrogate markets or through price information). Yet, the latter do not capture total *social net value* since they do not include benefits but instead rely on price data to provide (often arbitrary) information on merely the costs of environmental changes. This places valuation techniques higher up the 'preference reliance' scale. Pricing techniques such as the '*preventive or mitigation do not provide* the correct measure of the benefits derived by society from reduced damage in environmental resources. The correct measure of economic value (in terms of economic welfare theory) is given by the public's willingness to pay for reduced damages (or, equivalently, the willingness to accept to tolerate these damages). WTP to prevent damage may be larger, smaller or equal to maintenance or mitigation costs. In the case of environmental and cultural resources calculation of maintenance costs may seriously underestimate the damages since, not only will non-use values probably be relevant, but maintenance practices

may not prevent damage from occurring and that a part of the value may be irreversibly lost when the original resource/material is altered or replicated (Pearce and Mourato 1998).

Finally, stated preference, as opposed to revealed preference, valuation tools are currently considered the only method of being able to capture both use and not use values. In this respect they top the 'preference reliance' spectrum

3.2 Participatory and or Deliberative Approaches.

Participatory approaches have been suggested as an alternative to pure economic decision making process that could possibly avoid some of the limitations of valuation techniques while allowing a platform for individual preferences to feed into environmental decisions. The citizens jury approach is one of the most explicit applications of participatory decision making processes that has been used on several occasions in the US and Europe.⁸ The approach has been modelled after the criminal law system where a " group of randomly selected citizens, when exposed to good information presented by witnesses from differing points of view, is able to make good judgements on public policy matters even though in terms of training and experience there are many people more competent than they" Crosby (1995). The citizen jury (also referred to as value juries- e.g. Brown *et al* 1995) method was developed by the Jefferson Centre (in Minnesota, USA), a non-profit, non-partisan facilitation organisation. A randomly selected group of about a dozen jurors, designed to represent a microcosm of their society, is impanelled to study a specific local or regional public policy issue. The facilitating organisation develops a narrow 'charge', which is presented to jurors at the beginning of the process. The charge generally contains a clear statement of the problem to be addressed, often asking jurors to chose between three or four pre-selected options, and subsequent follow-up questions to consider. The jurors, who are paid for their time, participate in hearings over 4-5 days, facilitated by a neutral moderator. They hear from "witnesses" presenting a wide range of views on the issue. Jury members may question witnesses. The jurors then deliberate and issue findings and recommendations to policy makers. The process is designed, like a

⁸ Examples of the use of such techniques in the United Kingdom include a 1997 citizen's jury organised by the Welsh Institute for Health and Social Care on the subject of genetic testing for common disorders in the National Health Service. The first attempt to apply the Danish model of consensus conferences involving a cross-section of the lay public was the 1994 three day Conference on plant biotechnology organised by the Science Museum in London and funded by the Biotechnology and Biological Sciences Research Council. See Royal Commission on Environmental Pollution (1998) 21st Report Setting Environmental Standards Cm 4053 HMSO, London.

criminal jury, to examine a narrowly defined charge. Jurors receive limited background information and training, and the process does not promote critical inquiry into issues outside the limited mandate (Tickner and Ketelsen 2001, Renn, et al., 1995). As the decisions are made by majority vote, minority positions may not be adequately considered in the jury discourse. And, of course, currently these jury decisions have no legal weight but may, or, may not have a direct, formal input to the policy making system. Indeed, the use of the term 'jury' is to some extent unfortunate in that it may imply a body with the power to decide a particular issue. It is both preferable and more legitimate to view such mechanisms as a method of providing information input to the policy process.

Consensus conferences and planning cells are two mechanisms that are very similar to citizen juries. They differ from the latter in that they engage citizens in examining broadly defined questions of regional or national importance (see Dienel and Renn, (1995), Joss and Durant (1994)).⁹

Further scenario workshops, focus groups sessions, and other such models of deliberative decision-making have been used as vehicles for goal-setting and alternative assessment. In Europe, several governments have undertaken "scenario workshops" to develop future visions for a country or region. They involve different groups (residents, government, academics, business, etc.) and address broad "how" questions, such as how to develop a sustainable community or how to address toxic contamination. Often goals are set and strategies are developed to achieve those goals. In the U.S., sustainable community planning exercises have been undertaken in various locations (Tickner and Ketelsen

⁹ The lay panel in planning cells is the main actor in the process, determining the expert panel that provides the information, determining the questions to be asked, and reaching consensus. The process consists of three steps: education and reception of information on the topic, so that the panel members can formulate specific questions to be explored; processing of information through panel discussions, hearings, and questioning of experts; and group deliberations and findings. (Dienel and Renn, (1995); Sclove and Scammel, (1999), Fixdal, 1997)). The planning cell procedure draws from Multi-attribute Utility Theory to elicit values, criteria, and attributes and the assignment of relative weights to the different value dimensions. Participants are asked to rate each decision option on each criterion that they deem important. Each criterion is weighted against each other criterion resulting in a matrix of relative weights and utility measures for each option and each criterion. Both tasks (the transformation in utilities and the assignment of trade-offs) are performed individually and in small groups (Dienel and Renn, (1995)). The process is facilitated by a neutral third party. Results are generally widely distributed in the media and are the basis for further local hearings. Consensus conferences generally address broader issues than normally addressed by experts, and they issue broader recommendations. A Norwegian lay panel on genetically modified foods, for example, found that such foods were not needed because the selection and quality of food was already sufficient and there was too much uncertainty about the potential impacts of these foods on health and the environment. (Tickner and Ketelsen 2001). For a review of applications of consensus conferences and planning cells in Europe and the US see Dienel and Renn, (1995)).

2001). Citizen Advisory Committees (CACs) have been used in the US and Canada (since the early 1980's) to provide advice to federal, state and local government on implementing environmental law, promulgating regulations, and issuing permits and for planning of potentially polluting facilities. As in citizen juries a charge is given to the CAC (usually by the governmental agency responsible to resolving the problem at hand), yet its members are usually appointed as opposed to chosen on some quota sampling method. Members include interest groups and representatives of the constituency affected by the environmental issue. The main function of the CAC is to achieve some form of reconciliation among the participants rather than being instrumental in solving a particular problem (see Vari (1995), and Lynn and Kartez (1995)). It suffers from the 'small numbers' problem akin to all similar participatory methods but has the advantage of allowing public participation in a procedural stage where no preliminary decision have been made. Thus its scope does not have to focus on the final decision but can include the definition of goals and constraints.

It is important to be clear about both the role and limitations of such deliberative methods. In its 1998 report on environmental standards, the Royal Commission on Environmental Pollution promoted their development as a means of securing improved information about the nature of public values, and made a clear distinction between preferences and values which were described as "beliefs, either individual or social, about what is important in life and thus about the ends or objectives which should govern and shape public policies." (para 7.3). The Commission argued that values as described were not necessarily performed but for many people emerged out of discussion, debate and challenge, and as such were not suitable for analysis by conventional economic techniques. Furthermore it distinguished deliberative methods such as citizens' juries from stakeholder forums or conferences whose primary purpose was to seek an understanding or consensus between existing interests with a pre-conceived view or agenda. Despite promoting the use of new deliberative techniques, the Commission provided a warning that, "No method for determining or articulating people's values, whether traditional or novel, provides a guaranteed solution." (7.42), and that "The fundamental purpose of these new approaches is, not to produce a 'right answer', but to illuminate the value questions raised by environmental issues in order to identify the

policies around which consensus is more likely to form and enable decisions to be better informed."¹⁰

Economists have lately recognise some of the appealing features of these methods and are attempting to develop 'hybrid' methods that combine economic and participator approaches. Notable examples are the Market Stall (McMillan et al 2000) and the Valuation Workshop approaches (Kenyon and Hanley 2000). We shall turn to these approaches in more detail in the section on the role of information in environmental decision making.

3.3 Expert Based Approaches

Expert based environmental decision making processes can also be classified into revealed and stated preference techniques where the preferences are those of policy makers, experts or stakeholders as opposed to individuals. The *implicit valuation* method derives values from the information that is implicit in the decisions of policy makers (Navrud 2000).¹¹ The method assumes that the decisions of policy bodies made under conditions of complete information about the effect on environmental resources form a particular development decision reflect the social value of these resources. (Navrud 2000)

Turning to stated 'preference' approaches, Multi-Criteria Analysis (MCA) consists of a family of decision making approaches¹². MCA requires policy makers, experts and/or stakeholders to identify a set of decision making criteria and a scoring scale for each criterion (one such criterion could be the maximisation of economic benefits and the scale would be money). The various decision criteria are then weighted (alternative means of doing this are possible). The scoring of alternative environmental decision policies against the weighted criteria are then considered and the choice of the most appropriate

¹⁰The Government's response to the Royal Commission's report (Cm 4794, July 2000) accepted that deliberative processes could make a valuable contribution to policy making but also noted problems such as stakeholder capture and over-dominance by the articulate.

These fora may allow for the better articulation of non-economic values but they are likely to have little to say about economic values. In citizens' juries, for example, jurors may be seen as acting on behalf of society as a whole (maximizing social as opposed to economic welfare) (Brown et al, 1995). They may also be more suitable for dealing with environmental issues at a local or sub-regional level, and their use at, say, European or federal levels of government may raise serious practical and theoretical difficulties. Some such as Vari (1995) argue that valuation methods are therefore preferable for larger scale environmental issues, though this must be questionable to those who consider that such methods are ill-suited to reflecting questions of moral value in the sense used by the Royal Commission.

¹¹ See Carlsen et al (1994) for an application of the Implicit Valuation method.

alternative is made. Some variants of MCA are similar in spirit to the approach followed in choice experiments (they both derive implicit tradeoffs between attributes of an environmental good (in CE) or between the criteria of a particular environmental decision (in MCA). Yet, they differ in that MCA relies on experts, interest groups, and stakeholders to determine, the criteria, their scale and weight in the decision making process (while CE relies on individual preferences).

The *Delphi technique* relies on information obtain from surveys of experts on the environmental issue at hand.¹³ The experts are preferably selected from various fields and are typically interviewed more than once. The size of the panel varies considerably from under 10 to a few hundred. At each interview round they are presented with the evaluations of the other experts and are asked to re-assess their opinion based on this new information. The method is used to either obtain a consensus or a characterisation of the distribution of experts' valuations. (Pearce and Mourato 1998). The results of such an exercise usually do not derive monetary valuations for natural assets but rather provide information that can assist in ranking environmental resources (on ecological criteria) or in undertaking some form of cost-effectiveness analysis.¹⁴ *Policy juries* approaches (expert panels) differ from Delphi methods in that group interaction is allowed. Finally a broad range of *stakeholder involvement* mechanisms have been used which include formal and less formal mechanisms whose purposes may center on information elicitation and exchange, on advice-giving, or on decision making. These mechanisms may overlap with those that encourage public participation (e.g. juries), but stakeholder involvement does not typically include all of "the public" nor are stakeholders limited to "the public" Stakeholder involvement is thus a more targeted approach than public participation, and the questions it seeks to address are often more focused (English et al 1993).¹⁵

Conclusion: Preference and expert based environmental decision making processes differ in their reliance and usage of individual preference. The root of the divide can be traced to disagreements on the concept of economic value as applied to environmental decisions,

¹² See for example Nijkamp and Voodge (1984) for an introduction to MCA.

¹³ The technique was by developed by the Rand Corporation during the 1950's and 1960's (see Pearce and Mourato 1998).

¹⁴ Kuo and Yu (1999) use the Delphi technique to assist selection of which areas to be designated as national parks in Taiwan while Macmillan et al (1998) use this method for cost-effective analysis of woodland ecosystem restoration.

¹⁵ For a review of stakeholder involvement schemes see English et al (1993), Beierle (2000), and Barendse (1998). For an application of integrating stakeholder analysis in non-market valuation see Kontogianni et al (2001).

to disagreements on the moral and/or foundations of using individual preference (and economic values) as inputs into environmental decision processes and to disagreements as over the role of information. These three levels are discussed in turn in the sections below in relation to both environmental policy and damage assessment decisions.

4. The concept of economic value

At the conceptual level the debate over the use of individual preferences in environmental decision making falls back on the debate on the meaning and validity of the concept of economic value in general and as applied to environmental issues in particular. Comprehensive coverage of these topics can be found in Foster (1996), Crowards (1995), Kopp 1992, 1991). Space limitations do not allow for a thorough coverage of these issues. Instead we will focus on the conceptual validity of 'value' as applied to environmental resources.

One source of confusion in the literature discussing the role of individual preferences in environmental decision making can be traced to the differential usage of similar terms. For example the term 'value' is a particularly good example of such confusion which means very different things to different disciplines. For economics the term 'value' has a very specific meaning and it is only this meaning that is relevant for economics. For a moral philosopher, however, both individual and societal values are treated and articulated in a quite distinct way from preferences, and certainly cannot be equated with strong preferences.

Individual preferences are important for economics as so far as they allow people to make choices over goods or more generally 'over states of the world'. The economists definition of value is an inherently instrumentalist and anthropocentric concept that is based on the idea of people making choices under various constraints (e.g. income, time, information etc). Hence, economic value implies the notion of a 'trade-off': value is the 'amount' that has to be given up in order to get something else. Money is merely used to simplify matters by providing a single metric against which all states of the world can be traded-off. Essential to this concept of trade-off is that of 'opportunity cost': the value of that which must be given up to acquire or achieve something else.

Thus, the discussion on the role of individual preferences in environmental decision making ultimately falls back on discussions on the concept of economic value as applied to environmental resources. In the most extreme case critics have argued that the concept of economics is inherently flawed when applied to environmental resources and thus should have no place in environmental decision making. The main line of attack revolves around the ideas that people simply 'don't have values' for such resources as perceived by the economist and that values for environmental resources cannot be defined in economic terms.

One thing that is overlooked or misunderstood by many critics is that the concept of economic value is nothing but a theoretical construct of the economist. Values are simply 'estimated' based on (actual or stated) choices. As Kopp (1992) points out, many critics (e.g. Gregory *et al* 1991) erroneously assume that economists considers that people have values for "things". Yet economists merely assume that people *make choices* over bundles of things and value is merely the realisation of choice i.e. what you give up to get something else.

There is nothing in well established economic theory that limits the object of choice to physical private goods. Thus, the object of choice could include environmental resources or in general public goods but can even be further extended to include 'states of the world' (i.e. an individual may choose state A over state B). Concepts explaining choice over states of the world under various constraints (income, information, uncertainty etc) are well developed (Mas-Colell, Whinston and Green 1995).¹⁶ People do make choices in everyday life that do involve trade-offs between levels of environmental quality. In essence people can be viewed as making choices over different states of the world that entail different levels of quantities and qualities of these environmental resources. Using these *observed* choices the economists can estimate the value for *using* environmental resource. These estimates lead measures of use value: values that are related to the observed uses of the services provided by natural assets.

A particular form of value that has been at the centre of much debate are so called *non-use values* (NUVs). The general/intuitive idea of NUVs as the value associated with no

¹⁶ Of course mainstream economics is not without its critics. Yet, here we focus on whether the concept of economic value is applicable to environmental resources. A full blown attack on economics offers very little to the current discussion.

direct use of an environmental resource is usually attributed to Krutilla (1967) but has since then been more vigorously defined. In economic terms NUVs are best conceptualised as a form a pure public good. (e.g. McConnell 1983). The conception of NUV acknowledges that one's welfare can be enhanced from a particular natural resource without engaging in any observable behaviour. Environmental resources provide non-consumptive services, giving rise to NUVs, and provide these services to all without the possibility of exclusion. Moreover, one's person enjoyment does not interfere with the enjoyment of others and, for the most part, one may enjoy these services without any monetary expenditure (Kopp, 1992). Public goods ever since Samuelson (1948) seminal work have been well defined concepts and can be treated with the same welfare theoretic structure as private goods. Thus at the conceptual level, the economic definition of NUVs is sound. Note, that the economic conception of economic value does not invalidate other types or conceptions of value (see Turner 2000 for a review of various conceptions of value). Yet, these are the discourse of other sciences. "Value pluralism" may be important but is beyond the domain of economics. It is the role of policy makers -not the economist- to rank the importance of other forms of values.

Objections to the concept of economic value as applied to environmental resources:

The economic definition of environmental use values as the values associated with the direct and private services provided by natural assets as well as the conception of NUVs as forms of pure public goods has raised various objections, the most important of which are reviewed below.

'Slippery Slope' Argument

Some (e.g. Rosenthal and Nelson 1991) have argued that perceiving NUVs as pure public goods may lead to a dangerous 'slippery- slope' : almost any 'good' may have a public good component and by including NUVs in CBA or damage assessment the task would become daunting. We agree that in principle anything could have a pure public good component and should thus be included in any environmental decision making process. Yet this would cause problems (e.g. over estimation of damages) if the estimates from NUVs would be *equally* large for all environmental resources (i.e. the value would not vary with the nature of the good or damage). Yet, there is no evidence that suggests that

values are in fact non-good specific and do not vary with the nature or size of the good (see Carson 2001)

'Complexity of the Good' Argument

Others have used some form of the 'complexity of the good' argument (e.g. Vatn 2000, Vatn and Bromely 1994, Clarke et al 2000, Green 1997, Jacobs 1997) which acknowledges that economic value is a valid concept but one that is *not* valid for environmental goods since these are too complex to be 'commodified'. Vatn and Bromely (1994) offer a very convincing defence of this position based on cognition, incongruity and composition problems. Yet, these arguments seem misplaced in that the economic conception of value does not 'commodify' natural resources but simply treats them as objects of choice that involves opportunity costs.

Incommensurability, incomparability and lexicographic preference arguments

This last point has been attacked by an array of *incommensurability, incomparability and lexicographic preference arguments* (Beckerman and Pasek (1996) Lockwood (1999), Rekola et al (2000), Spash 2000, 1997) that support the view that environmental resource are not proper objects of choice, cannot be used to undertake trade-offs and lead to lexicographic preference orderings.

'Citizens Vs Consumers argument'

Further criticism of the concept of economic value as applied to environmental resources comes from the argument that people's preference over these resources may change according to whether the individual is consulted as an individual (e.g. in a CV study) or as a citizen (e.g. in a citizen jury) (Sagoff (1994), Blamely et al (1995), Common et al (1997), Spash (2000), Martinez-Alier et al (1998) Edwards (1992)).

One of the implications of the line of reasoning found in the above arguments is that other social goods such as health or education would also not be compatible with an economic framework of choice. Yet clearly, people *do* make choices over matters of health, education and the environmental however complex the nature of the choices may be. The majority of these arguments concern choices made in stated preference studies. They argue that empirical evidence from these studies suggests that people do not make trade-offs over environmental resources and thus the concept of economic value is

inappropriate for assisting environmental policy decision. In essence, they are saying that people are not 'playing along' with the economists perception of value when participating in CV experiments. This may be a valid type of criticism for stated preference experiments. Yet, being an empirical issue it will not be dealt with here. What is important to note here is that these arguments fail to demonstrate that people in *any setting* (either actual or hypothetical) do not make trade-offs over environmental resource. At the conceptual level these arguments can be seen to rest on Sen's (1970) seminal work that urged economics to consider that individual behaviour can be motivated by sympathy and commitment in addition to self-interest. A model that explains human behaviour solely in terms of self-interest is defective. There have been various attempts to accommodate these arguments in CBA. For example Randall and Stoll (1983), Margolis (1982) and McConnell (1997) offer models of choice that are based on altruism motivated by sympathy while Kopp (1992) and Kohn (1993) develop economic models that in which individuals are motivated by a sense of moral commitment. An interesting research challenge that has started in the last few years (e.g. Larson and Loomis (1994)) revolves around finding ways to operationalize these theoretical developments.

Conclusion: Thus, the concept of economic value is a meaningful concept based on the notion of trade-off and opportunity cost. Whether such a value should be used in policy and damage assessment decisions is discussed in the following sections.

5. Moral and Legal Issues

Having touched upon the conceptual validity of the economic notion of environmental valuation we can now turn to even more fundamental levels of the debate. This concerns the debate over the moral and/or legal validity of using preference based values in policy and damage assessment given that the conceptual issues raised in NUV are assumed to have been resolved. That is, putting aside the conceptual problems concerning preference based use and non-use values, there are further questions regarding the moral validity of using these values for policy decisions and the legal consistency of using them for damage assessment.

The separation of the discussion between the moral relevance of individual preferences for policy decisions and legal computability for damage assessment reflects the general debate in the existing literature that acknowledges that individual preferences and expert opinion may have differential roles or varying degrees of validity in these two fields. This debate primarily has focused on the use of individual preferences that lead to so called non-use values for environmental resources and is summarised in Table 2. That is, though most economists would agree that inclusion of use values is equally valid for both policy and damage assessment decisions, there is no such consensus regarding NUVs.

The debate for the use of preference based values is conducted mostly over practical/measurement problems, the issues presented in the next two sections go much deeper. Section 5.1. presents arguments concerning the *moral validity* of using individual preferences. The main question to be addressed is under what conditions are policy makers morally obliged to consider individual preferences when making decision that have environmental repercussions. Section 5.2 is concerned with the *legal validity* of including individual preferences in damage assessment.

5.1. Moral Issues in using individual preference in policy decisions.

CBA techniques have been used (officially and unofficially) by local and state governments in both the US and EU for several decades. For a review of the institutional setting in which the use of CBA has been embedded see Loomis (2000) for the US and Bonnieux and Rainell (2000) for the EU experience respectively. Yet, in this section we discuss the *normative* role of preferences in policy decisions. Some authors have asked whether rational and moral decision makers would or should consult an account of benefits and costs as economics understand the terms benefits and costs (Randall, 2002, Copp 1985).

Economists justify the use of cost benefit analysis in environmental decision making on the following moral basis (Randall, 2002): (i) *Welfarism*: CBA is seen as an empirical test of whether proposed public actions would increase preference satisfaction and (ii) The *Potential Pareto Improvement* criterion: CBA as an empirical test for PPIs. *In essence PPI implements welfarism.*

The economists' argument rests on attempting to argue that welfarism is the most adequate moral theory for public decision making and if CBA is the direct implementation of such a 'correct' moral theory then it must be justified. Hubin (1994) argues that the reasoning that attempts to justify or discredit the use of preference based approaches by direct appeal to their underlying moral theory should be resisted. He shows that failure to justify CBA by direct appeal to welfarist moral theory does not imply that the techniques of CBA are unjustified. Hubin's argument captures the essence of what most critics against the use of individual preference get wrong (e.g. Sagoff, Spash): they focus on criticising welfarism and consequentialism (on which CBA rests). Although this is done quite successfully¹⁷ they fail to realise that undermining the moral theory of a procedure does not undermine the validity or the moral relevance of the procedure itself. Note that the point Hubin makes is *not* that the *particular* moral theory associated with conventional CBA (namely welfarism) is flawed and thus the practice of CBA ought to be suspect, but that the procedure of CBA (and the use of preference based techniques) would be justified if we were to base CBA under *any* moral theory. This implies that there is no need to seek for *the* correct moral theory to base the use of CBA since the latter would be warranted as morally relevant and justified under any moral foundation. He best summarises his argument with the aid of an analogy drawn from the use of democratic procedures. Democratic moral theory - the theory that the right action is just that action approved by the majority- is the moral foundation of democratic electoral procedures. Yet, philosophers ever since Plato have (quite easily) shown that democratic moral theory is fundamentally problematic. "But this is not concern for the democrat; she has never felt that her conviction to democratic institutions committed her to democratic moral theory. Rather, the democrat sets about justifying democracy by appeal to other more plausible moral theories. The proponent of CBA should do likewise" (Hubin, 1994, p. 177).

Hubin (1994) and Randall (2002) argue that the inadequacy of the moral foundations of CBA does not preclude the consideration of individual preferences as morally irrelevant. Hubin shows that that approach taken by many economists to demonstrate the unique

¹⁷ The most effective points against the moral foundations of CBA include: (a) CBA moral theory assigns a morally unjustified status to the current state of affairs (b) it fails to accord the appropriate role to considerations of distributive justice (c) it fails to accord the proper status to future generations and to those individual/agents (human and non-human) lacking the cognitive abilities to express WTP/WTA and (d) CBA moral theory endorses a naive form of subjectivism (Hubin 1994).

adequacy of a particular moral theory in order to justify the use of CBA is flawed. Instead Hubin shows that BCA is endorsed by *every* viable moral theory. Two arguments can be used to justify Hubin's claim: the first argument is derived from the liberal justification of the state. Under this tradition (e.g. Nozick 1974) the state is not justified on philosophical but on political grounds: individuals with very different political and moral convictions nevertheless agree on political institutions since these are viewed as necessary to the achievement of *whatever* ideas or goals these people may have. Likewise, the information contained in a CBA is morally relevant. Hubin shows the most currently held moral theories (consequentialism, contractualism, deontology) would accept that information from preference is morally relevant and useful. The second is labelled the 'probabilistic moral argument' for the funding of and reliance on CBA: the fact that the information incorporated in a CBA is deemed morally significant and useful by most currently held moral theories does not mean that such information *is* morally relevant. Yet, Hubin argues that the currently held moral theories (consequentialism, contractualism, deontology) are representative of the range of plausible moral theories. That means that it is reasonable to expect that whatever moral theory turns out to be correct, it is likely to assign positive moral value to the justification of intrinsic preferences. Therefore, it is likely to take information (even if it is less than perfect information) about the degree to which such preferences are satisfied to be morally relevant information. Hence preference based information would be valuable inputs into public decision making processes.

Further Randall (2001) points out that the idea that an inadequate moral theory might nevertheless provide some principles for institutional design is entirely consistent with the standard justification of pluralism found in many contemporary philosophers (e.g. Williams (1985), Rorty (1992)). The increasingly emerging acceptance that the contest amongst ethical theories is inconclusive logically entails that the ethical grounding of approaches to environmental decision making should be found in ethical pluralism: policy makers/agents with different foundational ethics can nevertheless find agreement on a particular real world policy resolutions through agreed upon rules of action (heuristics).

What is the role of individual preference in policy decisions

If the information of CBA is morally relevant and then must be used then, what is the role and range for CBA? Most economists take the more modest stance that CBA merely provides information to decision makers which is to be treated as an advisory and not decisive type of input to any decision making tool (e.g. Arrow et al 1996, Kopp 1992).

Randal (2002) and Hubin (1994) argue that for both outcome-oriented and process-oriented reasons it can be argued that the role of CBA must be illumed to that of informational input into a broader decision making framework.¹⁸ Yet, this raises the question of how should we weight the importance of the information provided by CBA in each circumstance. Possible suggestions to this problem (the section follows Randall 2002) include:

- 1) Individual preference can provided input towards finding rules of action (heuristics) rather than attempting to settle the details of a particular decision. Thus individual preference can facilitate the *procedure* of environmental decision making if not the actual details of the solution.
- 2) Information form individual preference can be used *subject to constraints*. For example CBA tools can be used in so far as this use does not infringe on a set of basic well-defined set of human rights. We can view the role or use Constitutions in liberal societies as embodiments of such constraints.
- 3) Randall's 'don't do anything disgusting' argument also sets the basis for setting constraints to CBA and assigning weights to information obtained from CBA in particular circumstances. Randall grounds this argument in contemporary theories of ethical pluralism.

¹⁸ Reasons for rejecting an unrestricted/decisive role for CBA include: (a) CBA *itself* does not allow any role for side constraints on government action (e.g. CBA itself would not allow for a constitution) (b) CBA only captures economic values. Non economic (e.g. intrinsic, non-anthropocentric values) are not captured (see Turner 2000) (c) the reliance on WTP/WTA skews the analysis in favour of those with greater initial endowments; (d) CBA is indifferent to matters of distribution (this is a consequence of the fact the CBA is rooted in consequentialist moral theories) (Hubin 1994). These are 'result oriented' objections to CBA (i.e. there are objections directed against the results kind of choices made as a result of strict application of CBA). Yet, there may be even more fundamental 'process-oriented' objections. For example, most would object to dictatorial procedures even if they did reach the same results as democratic ones.

4) The safe-minimum standard (SMS) approach to using individual preference techniques (Bishop (1978)) has been suggested as a response to uncertainty about the workings of environmental systems. Economists have criticised SMS on the basis that it requires sharply discontinuous preferences and on the inability to analytically show that a risk averse rational agent would adopt a SMS constraint (Ready and Bishop, 1991). Yet, Randall (1991) and Randall and Farmer (1995) arguing from an existential ethical pluralism stance provide support for the use of the SMS constraint in using preference based CBA tools.

5) Norton's (1992) 'appropriateness matrix' may also provide insights as to the appropriate role of preferences in environmental decision making. The reasoning behind this approach is to weigh the information from individual preference according to two factors: the environmental damage cost involved and the degree of irreversibility of any losses. When both of these factors are high then individual preferences are to be given less weight.

Conclusion: the inadequacy of welfarism as *a moral theory* does not invalidate the use of the cost benefit analysis as *a procedure* for guiding environmental policy decisions. Further, it can be argued that individual preference are relevant to policy makers *no matter* which moral theory is used but CAB should, nevertheless, be confined to an 'advisory', 'information-providing' rather than to a decisive role.

5.2. Legal issues related to using individual preference in damage assessment.

The discussion now turns to review the debate on whether individual preferences and the economic conception of use and non-use value is compatible with the legal framework for awarding damages.

The following sections review the evolution of the current *legal setting* in the US and the EU with respect to incorporating individual preference in damage assessment estimation. This is followed by a section on the *legal theory* arguments surrounding this issue.

5.2.1 Current Legal setting in the US

Compared to the EU, the US legal system has more readily incorporated the use of individual preferences in assessing damages to environmental resources.

Government agencies as trustees

In the US the atmosphere, oceans, estuaries, rivers, and plant and animal species are public trust resources. The primary and most recent federal statutes containing provisions establishing management agencies as trustees of natural resources are the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA or more commonly known as Superfund)¹⁹, the Oil Pollution Act of 1990 (OPA), and the National Marine Sanctuaries Act of 1996 (NMSA). These Acts call on the President and State governors to designate officials to serve as trustees for natural resources on behalf of the public. Trustees, then, assess and recover damages to trust resources resulting from a discharge of oil, a release of a hazardous substance, or physical injury (Penn 2000). Federal trustees include the Department of Interior (DOI) and the National Oceanic and Atmospheric Administration (NOAA). The statutes also acknowledge various State or local governments and Native American Tribes as trustees.

Under all three statutes mentioned above, natural resource damage claims are based on the *restoration* of public resources and have three basic components. The measure of damages is (1) the cost of restoring, rehabilitating, replacing, or acquiring the equivalent of the damaged natural resources (primary restoration); (2) the diminution in value of the natural resources pending recovery of the resource to baseline, but-for the injury (interim lost value); and (3) the reasonable cost of assessing those damages. The first component provides for restoration of injured resources to their baseline level. The second component compensates the public for reductions in the value of resource services pending recovery of the injured resources. (Penn 2000, p.1).

Apart from the CERCLA, OPA and NMSA trustees can currently sue for environmental damages under the Clean Water Act of 1972, the Superfund Amendments and Reauthorization Act of 1986, the Deepwater Port Act of 1996, the Trans-Alaska Pipeline

¹⁹ CERCLA was amended by the Superfund Amendments and Reauthorization Act (SARA) in October 1986. The SARA encouraged greater citizen participation in making decisions on how sites should be cleaned up.

Act of 1973 and the Outer Continental Shelf Lands Act of 1953. Some state laws also allow damage recovery and provide various types and levels of coverage (see Breedlove, 1999 for more details).

Inclusion of Use and Non-Use values into the Statutes

The amount received by the trustees are to be used "only to restore, replace, or acquire the equivalent of such [damaged] natural resources" (CERCLA Section 9607). The statutes allow for damages to include restoration cost as well as any permanent or temporary loss in use or non-use values. It was the 1989 case *Ohio Vs Us Department of Interior* motivated by the Exxon Valdez Oil which granted equal weight to use and non-use values in damage assessment and greater scope for the use of stated preference techniques.²⁰

Note that the allowance of NUVs in the scope of damages implies the use of stated preference techniques since these were (and generally still) considered the only feasible method of estimating such values. Further individual preference based valuation techniques (including CV and TV methods) were given "rebuttable presumption" which implies that US legislators found that preference based methods of valuation were reliable and the best available techniques for quantifying natural resource damages (Loomis 2000). Defendants can appeal the specific application of these methods but not the methods in general.²¹

NOAA Panel Recommendations of the inclusion of Preferences in Damage Assessment.

As a response to the industry's fierce opposition to the use of preference based techniques and especially the use of the CV method for estimating non-use values the Department of Commerce convened a panel consisting of leading economists (including the Nobel prize

²⁰ Shavell (1993) notes that the possible uses of stated preference techniques in litigation can extend beyond damage assessment but may in principle be used for (a) the determination whether a party who has caused harm to a natural resource is liable for negligence (where liability is based on negligence rather than strict liability). Shavell explains this arguing that determination of negligence requires assessment of the magnitude of possible harm and it is for the latter purpose which stated preference techniques could be useful; and (b) the assistance in calculating the degree of cleanup required of a party responsible for harm to a natural resource. This is so because the value of the resource will affect the amount that is rational to spend on cleanup (Shavell, 1993, p.373).

Laureates R. Sollow and K. Arrow) to assess the validity of the CV method and the use of non use values. The NOAA panel (Arrow *et al* 1993) cautiously supported the use of NUV and stated preference techniques to be used in damage assessment.²² They concluded that information provided by stated preference techniques is as reliable as marketing analysis of new products and damage assessment normally allowed in court proceedings. A stringent list of guidelines were recommended to assure reliability and validity.

The US NRDA guidelines

The US Natural Resource Damage Assessment (NRDA) guidelines are based on the provisions of the OPA (1990). These state that damages must be assessed so that the environment and public are 'made whole' for injuries to natural resources and services resulting from an incident involving a discharge or substantial threat of a discharge of oil. This goal is achieved through the return of the injured natural resources and services to baseline and compensation for interim losses of such natural resources from the date of the incident until recovery. (OPA 1990, 33 U.S.C. 2701). The purpose of this part is to promote expeditious and cost-effective restoration of natural resources and services injured as a result of an incident. To fulfil this purpose, this part provides a natural resource damage assessment process for developing a plan for restoration of the injured natural resources and services and pursuing implementation or funding of the plan by responsible parties. This part also provides an administrative process for involving interested parties in the assessment, a range of assessment procedures for identifying and evaluating injuries to natural resources and services, and a means for selecting restoration actions from a reasonable range of alternatives. (MaCalister et al 2001).

The OPA directs trustees to: 1) return injured natural resources and services to the condition they would have been in if the incident had not occurred; and 2) recover compensation for interim losses of such natural resources and services through the restoration, rehabilitation, replacement, or acquisition of equivalent natural resources and/or services. In 1997 NOAA issued a document to guide trustees in assessing

²¹ The 'rebuttable presumption' status of preference based techniques was attacked by industries, yet both the US Court of Appeals (US Court of Appeals, 1989) and Department of Interior (DOI 1991) found that preference techniques to be reliable for estimating both use and non-use values.

²² The panel concluded "that CV [contingent valuation] can produce estimates reliable enough to be the starting point of a judicial process of damage assessment, including lost passive-use values."

damages to natural resources from a discharge of oil. The document provides a blueprint that enables natural resource trustees to focus on significant environmental injuries, plan and implement efficient and effective restoration of the injured natural resources and services, and encourages public and responsible party involvement in the restoration process (Penn 2000).

Under the new rule, the natural resource damage assessment process is divided into the five phases (see Box 1 for a summary). This process is designed to restore injured natural resources and services to the condition that would have existed had the damage not occurred and compensate the public for the losses experienced from the date of the damage until the affected natural resources and services have recovered.²³

In considering the restoration activities that make the public whole, trustees must consider compensatory restoration that provides services of the same type and quality, and of comparable value as those injured. If, in the judgement of the trustees, compensatory actions of the same type and quality and comparable value cannot provide a reasonable range of alternatives, trustees should identify actions that provide natural resources and services of comparable type and quality as those provided by the injured natural resources. In order to provide restoration of the same type and quality or comparable type and quality, the restoration should generally occur in the vicinity of the injury. After identifying the types of restoration actions that will be considered, the trustees have to scale those actions that will make the public and the environment whole. “Scaling” is usually referred to in the context of determining the size of the compensatory restoration action to ensure that the value of resource and service gains equals the value of interim losses due to the incident. The appropriate approach to determining compensatory restoration scale depends on the type of available replacement resources and services relative to those injured. The two major approaches are the service-to-service or resource-to-resource approach and the valuation approach. The former approach (hereafter referred to as service-to-service) is a simplification of the valuation approach and is used when the injured and replacement resources and services are of the same type, quality, and comparable value. The valuation approach applies under conditions of comparable type and quality, but not of comparable value. (Penn 2000, p. 4)

The service-to-service approach is similar to in-kind trading between the injured and replacement resources and services. This approach requires that the lost and restored resources and services be the same type and quality, and of comparable value so no explicit valuation is necessary. Under this approach, the scaling analysis simplifies to selecting the scale of a restoration action for which the present discounted quantity of replacement services equals the present discounted quantity of services lost due to the injury. Unsworth and Bishop (1994) have proposed a variant of the service-to-service approach for natural resource damage assessment. The habitat version of the approach, habitat equivalency analysis, has been applied in a number of damage assessment cases and has been largely accepted by the responsible party community.

To determine the scale of compensatory restoration in practice, a number of parameters have to be identified. The services lost due to the injury are quantified by defining the time of the injury, the extent of the injury, the reduction in resources and services from baseline, and the trajectory of recovery back to baseline. The parameters that define the benefits of restoration include when the restoration project begins, the time until the project provides full services, the productivity of the project through time, and the relative productivity of the created or enhanced resources and services compared to the injured resources and services. A discount rate is applied in quantifying the lost and replacement services because the services occur in different time periods and they are not comparable otherwise. Without identifying these parameters, it would not be possible to determine how much compensatory restoration is required to make the public whole.

An alternative framework for scaling is the valuation approach. Valuation is applicable when the injured and restored resources and services are not of the same type, quality, and value. The valuation (or value-to-value) approach calculates the value of gains from the proposed restoration actions and the value of the interim losses. Procedures used to calculate values include the travel cost method, hedonic price models, conjoint analysis, and contingent valuation. Scaling an action then requires adjusting the size of restoration to ensure that the value of action gains equals the value of the interim losses. Responsible parties are liable for the cost of implementing the restoration action that would generate the equivalent value, not for the calculated interim loss in value.

²³ For full details of the damage assessment process recommended by the OPA see

In some circumstances, the “value-to-cost” variant of the valuation approach may be employed. Value-to-cost is only appropriate when valuation of the lost services is practicable but valuation of the replacement natural resources and services cannot be performed within a reasonable time frame or at a reasonable cost. With this approach, the restoration is scaled by equating the cost of the restoration plan to the value (in dollar terms) of losses due to the injury. The value-to-cost approach is equivalent to the framework for compensation prescribed by the CERCLA damage assessment regulations.

As a generalization, it is often with impacts to human use services, for example recreational fishing and recreational beach use, that the trustees cannot identify restoration projects with services of comparable value and must therefore apply the valuation scaling approach. In the assessments with more significant impacts where time and cost intensive valuation studies can be justified, the trustees can determine the amount of natural resources and services that must be provided to produce the value that was lost. Typically, the injured and replacement resources and services are measured and compared in dollars but it may be possible to implement the valuation approach with a single survey eliciting the direct resource-to-resource trade-offs between the injured natural resources and potential compensatory natural resources. When the trustees cannot justify the time or cost needed to value the compensatory restoration action – usually in assessments of smaller recreational impacts – the trustees may employ the value-to-cost valuation approach. (Penn 2000)

Practical Experience

The use of CV in damage assessments under OPA to value both the injuries and the compensatory restoration actions has been infrequent. Existing CV studies have been used under the value-to-cost approach. CV literature values of a fishing day or beach recreation day have been transferred and used to value beach use and fishing impacts due to an oil spill. The dollar value of losses has then been spent on restoration projects. (Penn 2000)

Site specific contingent valuation has been used for damage assessments pre-OPA and under CERCLA. Probably the most publicized case that used a CV is the Exxon Valdez

oil spill in Alaska. In the Montrose damage assessment, which settled recently, trustees used a CV to assess the value of impacts due to DDT contamination off the coast of California. In both cases the trustees recovered the value of interim losses. (Penn 2000)

To date most cases involving damage assessment based on individual preference have been settled out of court. Hence the effect of individual preference techniques on damage assessment has been primarily indirect (i.e. in that it has induces out of court settlements). (Foster 1996).²⁴

The implementation of the NOAA NRDA guidelines has altered significantly over time. In particular, a shift in emphasis occurred in the mid-1990s, with respect to approaches to determining the scale of compensatory restoration. In the early 1990s, economic assessments of natural resources damage were conducted with the *objective of determining a money value of damage* that, if paid as compensation, would make the public whole again. This process involved applying the theory and methods of welfare change measurement, and often made use of monetary valuation techniques. The money amount of liability included the costs incurred by the public trustees in assessing the damage, and the *value* of the appropriate scale of compensatory restoration. (MacAlister et al 2001

The procedures for NRDA have altered somewhat since the mid-1990s. In the current guidelines for NRDA, and the applicable legislation, there is a pronounced shift towards resource compensation and the resource-to-resource (or service-to-service) approaches to determining the scale of compensatory restoration. Economic assessments of natural resources damage are conducted with the *objective of determining the scale of compensatory restoration that would make the public whole* again. In general, the preferred approach for determining the scale of compensatory restoration is resources-

²⁴ One of the most well-known examples where the results from preference based valuation methods were put aside in favour of a settlement is the Exxon Valdez oil spill. The damages from an oil spill caused by Exxon off the shores of Prince William Sound in the State of Alaska were assessed to lie between \$3 and \$15 billion (Carson *et al* 1994). Exxon settled out of court to pay a total of US\$1 billion. See Breedlove (1999) for more examples of US legal cases in which defendants opposed the use of information from stated preference techniques to assess environmental resource damages. Successful use of preference based techniques for the estimation of environmental damages was made by the State of Colorado which sought to quantify the damage caused by the Eagle Mine. The State used stated preference techniques to estimate both use and non-use values (see Kopp and Smith 1989). Rowe et al (1992) used stated preference techniques to quantify the damages (in terms of loss in use and non-use value) of an oil spill that soiled the coastland of the State of Washington and Vancouver Island (BC, Canada). See Loomis (2000), Hanemann

for-resources (or service-to-service) compensation, where possible. However, it should be noted that this does not eliminate welfare-economic considerations. Rather, the welfare-economic task is to determine the welfare-restoring scale of compensatory restoration, where compensatory restoration could be considered an in-kind payment (rather than a money payment) to compensate the public. Economic techniques, such as choice modeling, which may be used to determine trade-offs between different resources, or between resources and money, are therefore relevant for the assessment procedures. Monetary valuation procedures are still used when there are no appropriate compensatory restoration options (MacAlister *et al* 2001).

In the current guidance documents CBA may be used in different contexts as follows (MacAlister *et al* 2001):

- If it can be shown that the costs of primary restoration are grossly disproportionate to the benefits, incomplete primary restoration may be permitted. The responsibility for demonstrating this rested with the party responsible for the damage;
- Welfare-economic principles are implemented in determining the appropriate scale of compensatory restoration (viewed as an in-kind compensating payment); and
- If it can be shown that the costs of appropriately-scaled compensatory restoration are grossly disproportionate to the benefits, a modified restoration plan is developed.

In simple cases, dealing with modest injuries to homogeneous resources, scaling is a relatively straightforward matter. Unsworth and Bishop (in Randall, 1997) dealing with a few acres of damaged wetlands, assume that restored wetlands will be homogeneous to injured wetlands and, from that point, scaling is largely a matter of determining the time-path of resource recovery and applying the appropriate discount rate. For larger and more complicated injuries, methods such as choice experiments are appropriate. However, it has been recognized (e.g. MacAlister *et al* (2001)) that such methods, while promising, have yet to be validated in large-scale application under litigation conditions.

(1992) and Ward and Duffield. (1992) for more examples of the use of preference based techniques in US legal damage assessment.

5.2.2. Current Legal setting in the EU.

Though EU member states, in one form or another, include 'use' values in the determination of damages (usually through the reliance of market prices to assess restoration costs) the incorporation of non-use values is wanting. In EU Member States environmental liability regimes, there is only limited experience regarding direct valuation of natural resource damage. Hence, individual preferences are used only as far as they are reflected in actual market prices.²⁵

Yet, a recent White Paper on Environmental Liability (Com (2000) 66) has opened the way for the inclusion of individual preferences to determine economic values (in addition to market prices) for resource damage assessment in the statutes of EU damage assessment procedures. The objective of the White Paper is to explore how the polluter pays principle, one of the key environmental principles in the EC Treaty, can best be applied to serve the aims of Community environmental policy. Avoiding environmental damage is the main aim of this policy. The White Paper explores how a Community regime on environmental liability can best be shaped and will form the basis for the proposed new Liability Act. The White Paper states that:

"Economic valuation of biodiversity damage is of particular importance for cases where damage is irreparable. But if restoration of damage is feasible, there also have to be valuation criteria for the damaged natural resource, in order to avoid disproportionate costs of restoration. A cost-benefit or reasonableness test will have to be undertaken in each separate case."

The document endorses the use of revealed and stated preference techniques but it is cautious about the cost involved in undertaking original on-site studies. Thus the development of benefit transfer method is encouraged

²⁵ In Italy for example only if - for whatever reason - restoration is infeasible, damages are quantified not on the basis of restoration costs, but by reference to principles of equity, taking into account the extent of

5.2.3 The legal consistency of using economic values in damage assessment

Despite the introduction of economic values and stated preference techniques in the EU and US legal frameworks, the debate goes on regarding the legal validity or compatibility of using economic values and individual preferences for the determination of damages. As is the case in the debate on the validity of CBA tools in environmental policy decisions, a sizeable part of this debate concerns measurement issues (e.g. Shavell 1993). The objections raised for the use of individual preference based values mainly concern estimates of so called NUVs. The concerns raised are mostly the same found in the general debate on the validity of using estimates derived from stated preference techniques in CBA. Yet, there are two particular arguments raised in relation to using stated preferences estimates for damage assessment. The first, concerns accuracy. Some have argued (e.g. Desvousges *et al* 1993) that damage assessment requires a much higher degree of accuracy than that required for welfare estimated for CBA. The risk associated with this inaccuracy and variability of estimates across different CV studies may lead firms to invest in excessive resources in preventing environmental damages.

The second point of concern has to do with the costs required to undertake a 'state-of-the-art' CBA. Some have argued (e.g. Shavell 1993) that in many cases the cost of undertaking the study may exceed the damage itself and thus CBA may not pass a CBA itself!

Shavell concludes that this reasoning is consistent with the actual law of damages for torts (civil liability or causing harm). The legal system excludes components of loss from tort damages if these components are too difficult to estimate, even though these components are often positive. Similar principles govern the calculation of damage in contract and other areas of law (see for example §§9.8 and 9.10 Fleming 1983). Shavell interprets the provisions of the current legal system as implying that inclusion of preference based estimates of loss would be costly, increase the bias and risks of the legal procedures, whereas exclusion would not greatly harm incentives when "the true

the damage to natural resources, the economic benefits, and the extent of the damage caused by the

elements of loss are not very large" (p. 379). Yet this line of reasoning breaks down if we accept that NUVs are a large component of natural resources value. Also, it tells us little if inclusion of preference based values is legally justified on theoretical legal grounds granted that measurements of such values could be undertaken cheaply and accurately.

That is, the more fundamental issues with respect to using NUVs and individual preference in damage assessment are not issues of measurement but concern the problem of whether individual preference based values are compatible with the legal framework of damage assessment.

The debate over the legal consistency

Daum (1993) examines the extent to which damages calculated using preference based techniques correspond to ordinary notions of compensable damage and loss. Daum argues that though the *ex ante* use of preference based values for the determination of benefits may be valuable for policy decisions, it does not follow that it is equally useful or desirable to use these values *ex-post* for the measurement of damages. Daum argues that the purpose of the CERCLA was to provide a measure of damages for environmental resources that accomplishes the purpose served by established measures of damages in ordinary property damage cases. Those purposes are generally recognised to be two: first measures of damages have a compensation aspect and second they have a restoration aspect. Daum argues that preference based estimates of damages and in particular those measuring NUVs cannot achieve the compensation function of ordinary measures of damages and that these values are unnecessary to achieve the restoration function.

Regarding the failure of individual preference based value to provide adequate measures of compensation, Daum argues that compensating someone for a loss means that the court can identify what has been lost and calculate its value. If this is not achieved, the damages paid are not compensation for a loss incurred but for something else. If damages are to truly reflect the compensation for loss, the amount to be paid should be determined by a calculation that (a) identifies the damaged good and (b) identifies the present and future benefits derived from the damage good (and only the damage good) and (3) value those benefits on the basis of their value as of the time the damage occurred (Daum 1993,

claimant when taking response actions such as clean-up measures. (Brans and Uilhoorn, 1997)

p. 393). According to Daum this model of damage calculation embedded in tort law is not compatible with the type of damages that are derived from (stated) preference based techniques for two reasons: first, stated preference studies are always carried out after the damage has occurred and does not reflect pre-existing values independent of the accident and of the valuation process and second, stated preference studies simply do not estimate real economic value but something else (e.g. a sense of moral duty). Yet, the latter claim is not justified by empirical evidence, since if Daum was correct than all stated preference techniques would produce the same value. This is not the case. In any event this is a measurement issue and thus will not be dealt with further. The first charge, however, is much more substantial. Economists do recognise that WTP to avoid damage is a different welfare concept than the value of an environmental resource as a result of harm. This simply means that stated preference techniques should be designed so as to capture the change in the value of the asset as a result of harm as opposed to estimating WTP to avoid damage. Thus, Daum points that NUVs and stated preference techniques do not capture the appropriate concept of "compensation for loss" can be rectified by developing stated preference studies with the requirements of the legal system in mind.

Finally Daum argues that preference based non-use values are not only incompatible with the standard legal notion of compensation but are even *unnecessary* in determining restoration levels. The standard rule of damages according to Daum can be readily applicable to damage to environmental resources: under such a rule the defendant would be liable for the cost of restoring the resource to its condition prior to the accident and is also liable for the interim loss in use values. And Daum concludes that the calculation of costs of restoration requires science (i.e. experts) and not individual preferences (i.e. for Daum the amount people are WTP to prevent harm to a resource has nothing to do with the actual costs of restoring that resource after it has been damaged). Yet Daum's reasoning does not account for loss in non-use values, for situations where restoration is not feasible (irreversibilities) and tells us very little about the type and level of restoration. For example who will decide if a resource is in fact restored, a judge, experts, the public? A resolution of these issues would require the use of individual preferences.

Moreover Daum argues that the problems with the use of stated preference techniques are not cured by the "rebuttable presumption" language of §107(f)(2)© of CERCLA. He argues that in federal courts a "rebuttable presumption" means only that in the absence of

any other evidence the trier of fact may find the presumed fact to be true (Fed. R. Evid. Rule 301). That is, if the results of the damage assessment are questioned by the defendant (as is most likely the case in practice) the judge or jury is entitled to find that the assessment is incorrect. Hence, the party relying on the stated preference technique will no longer be able to benefit from the rebuttable presumption, but will require to provide alternative admissible evidence (Daum 1993, p. 406).

The Debate over Economic Efficiency

Economists (e.g. Kopp 1991, Brookshire and McKee 1994) favour the use of CBA techniques in legal procedures on efficiency grounds. It can be argued that the economists rationalisation for this is compatible with the basic precepts of tort law.

For the lawyer environmental damage cases fall into the domain of tort law in which the role of damages has a two tier role: (a) to compensate the victims for the loss suffered and (b) to serve as an incentive for the tortfeasor to take cost -justified care to avoid damages (Brookshire and McKee 1994). The deterrence role is usually described by reference to the so called 'hand-rule', which provides for incentives to avoid damage to environmental assets to the point where the cost of care is equal to the expected cost of the damages. When the full amount of damages are not calculated (as it the case when NUVs are omitted), then this elementary incentive mechanism breaks down (Posner 1970, Stephen 1988, Hirsch 1979).

For the economist damages are based on the diminished value of the services (both consumptive and non-consumptive) provided by the natural resource as a result of the harm caused. The values measured for these reductions in services represent the monetised change in individual's utility as a result of the injury to the resource. If the value of the diminished NUVs is not included in the damage award, then the award does not reflect the complete loss in monetised well-being to those members of society who benefit from the resource. The prospective efficiency of damage awards in inducing the optimal quantity of due care on the part of those undertaking risky activities rests on the damage award accurately reflecting society's loss once the accident has occurred (Kopp 1991, Shavell 1984, 1987). Hence setting the correct 'price' signal is crucial. Not using preference based values would most likely under-estimate these signal (since non-use

values would most likely be excluded) thus leading to inefficient levels of due care. It thus seems that the economists rationalisation for using individual preference including those that lead to so called NUVs is compatible with the general foundations of tort law. It should be noted that in the United Kingdom at any rate (where with the exception of libel actions judges rather than juries now determine damages awards in tort cases) courts do not explicitly emphasize the deterrent role, but confine themselves to the more traditional compensatory model. The only exception is in the award of exemplary or punitive damages which may be awarded in limited circumstances, and to date there has been no case in nuisance or *Rylands v Fletcher* where such an award has been made (Murphey, 2000).

This view has been contested by several authors (mainly from the legal profession; (e.g. Cummings and Harrison (1994). Daum 1993, Boudreaux et al 1999) which question the success of using individual preference based techniques to promote efficient levels of environmental protection. Yet, these criticisms have almost exclusively been based on arguments that have to do with measurement issues (i.e. the totality of economic values for the environmental cannot be adequately measured) and thus do not challenge the use of valuation techniques at the legal or conceptual levels.

The information provided from individual preference must thus be used in damage assessment if the efficient level of compensation is to be provided and the efficient amount of due care is to be taken. Even if we accept that measurements of economic values from stated or revealed preference techniques are not accurate, the use of this information is still justified if the losses avoided by such use exceed those from not using the information. Seen in this way, those who oppose the use of individual preferences in the determination of damage assessments should demonstrate that the information has no merit. This last point can be better clarified by using an analogy drawn by Brookshire and McKee (1994, p. 70-1) between weighing to types of errors (over or under estimation of damages) with the decision encountered in statistics when dealing with Type I and Type II errors. If we reject all information for individual preferences, the best the court can achieve is to assign a uniform distribution to our estimate of the value of the environmental damages. The information from preference based valuation studies allows the court update this prior distribution by employing Bayes' Rule to obtain a posterior distribution which by definition will have a smaller variance than the original and thus

will provide a better measure of central tendency. The larger the variance the larger the chance of committing a Type I error, incorrectly rejecting the null hypothesis concerning the value of the environmental damages. Thus utilising even imprecise information in damage assessment cases will improve the decision process. Skewed indicators of individual preferences can be still useful indicators, provided the ways in which they are skewed are understood. Even prior to its repair, the Hubble telescope was apparently returning valuable information despite the distortions produced by the improper design of the telescope (Hubin, 1994, p.185).

The Debate over property rights

Another dimension of the debate on the legal foundations of accepting NUVs concerns the question of whether the concept NUV is compatible with the 'law and economics' or Coasean framework? Could for example those who experience a loss in NUVs bribe the other party to reduce the level of externality generating activity? Some (e.g. Foster 1996) have argued the transactions such as debt-for-nature swaps could be viewed as a examples of this reasoning at work.

An immediate reaction to these questions would be that in most cases involving environmental damages transaction costs would be prohibitively high to allow for any form of bargaining.²⁶ A typical example would be the case of an oil spill where the 'victims' are usually numerous thus increasing the transactions costs of bargaining (transactions costs include the costs of identifying and assembling the parties involved in the negotiations, the costs of the actual negotiations and the costs of enforcing the outcome of the negotiations). Within a Coasean framework the, large transaction would invalidate the 'invariance thesis' and thus the delineation of property rights becomes crucial (Swanson and Kontoleon (2000a)). Payment of damage would only be consistent with cases where infringement of property rights can be adequately defended and identified. This poses a serious problem of the use of NUV estimates (Bishop and Welsh 1992). The incorporation of NUV in the US legal system has focused on natural resources that 'belong' to the government (the government acting as a trustee on behalf of society). Such an emphasis implicitly grants equal property right to each member of society. The crucial issue is whether common property rights are defined sufficiently broadly to encompass NUVs. In principle, there seems to be no reason why this could not be

accomplished. In fact, the US legal guidelines listed above on valuation can be interpreted as precisely attempting this task.

The issue becomes more complicated when we are dealing with situations where individuals obtain NUV from resources which are privately owned. Examples of this would be the disutility felt by member of the public if a private forest owner converts her forest land into a shopping mall or a farmer chooses to take out the hedgerows on her land. Sunstein (1993) offers a legal positivist view of law in support of the idea that property rights in NUVs are just as legitimate as private property rights over physical objects. Boudreaux et al (1999) offer a series of theoretical and practical objections to this position. Their critique mainly rest on the grounds that granting such property rights in NUVs will undermine one of the basic cornerstones of law, which is to allow citizens to form trustworthy expectations about the behaviour of others. When property rights are insecure, "gains that would otherwise be available from exchange instead will be dissipated by searches for and defences of takeable assets, and resources available for investment will be diverted toward less takeable uses."(Haddock et al., 1990). Hence if existence values for privately owned resources become legally recognised, new incentives are unleashed for parties to attempt to grab resources. Resources will be devoted to litigation and other legal processes that would not have been so allocated.(185) In the face of such a scramble for property, there is no assurance, even for those who think the world will be better if existence value were a legally protected right, that it will turn out the way they hoped (Boudreaux et al 1999). Moreover, providing legal standing to rights such as existence value would lead to inefficient allocation of resource and thus incentives to invest in environmental quality may be reduced *not* enhanced.²⁷

Is the inclusion of NUVs necessary?

²⁶ Yet, if the non-use externality were sufficiently generalised, at a national level, the problem could potentially be resolved by government intervention (Foster 1996).

²⁷ An illuminating example is the Sierra Club Vs Morton case. The Forest Service approved plans for commercial exploitation of resources on land the agency controlled. The Sierra Club sued to block the development, claiming standing to intervene based on its "special interest in the conservation and the sound maintenance of the national parks, game refuges and forests of the country." See *Sierra Club v. Morton*, 405 U.S. 727 (1972). The Supreme Court rejected the claim that "a mere 'interest in a problem' was sufficient to establish legal standing. Standing requires a more immediate interest, such as would be had by neighbouring property owners affected by the proposed development. The importance of standing is that, without it, the Sierra Club or any other "distant" party cannot get into court to reveal the existence value it places on certain environmental amenities. Even parties with standing must demonstrate market (use) value affected by the activities in question. (Boudreaux et al 1999).

The previous sections provided a brief exposition of some legal and economic theory arguments for the inclusion of NUVs in damage assessment. It was shown that the need to include such values can be debated on both efficiency (economic) and tort law (legal) grounds. Yet, considering the conceptual and measurement issues that have concerned many lawyers and economists, one would be inclined to ask whether these values are sufficiently large enough to necessitate their inclusion in damage assessment. 'Sufficient' could be interpreted as being enough to alter the outcome of the 'hand-rule' or a 'reasonableness test'. If the court could somehow a priori know that the NUVs for a particular case would be small it could avoid the complications and costs of their estimation.

The literature on NUVs had emphasised the uniqueness or 'specialness' of the resource in question and the irreversibility of the loss or injury as criteria for generating large NUVs. For example economists have shown that preserving such celebrated species as the Giant Panda in its natural habitat (Swanson and Kontoleon 2000b) is associated with quite large NUVs. In contrast, preserving ordinary say, cattle, species would be argued by economists to have relatively low NUVs because of availability of close substitutes. In addition the literature suggests that NUVs may be small in cases where recovery from an injury is quick and complete either through natural processes or via restoration acts. Yet, there are problems in giving operational meaning to the idea of uniqueness. In economic terms, uniqueness would be reflected in the absence of substitutes and a low price elasticity of demand. Yet, Freeman (1993) points out that there is no threshold on price elasticity that distinguishes between the presence or absence of close substitutes. Similarly, long-term injury with slow recovery (e.g. restoring a whale population) could give rise to NUVs that are of the same order of magnitude as those with irreversible injury (Freeman 1993). These issues are not yet resolved which signifies the need for ongoing comparative research that tries to identify factors which could give a prior indications when NUVs are bound to be small.²⁸

Conclusions: The input of individual preferences in damage assessment is compatible with the basic foundations of tort law since it promotes both the compensatory and deterrent role of damages. Though the assignment of property rights that would give rise to non-use values is problematic when the environmental resource in question are

²⁸ Meta-analytic research of existing valuation studies could be potentially useful to address these issues (see e.g. Loomis and White 1996).

privately owned, the assignment of such rights for publicly owned resources is quite sound.

6. The Role of information.

Having reviewed some of the conceptual, moral and legal issues surrounding the use of individual preferences in environmental decision making it seems that we are left with the general conclusion that (a) the concept of economic environmental values, as derived from individual preferences, is quite robust since it is embedded in standard welfare and contingent claims theory (i.e. economic value as the realisation of choice over (contingent states of the world that entail different levels of environmental quality)); (b) the use of individual preference in policy decisions is compatible with *any* moral position that policy makers may hold (consequentialist, deontologist, contractualist) and that the role of CBA tools can have an effective role *provided it used in a constrained manner* and (c) the input of individual preferences in damage assessment is compatible with the basic foundations of tort law since it promotes both the compensatory and deterrent role of damages. Though the assignment of property rights that would give rise to non-use values is problematic when the environmental resource in question are privately owned, the assignment of such rights for publicly owned resources is quite sound

It thus appears that in most liberal democratic societies most people would agree that preferences (leading to both use and non-use values) ought to have some weight in the decision making process. But would any 'type' of preferences be appropriate? Would, for example, the preferences of individuals over the management of complex environmental ecosystems of which they have very little or even inaccurate information be of any merit? The initial response to these question would be that it is the preferences of *informed* individuals that are to be used as inputs in the decision making process. Yet, this raises further issues as to the exact role of information in the formation of individual preferences and on the role of information in policy and damage assessment decisions.

Information in Stated Preference Valuation Studies

That the discussion on the role of information has almost exclusively centred around non-market goods where observed behaviour is lacking. Thus, the role of information is

typically discussed in relation to stated preference techniques and hence the points surveyed here will not include 'informational' issues related to choices made in real market settings.²⁹

The impact of information on individual preference over public goods has been extensively analysed both at the conceptual and the empirical level (see Munro and Hanley 2000 for a review). Analytical models of the effects of information can be found in Bergstrom et al (1990) and Blomquist and Whitehead (1998). At the empirical level Bergstrom and Stoll (1999) discuss the effects on preference of too much information, Whitehead and Blomquist (1991) and Whitehead et al (1995) focus on the effects of no prior information, Loomis *et al* (1994) deal with the effects of knowledge about one's budget constraints, Boyle et al (1990) examine the effect of knowledge of substitute goods, Whitehead and Blomquist (1991) undertake a study on the effects of information on *related* environmental resources, Bergstrom et al (1985) and Samples et al (1986) examine the effect of altering the information regarding the flows generated by environmental resources.

The overall impression obtained from reviewing at this literature is that information does change people preference and thus the estimated values obtained from stated preference techniques and information dependent. Yet, to what direction do these values change? Would altering information allow respondents to make 'better' choices? Would choices based on more/better information converge to those that would have been made by experts groups? Some strands of literature suggests that this may be in fact the case if information about the *ecosystem functions* (and not just the *ecosystem components*) of the environmental resource are provided (e.g. Kenyon and Edwards-Jones (1998)). Yet, based on other strands of the literature (e.g. drawing from results found in papers such as Ajzen et al 1996) such convergence may *not* be achieved for environmental goods *which have low relevance* to respondents.

²⁹ This, in fact, is a much more general problem in the debate over the use of individual preferences to environmental resource decisions. Commentators argue that the economic model of choice is inadequate to deal with environmental issues for a variety of cognitive or conceptual reasons (e.g. it faces problems from agent's lack of information about environmental resource (Ajzen *et al* 1996) or it breaks down due to problems of warm glow (Kahneman and Knetsch (1992)) or problems caused by choice motivated out of symbolic or moral sentiments (Blamey 1998)) (Spash 1997)). Though these issues are almost exclusively discussed in relation to *stated preference techniques*, they are by no means restricted to non-market goods! Individuals can 'suffer' from problems of lack of information, from warm glow, from symbolic or moral commitment bias even when she makes decisions in real market settings. This has two implications: either

Information and Individual Vs Expert opinion in public decision making.

The NOAA panel recommendation (Arrow *et al* 1993) for stated preference valuation techniques requires the analysts to "decide ... the standard of knowledgeability of the respondents that [they] want to impose on a CV study. *It is clear* that it should be at least as high as that which the average voter brings to a real referendum..." (p.4607) and "if CV surveys are to elicit useful information about willingness to pay, respondents must understand exactly what it is they are being asked to value...." (p.14). Yet, conveying the appropriate level of information in a stated preference study is very difficult especially for unfamiliar and complex environmental resource (Munro and Hanley 2000). This seems to be an almost unsolvable difficulty due to the very nature of these studies. First, CV practitioners faced with a limited budget cannot overcome the time limitations of each interview. In-person interviews can afford to allocate about 5-10 minutes for explaining the environmental good, describing the proposed scenario and allowing people to process this information in order to make their (stated) choice. This brief time allocated to each interview is clearly insufficient when dealing with complex and unfamiliar environmental resource. Second, respondents may not receive information that is suited to their individual needs (cognitive ability, existing knowledge etc). CV practitioners try to provide information that can be understood by the 'average' individual. Yet, the level of information required to make a decision will vary from individual to individual, hence standardised information sets, no matter how well designed, will unavoidably run the risk of leaving some respondents unconvinced by the over-simplistic nature of the questionnaire (information underload) or confused (information overload). (MacMillan *et al* 2000). Numerous studies have shown that participants in CV studies have a very poor understanding of the environmental resource in question (e.g. Chilton and Hutchison (1999)) and resort to construct various heuristics or to relying on survey cues (e.g. wording) while making their choices (e.g. Ajzen *et al*, 1996; Blamey 1998). Also, the complexity of CV settings may opt people to make hasty choices which do not reflect their true preferences (e.g. 'yeah-saying', 'don't know' or 'protesting' to terminate the interview quickly (Clark *et al.*, (2000) in MacMillan *et al* 2000).

we must abandon the economic model of choice altogether or accept that many of the issues raised by

The acknowledgement that individual preferences do have a role in environmental decision making coupled with the recognition that stated preference techniques are dented by difficulties in conveying the appropriate information have lead some to propose *other* methods for incorporating individual participation in environmental decision making. Most notably, the citizen jury or the similar planing cell technique have been suggested as viable alternatives (Brown et al (1995) and Crosby (1995), Diemel and Renn (1995)). The workings of these methods were briefly mention in Section 3. Here we focus on their potential role in overcoming the ‘informational’ difficulties encountered in stated preference techniques. Respondents in citizen juries (CJs) compared to those in CV studies are much better informed about the issue because they are deliberating for several days, interviewing an array of experts, and discussing the issue among their peers to reach a consensus about the particular environmental issue (or ‘charge’) presented to them. Yet, CJs do not provide *economic* values associated with any particular project nor whether it constitutes an efficient use of resources (Kenyon and Hanley (2000)). These weaknesses have recently prompted economists to develop new methods that attempt to combine stated preference techniques (necessary to provide information on efficiency questions) with jury-type methods (that allow for citizens to be better informed and thus provide more meaningful choices). Examples of this work are Macmillan et al (2000) who develop the ‘Market Stall’ method and Kenyon and Hanley who explore the ‘valuation workshop’ approach. Though these are very encouraging developments in the field of non-market valuation, they fail to address the important question posed above, namely, if informed preferences will lead to different choices, are these new choices closer to those reached by experts who act under (near) perfect information? That is, will the opinion of well informed citizen’s converge with the prescriptions of expert panels? To date, there have been only a few studies that compare results form CV studies with results obtained form expert panels (e.g. Kenyon and Edwards-Jones (1998)). A promising research agenda would focus on a comparison of these new hybrid methods (such as the valuation workshop) with expert or Delphi type studies.³⁰

critics of stated preference techniques are also relevant in choices made in real markets.

³⁰ The authors are currently undertaking such a study that seeks to examine both expert and individual opinion about the importance of managing remote mountain lakes in Europe. The experiment seeks to investigates whether increasing the amount of information about mountain lakes (admittedly a relatively 'unknown' natural resource) provided to individuals participating in a contingent valuation type study will induce responses that are consistent or even coincide with the opinions of lake scientists as obtained from a Delphi study. The result of the study will be available in early September 2001.

7. Concluding Remarks.

Preference and expert based environmental decision making processes differ in their reliance and usage of individual preference. The root of the divide can be traced to disagreements on the concept of economic value as applied to environmental decisions, to disagreements on the moral and/or foundations of using individual preference (and economic values) as inputs into environmental decision processes and to disagreements as over the role of information. The preceding discussion of these topics suggests that: (i) the concept of economic value is a meaningful, well-defined concept based on the notion of trade-off and opportunity cost. A substantial portion of criticism on the conceptual validity of this notion is ill targeted since it is based on an often misconceived understanding of the *nature* and *scope* of the concept of economic value; (ii) the inadequacy of welfarism as *a moral theory* does not invalidate the use of the cost benefit analysis as *a procedure* for guiding environmental policy decisions. (iii) individual preference are relevant to policy makers *no matter* which moral theory is used but CBA should, nevertheless, be confined to an 'advisory', 'information-providing' rather than to a decisive role; (iv) the input of individual preferences in damage assessment is compatible with the basic foundations of tort law since it promotes both the compensatory and deterrent role of damages; and (v) lack of appropriate information on behalf of individual citizens or consumers about environmental ecosystems and their threats may dent the reliability of preference based valuation techniques. This has impelled a new research agenda that seeks to merge individual preference and expert opinion methods of environmental decision making.

8. Preferences [incomplete]

Ajzen, I, Brown, T. and Rosenthal, L.H (1996), Information Bias in contingent valuation: effects of personal relevance, quality of information, and motivational orientation, *Journal of Environmental Economics and Management*, 30, 43-57.

Arrow, K., R.Solow, E.Leamer, P.Portney, R.Radner and H.Schuman (1993), "Report of the NOAA Panel on Contingent Valuation", *Federal Register*, 58, 4601-14.

Arrow, Kenneth J. Maureen L. Cropper, George C. Eads, Robert W. Hahn, Lester B. Lave, Roger G. Noll, Paul R. Portney, Milton Russell, Richard Schmalensee, V. Kerry Smith, Robert N. Stavins (1996), 'Is There a Role for Benefit-Cost Analysis in Environmental, Health, and Safety Regulation?' *Science*, Volume 272, Number 5259, Issue of 12 April 1996, pp. 221-222

Barendse et al (Eds) (1998) NOW International Conference, *Beyond Sustainability integrating behavioural, economic and environmental research, Conference Report, 19-20th November 1998, Amsterdam, Netherlands.*

Bateman, I.J. (1999) 'Environmental impact assessment, cost-benefit analysis and the valuation of environmental impacts', in J. Petts, *Handbook of Environmental Impact Assessment, volume 1* environmental impact assessment process, methods and potential. Oxford: Blackwell Science

Beckerman, W. and J. Pasek (1996) Plural Values and Environmental Valuation, CSERGE Working Paper GEC 96-11.

Beckerman, W. and J. Pasek (1996) Plural Values and Environmental Valuation, CSERGE Working Paper GEC 96-11.

Beierle, Thomas C. (2000) 'The Quality of Stakeholder-Based Decisions: Lessons from the Case Study Record', *RRF Discussion Paper 00-56.*

Bergstrom, J.C., Dillman, B.L., Stoll, J.R., 1985. Public environmental amenity benefits of private land: the case of prime agricultural land. *Southern J. Agric. Econ.* 17, 139-149.

Bergstrom, J.C., Stoll, J.R., Randall, A., 1990. The impact of information on environmental commodity valuation decisions. *Am. J. Agric. Econ.* 72, 614-621.

- Bishop, R.C and Welsh M.P. (1992) 'Existence values in Benefit Cost Analysis and Damage Assessment', *Land Economics*, 68, pp.405-417.
- Bishop, R.C. (1978) Endangered Species and Uncertainty: The Economics of Safe Minimum Standard, *American Journal of Agricultural Economics*, 60 (1), pp. 10-18.
- Blamey, R.K. *et al* (1995) 'Respondents to Contingent Valuation Surveys: Consumers or Citizens?' *Australian Journal of Agricultural Economics*, 39, pp. 263-88.
- Blamey, Russell K. (1998) Decisiveness, Attitude Expression and Symbolic Responses in Contingent Valuation Surveys, *Journal of Economic Behaviour and Organisation*; 34(4), March 1998, pp. 577-601.
- Blomquist, G. C. and J. C. Whitehead (1998) Resource quality information and validity of willingness to pay in contingent valuation, *Resource and Energy Economics*, 20, pp. 179-196.
- Bonnieux, F and P. Rainelli (2000) 'Contingent valuation methodology and the EU Institutional Framework', in *Valuing the Environment Preferences*, Bateman, I.; Willis, K., eds. Oxford University Press
- Boudreaux, Donald J., Roger E. Meiners; Todd J. Zywicki (1999) Talk is cheap: the existence value fallacy, *Environmental Law*, Vol. 29 No. 4 Pg. 765.
- Boyle et al (1995) Validating contingent valuation with surveys of experts, *Agricultural and Resource Economics Review*, Oct, 24, 2, pp.247-253
- Brans, E.H.P. and M. Uilhoorn (1997) "Liability for Ecological Damage and Assessment of Ecological Damage" *Background Paper for EU White Paper on Environmental Liability*.
- Breedlove, J. (1999) *Natural Resources: Assessing Non market Values Through Contingent Valuation*, Congressional Research Service, Report for Congress.
- Brookshire, D and M. McKee (1994) 'Is the Glass half empty, is the Glass half Full? Compensable Damages and the Contingent valuation', *Natural Resource Journal*, 34 pp.51-72.

- Brookshire, D. S. *et al* (1986). 'Existence values and Normative Economics', *Water Resource Research*, 22, pp. 1509-1518.
- Brown, Thomas C., Peterson, George L. and Tonn, Bruce E. (1995)'The values jury to aid natural resource decisions.(Speculations)' *Land Economics*, 71(2), May 1995, pages 250-60.
- Cameron, T. and J. Englin (1997) Respondent Experience and Contingent Valuation of Environmental Goods, *Journal of Environmental Economics and Management*, 33(3), pp. 296-313.
- Carlsen, A.J *et al* (1994) Implicit Environmental Costs in Hydroelectric Development: An analysis of the Norwegian master Plan for Water resources, *Journal of Environmental Economics and Management*, 25, 3, pp.201-211.
- Carson, Richard T., Nicholas E. Flores, and Norman F. Meade (2001), 'Contingent valuation: controversies and evidence', *Journal of Environmental and Resource Economics*, 19, pp. 173-210.
- Carson *et al* (1994) Contingent valuation and Lost Passive Use: Damages from the Exxon Valdez, *RFF Discussion Paper 94-18*
- Chilton,-Susan-M.; Hutchinson,-W.-George (1999) Exploring Divergence between Respondent and Researcher Definitions of the Good in Contingent Valuation, *Studies, Journal of Agricultural Economics*; 50(1), January 1999, pages 1-16.
- Christopher L. Lant, The role of property rights in economic research on U.S. wetlands policy, *Ecological Economics* (11)1 (1994) pp. 27-33
- Clark, J., Burgess, J. and Harrison, C. 2000. "‘I struggled with this money business’ – Respondents’ Perspectives on Contingent Valuation’, *Ecological Economics* 33 (1): 45–62
- Common, M, I. Reid, and R. Blamey (1997). 'Do Existence Values for Cost Benefit Analysis Exist?', *Environmental and Resource Economics*; 9(2), pp. 225-38.
- Copp, D (1985) ' Morality, Reason and Management Science: the rationale of cost-benefit analysis, in E.Paul, J. Paul, and F. Miller (eds.), *Ethics and Economics*, Oxford: Blackwell, pp.128-151.

- Crosby,-Ned (1995) Citizens Juries: One Solution for Difficult Environmental Questions, Renn,-Ortwin;Webler,-Thomas; Wiedemann,-Peter, eds. Fairness and competence in citizen participation: Evaluating models of environmental discourse. Technology, Risk, and Society series. Dordrecht; Boston and London: Kluwer Academic, 1995, pages 157-74.
- Crowards, T. (1995) 'Non-use values and Economic Valuation of the Environment: A Review', *CSERGE Working Paper GEC 95-26*.
- Cummings R.G and G.W. Harrison (1994). 'Was the Ohio court well informed in their assessment of the accuracy of the contingent valuation method?', *Natural Resource Journal*, 34, pp. 1-36.
- Damage Assessment and Restoration Programme (1999) *Discounting and the Treatment of Uncertainty in Natural Resource Damage Assessment*, Technical Paper 99-1, NOAA: Maryland.
- Daum. J.F. (1993). 'Some Legal and Regulatory Aspects of Contingent Valuation' in Hausman, J.A. ed. *Contingent Valuation: A Critical Assessment*.
- David D. Haddock et al (1990) An Ordinary Economic Rationale for Extraordinary Legal Sanctions, 78 *California Law Review* 1, 17.
- David D. Haddock et al.(1990), 'An Ordinary Economic Rationale for Extraordinary Legal Sanctions', 78 *California Law Review*, 1, 17.
- Desvousges W.H. *et al* (1993) Measuring Natural Resource Damages with contingent Valuation: Tests of Validity and Reliability, in Hausman, J.A. ed. *Contingent Valuation: A Critical Assessment* (1993).
- Diamond P.A. and J.A Hausman (1994) Contingent valuation: is some number better than no number? *Journal of Economic Perspectives*, 8, (4), pp. 45-64.
- Dienel, P.C. and O. Renn.(1995) Planning cells: A gate to fractal mediation. In Renn, O, et al. *Fairness and Competence in Citizen Participation*. Boston: Kluwer Academic, pp. 117-140.
- Dixon, J.A. *et al* (1988) *Economic Analysis of the Environmental Impacts of Development Projects*, Earthscan, London.

- Dixon, J.A. *et al* (1988) *Economic Analysis of the Environmental Impacts of Development Projects*, Earthscan, London.
- Edwards, S.F. (1992). 'Rethinking Existence Values', *Land Economics*, 68, pp. 120-122.
- English *et al* (1993) 'Stakeholder Involvement: Open Processes For Reaching Decisions About The Future Uses Of Contaminated Sites', *Working Paper, Waste Management Research and Education Institute, University of Tennessee, Knoxville*
- Fixdal, J. 1997. Consensus Conferences as Extended Peer Groups. Presented at Technology and Democracy: Comparative Perspectives, Centre for Technology and Culture, University of Oslo, Norway, January 17-19.
- Fleming, J. (1983) *The Law of Torts*, 6th Ed, Perth, The Law Book Company.
- Foster, V. (1996) 'Do Non-Use Values Exist? The State of the Debate' *Mimeo, CSERGE*.
- Freeman, M.A. (1979) *The Benefits of Environmental Improvement*, Washington, D.C. Resources for the Future.
- Freeman, M.A. (1993) *The Measurement of Environmental and Resource Values : Theory and Methods*, Washington, D.C. Resources for the Future.
- Fuguitt, Diana; Wilcox, Shanton J. (1999) *Cost-benefit analysis for public sector decision makers*, Westport, Conn. and London: Greenwood, Quorum Books, 1999, pages xiv, 325.
- Green, C. 1997. Are Blue Whales Really Simply Very Large Cups of Coffee? Middlesex University Flood Hazard Research Centre.
- Gregory, R *et al* (1991) 'Valuing Environmental Resource: A Constructive Approach' *Decision Research*, Eugene, Ore.
- Hanemann, M (1992) 'Natural Resource Damages for Oil Spills in California', pp. 555-80, in J. Ward and J. Duffield (eds.), *Natural Resource Damages: Law and Economics*, John Wiley, New York.
- Hirsch, Werner Z. (1979), *Law and Economics: An Introductory Analysis*, London, Academic Press.

- Hubin, D.C. (1994) The Moral Justification of Benefit/Cost Analysis, *Economics and Philosophy*, 10, 169-194.
- Jacobs, M. (1997) 'Environmental Valuation, Deliberative Democracy and Public Decision-Making Institutions', in Foster, J. (ed.), *Valuing Nature? Economics, Ethics and Environment*, London: Routledge, pp.211-31.
- Joss, S. and J. Durant. 1994. Consensus Conferences. London: National Museum of Science and Industry.
- Kahneman, D. and J.Knetsch (1992) 'Valuing Public Goods: The Purchase of Moral Satisfaction', *Journal of Environmental Economics and Management* 22, 55-70
- Kenyon, W. and Hanley, N 2000. Economic and participatory approaches to environmental evaluation. Discussion paper 00-15, Economics Department, University of Glasgow.
- Kenyon, Wendy; Edwards-Jones, Gareth (1998) What Level of Information Enables the Public to Act Like Experts When Evaluating Ecological Goods? *Journal of Environmental Planning and Management*;41(4), July 1998, pages 463-75.
- Kohn, Robert E. (1993) 'Measuring the Existence Value of Wildlife: Comment,' *Land Economics*; 69(3), August 1993, pp. 304-08.
- Kontogianni, A. *et al* (2001) 'Integrated stakeholder analysis in non-market valuation of environmental assets', *Ecological Economic*, 37, pp.123-138.
- Kopp, R. and K. Pease (1996) Contingent valuation: economics, Law and politics, RFF Working Paper.
- Kopp, R. and V.K Smith (1989) Benefit Estimation Goes to Court: The case of natural damage assessments, *Journal of Policy Analysis and Management*, 8: 593-612.
- Kopp, R.J. (1991). 'The Proper Role Of Existence value in Public Decision Making'. *Recourses for the Future, Discussion Paper QE 91-17*.
- Kopp, Raymond J. (1992) 'Ethical Motivations and Non use Values' *Resources for the Future Discussion Paper QE92-10* Washington DC: Resources for the Future

- Krutilla, J. (1967). 'Conservation Reconsidered', *American Economic Review*, 57, no 4, pp.777-786
- Kuo, Nae Wen and Yu, Yue Hwa (1999) An Evaluation System for National Park Selection in Taiwan, *Journal of Environmental Planning and Management*, 42 (5), pp. 735-45.
- Larson, D.M. and Loomis J.B. (1994) 'Separating Marginal Values of Public Goods From Warm Glows in Contingent Valuation Studies.' Department of Agricultural Economics, University of California, Davis.
- Larson, D.M.(1992) 'Can Non Use Value be Measured from Observable Behavior?' *American Journal of Agricultural Economics (proceeding)*, 74, pp. 1114-1120
- Levaggi, Rosella (1998) Resources Allocation in the Internal Market: Whose Preferences Count? *Studi-Economici*;53(65), 1998, pages 105-22..
- Lewis Owen Amack, (1994) Contingent Valuation of Natural Resource Damages At: <http://www.lawinfo.com/forum/conval.html>
- Lockwood, M. (1999) Preference Structures, Property Rights, and Paired Comparisons. *Environmental and Resource Economics* 13: 107-122.
- Lockwood, Michael (1997) Integrated value theory for natural areas, *Ecological Economics* (20)1, pp. 83-93
- Loomis, J. et al (1994) Do reminders of substitutes and the Budgets Constraints Influence CV estimates?, *Land Economics*, 70 (4), 499-506
- Loomis, John B and White, Douglas S. (1996) Economic Benefits of Rare and Endangered Species: Summary and Meta-analysis *Ecological Economics*;18(3), September 1996, pages 197-206..
- Loomis, John, B. (2000) 'Contingent valuation Methodology and the US Institutional Framework' in *Valuing the Environment Preferences*, Bateman, I.; Willis, K., eds. Oxford University Press.
- Lynn, F. M., & Kartez, J. D. (1995). The redemption of citizens advisory committees: A perspective from critical theory. In Renn, O., Webler, T., & P. Wiedemann, (Eds.),

Fairness and competence in citizen participation: Evaluating models for environmental discourse. Boston: Kluwer Academic Publishers.

Macalister, Elliott et al (2001) Study On The Valuation And Restoration Of Biodiversity Damage For The Purpose Of Environmental Liability, Final report of project B4-3040/2000/265781/MAR/B3, EU Commission.

Macmillan, Douglas C. David Harley, Ruth Morrison (1998) 'Cost-effectiveness analysis of woodland ecosystem restoration' *Ecological Economics*, 27, 3, pp. 313-324.

Macmillan, Douglas C., Nick Hanley , Lorna Philip and Begona Alvarez-Farizo (2000) Valuing the non-market benefits of wild goose conservation: A comparison of individual interview and group-based approaches University of Aberdeen, University of Glasgow.

Madariaga, B. & McConnell, K.E. (1987). 'Exploring Existence Value', *Water Resources Research*, 23(5), pp. 936-942.

Margolis, H. (1982) *Selfishness, Altruism, and Rationality: A Theory of Second Choice*, Cambridge, Cambridge University Press.

Martinez-Alier J., Munda, G. and O'Neill, J. 1998. 'Weak Comparability of Values as a Foundation for Ecology and Economics', *Ecological Economics* 26 (3): 277–86.

Mas-Colell, A., M.D. Whinston. and J.R. Green (1995) *Microeconomic Theory*, Oxford University Press

McConnell K.E. (1983) 'Existence and Bequest Value' in Robert D. Rowe and L. G. Chestnut (Eds.), *Managing Air Quality and Scenic Resources at National Parks and Wilderness Areas*. Boulder. Colorado: Westview Press

McConnell, K.E. (1997) 'Does Altruism Undermine Existence Value?' *Journal of Environmental Economics and Management*, 32(1), January 1997, pages 22-37.

Munro, A and N.D. Hanley (2000) Information, Uncertainty, and contingent valuation, in *Valuing the Environment Preferences*, Bateman, I.; Willis, K., eds. Oxford University Press

- Murphey, J. (2000) 'Noxious Emissions and Common Law Liability: Tort in the shadow of regulation' in J. Lowry and R Edmunds (eds.) *Environmental Protection*, 51-76 and the Common Law , Hart Publishing, Oxford
- Navrud, S. (2000) 'Strengths, weaknesses and policy utility of valuation techniques and benefit transfer', Invited Paper for the OECD-USDA workshop *The Value of Rural Amenities: Dealing with Public Goods, Non-Market Goods and Externalities*, Washington, D.C., June 5-6, 2000.
- Nijkamp, P. and Voogd, J.H. (1984) 'An Informal introduction to multicriteria evaluation, in G. Fandel and J. Spronk (ed) *Multiple Criteria Decision Methods and Applications* (Berlin, Springer-Verlag).
- Norton, Bryan 1992. 'Sustainability, Human Welfare and Ecosystem Health', *Environmental Values* 1: 97–111.
- Nozick, R. (1974) *Anarchy, State and Utopia*, New York: Basic Books, Inc.
- Nyborg, Karine (2000) Homo Economicus and Homo Politicus: interpretation and aggregation of environmental values, *Journal of Economic Behaviour and Organisation* Vol. 42 (3) pp. 305-322.
- Pearce, D.W. and Mourato, S. (1998) *The Economics of Cultural Heritage*, *World Bank Support to Cultural Heritage Preservation in the MNA Region*, CSERGE Report 1998.
- Penn, T. A (2000) Summary of the Natural Resource Damage Assessment regulations under the United States Oil Protection Act, NOAA Report
- Posner, Richard A. (1972), *Economic Analysis of Law*, Boston, Little Brown.
- Quiggin, John (1993). 'Existence Value and Benefit-Cost Analysis: A Third View', *Journal-of-Policy-Analysis-and-Management*; 12(1), pp. 195-99.
- Quiggin, John (1998) 'Existence Value and the Contingent Valuation Method', *Australian Economic Papers*; 37(3), pp. 312-29.
- Randall, A. (1991) 'The Economic Value of Biodiversity' *Ambio- A Journal of the Human Environment*, 20 (2), pp. 64-68.

- Randall, A. and J.R. Stoll (1983)'Existence value in a Total Valuation Framework' in Robert D. Rowe and L. G. Chestnut (Eds.), *Managing Air Quality and Scenic Resources at National Parks and Wilderness Areas*. Boulder. Colorado: Westview Press.
- Randall, A. and M.C Farmer (1995) 'Benefits, Costs, and the safe minimum standard of conservation, in D.W. Bromely (ed.) *Handbook of Environmental Economics*, Cambridge, MA: Basil Blackwell, Ltd, pp. 26-44.
- Randall, Alan (1997) Whose Losses Count? Examining Some Claims about Aggregation Rules for Natural Resources, *Contemporary Economic Policy*;15(4), October 1997, pages 88-97.
- Randall, Alan (2002) 'Benefit-Cost Considerations Should Be Decisive When There is Nothing More Important at Stake' in *Economics, Ethics, and Environmental Policy: Contested Choices*, Daniel Bromley and Jouni Paavola (eds.), Blackwell Publishers (2002 forthcoming).
- Ready, R. and Bishop (1991) 'Endangered Species and the Safe Minimum standard' *American Journal of Agricultural Economics*, 72, (2), pp.309-312
- Rekola, M. *et al* (2000) Incommensurable preferences in contingent valuation: commitments to nature and property rights, presented in EAERE conference Crete 2000.
- Renn, O., T. Webler, and P. Wiedemann. 1995. The pursuit of fair and competent citizen participation. In Renn, O, et al. *Fairness and Competence in Citizen Participation*. Boston: Kluwer Academic, pp. 339-368.
- Rorty, A.O. (1992), 'The Advantages of Moral Diversity', in E. Frankel, F.D., Miller, and J. Paul (eds.), *The Good Life and the Human Good*, New York, Cambridge University Press.
- Rosenthal, Donald H. and Nelson, Robert H. (1992). 'Why Existence Value Should Not Be Used in Cost-Benefit Analysis', *Journal of Policy Analysis and Management*, 11(1), pp.116-22.

- Rowe, R. and Shaw, D. and Schulze, W. (1992) Nestucca Oil Spill', in J. Ward and J. Duffield (eds.), *Natural Resource Damages: Law and Economics*, John Wiley, New York.
- Royal Commission on Environmental Pollution (1998) 21st Report Setting Environmental Standards Cm 4053 HMSO, London.
- Sagoff, Mark (1994) Should Preferences Count? *Land Economics*; 70(2), May 1994, pages 127-44
- Samples, K.C., Dixon, J.A., Gowen, M.M., 1986. Information disclosure and endangered species valuation. *Land Economics*, 62, 306–312.
- Samuelson, P. (1948) *Economics: An introductory analysis*, New York : McGraw-Hill.
- Sclove, R. and M. Scammell. 1999. Practising the principle. In Raffensperger, (c) and J. Tickner eds. *Protecting Public Health and the Environment: Implementing the Precautionary Principle*. Washington, DC: Island Press, pp. 252-265.
- Sen, A. (1970) *Collective Choice and Social Welfare*, San Francisco: Hodlen Day
- Shavell, S. (1984) 'Liability for Harm Versus Regulation for Safety' *Journal of Legal Studies*, Juen, pp.357-374.
- Shavell, S. (1987) *Economic Analysis of Accident Law*, Cambridge, Mass., Harvard University Press'
- Shavell, S. (1993) 'Contingent Valuation of the Non-use value of Natural Resources: Implications for public policy and the Liability System' in Hausman, J.A. ed. *Contingent Valuation: A Critical Assessment*.
- Smith, K.V., 1987. Non-use values in benefit cost analysis. *Southern Econ. J.* 54, 19–26.
- Smith, K.V., 1992. Environmental risk perception and valuation: conventional versus prospective reference theory. In: Bromley, D.W., Segerson, K. Eds. , *The Social Response to Environmental Risk*, Chap. 2.
- Spash C. (1997) Ethics and Environmental Attitudes With Implications for Economic Valuation, *Journal of Environmental Management* (1997) 50, 403–416.

- Spash, Clive L (2000) 'Ecosystems, contingent valuation and ethics: the case of wetland re-creation', *Ecological Economics*, 34 (2), pp. 195 - 215
- Stephen, Frank H. (1988), *The Economics of the Law*, Harvester Wheatsheaf.
- Stirling, A. (1997) 'Limits to the Value of External Costs', *Energy Policy*, 25, pp.517-540.
- Sunstein, Cass R. (1993) Endogenous Preferences, *Environmental Law*, 22 *Journal of Environmental Legal Studies* TUD. 217, pp. 252-53.
- Swallow, Stephen-K. et-al. (1994) "Heterogeneous Preferences and Aggregation in Environmental Policy Analysis: A Landfill Siting Case", *American-Journal-of-Agricultural-Economics*;76(3), pages 431-43.
- Swanson, T.M. and A. Kontoleon (2000a) 'Nuisance' in *Encyclopaedia of Law and Economics*, Vol 2, Civil Law and Economics, Boudewijn Bouckaert and Gerrit De Geest (eds.), Edward Elgar, Cheltenham, UK.
- Swanson, T.M. and A. Kontoleon (2000b) 'Why Did the protected Areas Fail the Giant Panda? The Economics of conserving endangered species in developing countries', *World Economics*, 1(4), pp.135-148.
- Tickner, Joel and Lee Ketelsen (2001) Democracy and The Precautionary Principle, *The Networker*, vol, 6.
- Turner, K.R (2000) 'The Place Economic Values in Environmental Valuation' in *Valuing the Environment Preferences*, Bateman, I. and K. Willis (eds). Oxford University Press.
- Unsworth, Robert. E., and Richard C. Bishop, (1994) 'Assessing Natural Resource Damages Using Environmental Annuities' *Ecological Economics*, 11(1994): 35-41.
- Vari, A. (1995). Citizens' advisory committee as a model for public participation: A multiple-criteria evaluation. In Renn, O., Webler, T., & P. Wiedemann, (Eds.), *Fairness and competence in citizen participation: Evaluating models for environmental discourse*. Boston: Kluwer Academic Publishers.

- Vatn, A (2000) 'The Environment as a Commodity', *Environmental Values*, 2000, vol. 9, no. 4, pp. 493-510.
- Vatn, Arild and Daniel W. Bromley (1994)'Choices without Prices without Apologies', *Journal of Environmental Economics and Management*, Vol. 26, No. 2, pp. 129-148.
- Viscusi, K.W., 1989. Prospective reference theory: toward an explanation of the paradoxes. *J. Risk and Uncertainty* 2, 235–264.
- Walsh et al (1989)_Issues in nonmarket valuation and policy application: a retrospective glance, *Western Journal of agricultural Economics*, 14, 178-88
- Weber, R.P., 1985. *Basic Content Analysis*. Sage University Papers Series, Quantitative Applications in the Social Sciences, No. 07-049. Sage, Beverly Hills.
- Wenstop, Fred, et-al. (1994) Valuation of Environmental Goods with Expert Panels in Climaco,-Joao, ed. *Multicriteria analysis: Proceedings of the XIth International Conference on MCDM*, 1-6 August 1994, Coimbra, Portugal. Heidelberg and New York: Springer, 1997, pages 539-48.
- Whitehead, J.C., Blomquist, G.C., 1991. Measuring contingent values for wetlands: effects of information about related environmental goods. *Water Resour. Res.* 27, 2523–2531.
- Williams, B. (1985) *Ethics and the Limits of Philosophy*, Cambridge, MA: Harvard University Press.
- Yankelovich, Daniel (1992)A Widening Expert/Public Opinion Gap, *Challenge*;35(3), May-June 1992, pages 20-27.

Appendix

Table 1: Spectrum of Environmental Decision Making Approaches (adopted from Dixon et al 1988, Bateman 1999, Navrud 200, Renn et al 1995, Beierle 2000, English et al 1993 and Tickner and Ketelsen 2001).

<i>Valuation Methods</i>		<i>Pricing Techniques</i>			<i>Participatory/ Deliberative Approaches</i>		<i>'Expert'-based Methods</i>	
Stated Preference	Revealed Preference	Market prices/dose-response techniques	Value of <u>Actual</u> Expenditures Approaches	Value of <u>Potential</u> Expenditures Approaches	Mixed economic and participatory approaches.	'Pure' participatory approaches.	Revealed Preferences	Stated Preferences
- Contingent Valuation - Choice Experiments - Contingent Ranking	- Travel Cost Method - Hedonic Pricing methods - Wage Differential approaches	- Changes-in-productivity' approaches - Loss of earnings approaches - Opportunity Cost Approaches	- Cost-effectiveness analysis - Preventive or mitigation expenditure approaches	- Replacement Cost approaches - Relocation Cost approaches - Shadow-Project approaches	- Valuation Workshops. - Market Stall.	- Citizen Juries - Consensus Conferences - Focus Groups - Planning Cells - Citizens Advisory committees - Scenario workshops - Town meetings	- Implicit Valuation	- Multi-criteria Analysis - Delphi Method - Stakeholder involvement mechanisms - Task forces - Expert Panels



Strong reliance on individual preference based values

Weak reliance on individual preference based values

Table 2 Organisation of the debate.

	<i>Policy Decisions</i>	<i>Damage Assessment</i>
<i>Conceptual</i>	Common Issues	
<i>Moral/legal basis</i>	Moral Arguments	Legal Arguments
<i>The role of Information</i>	The role of information in using CBA in policy decisions	The role of information in using CBA in damage assessments.

Table 3: Views on the Use of CBA in policy and damage assessment decisions.

In favour of using non-use values for CBA (policy recommendations) <i>and</i> legal judgements (internalising externalities). Argue in favour of the concept of non-use values.	Non-use values should be used for CBA <i>but not</i> for legal settlements	Non-use values should be decomposed and only some of these sub-components can be used for CBA and/or legal settlements	Non-use values should be used in legal settlements <i>but not</i> for CBA.	Against the use of non-use values for both policy and legal recommendations. Criticise the concept of non-use values per se.
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NOOA Panel (Arrow et al 1993) Carson <i>et al</i> 1994, Hanemann 1992, Kopp 1991	Desvouges et al 1993;Shavell 1993	Milgrom 1993 Madariaga and McConnell 1987 Brookshire et al 1986.	Bishop and Welsh 1992	Diamond and Hausman (1994)
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Box 1 Outline of the USA NRDA Process

1. Review Preliminary Restoration Objectives

This is the starting point in an NRDA, which aims to assess injury to natural resources and the loss or impairment of the ecological and human services they support. The review aims to provide the following information:

- i. preliminary identification of natural resources and services that have been injured or lost;
- and
- ii. preliminary identification of the degree, spatial and temporal extent of the injury, including a determination of the potential recovery period.

With this information, trustees may define restoration objectives in terms of specific resources and services to be restored or replaced.

2. Identify Possible Restoration Actions

The aim of this step is to identify a range of possible primary and compensatory actions that address restoration objectives.

3. Classify Restoration Actions

Restoration actions are classified according to whether they provide services of the same type, quality and value as those that were lost due to injury. Services considered include geo-hydrological, habitat, recreation, commercial, cultural, health and passive uses. The classification of restoration actions serves two purposes:

- i. Prioritising compensatory restoration actions: the OPA regulations place a priority on compensatory actions which provide resources and services of the same type and quality and of comparable value. If this is not possible, actions which provide services and resources of at least comparable type and quality may be considered; and
- ii. Selecting a suitable approach for scaling: the type, quality and value of the services provided by restoration has implications for the choice of scaling method (see points 4 and 5 below).

4. Scaling of Primary Restoration Actions

For primary restoration, this addresses the question of what scale of primary restoration is necessary to return the stock of resource and service flows to baseline levels in a timely manner. Once primary restoration actions are selected, this allows quantification of the extent and duration of injury, i.e. estimation of interim losses, which informs the analysis of compensatory restoration actions (see step 5).

5. Scaling of Secondary Restoration Actions

The relevant question to be addressed here is: what scale of compensatory restoration action is necessary to compensate for the interim loss of natural resources from injury until full recovery? Scaling in this case involves adjusting the size of the action to ensure that (present discounted) gains from the action equal the (present discounted) losses from the injury.

Scaling requires:

- i. Quantifying the extent and duration of service losses;
- ii. Quantifying the extent and duration of gains for different scales of compensatory action;
- and
- iii. Determining trade-offs between services lost due to injury and gains from restoration actions.

Source: from MacAlister et al 2001. See also Penn (2000) for a concise evaluation of the NOAA (1997) guidelines.