

# WHAT IS THE ROLE OF ENVIRONMENTAL VALUATION IN THE COURTROOM?

## THE US EXPERIENCE AND THE PROPOSED EU DIRECTIVE

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The proposed EU Environmental Liability Directive is likely to pave the way for the use of economic valuation tools in European courts. The current paper seeks to assess the US experience with using CBA in courts with the aim of providing suggestions as European legislators formulate the direction of the EU environmental liability regime. The US experience highlights the issues that are likely to be important in the future in the EU. These are identified as: i) issues of accuracy and the cost of valuation studies ii) issues of consistency of valuation with the compensation aspect of the new liability iv) issues of standing regarding both use and non-use values. These topics have been the basis for ongoing debate in the US and are discussed with the aim of providing some ideas for consideration in light of the development of the EU environmental liability regime. The paper concludes that valuation has a role in civil liability, but it should be seen as an extraordinary remedy for checking nonresponsive regulators.

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## **1. Introduction**

The proposed EU Environmental Liability Directive is likely to pave the way for the use of economic tools for natural resource damage assessment (NRDA) in European courts. The current paper seeks to assess the US experience with using valuation methods in courts with the aim of providing suggestions as European legislators formulate the direction of the EU environmental liability regime. We find that the US experience resembles an attempt to “make the foot fit the shoe”, i.e. the problem of environmental harm does not easily fit into the paradigm of civil liability. This raises many issues concerning costs and accuracy of valuation studies, but most of all it points to the issue concerning the standing to claim damages for environmental injuries. Despite more than ten years of experience with these problems, the US courts have made little real progress towards their resolution, partly because they are not resolvable in this context. Does this mean that there is no role for valuation in courtroom? We argue that environmental valuation has made its way into the courtrooms for reasons of dissatisfaction with alternative political mechanisms for controlling these harms, and thus a residual role for this approach exists.

Our discussion proceeds as follows. Section two outlines the US experience with using valuation methods in courts. Section three discusses the new EU White Paper on Environmental Liability, and contrasts it with the US legislation. Section four presents certain issues regarding valuation that have pre-occupied both academics and the courts in the in the US. Lessons for the new EU environmental liability directive are drawn.

## **2. Environmental Valuation in US Courtrooms**

In the US public natural resources such as the atmosphere, oceans, estuaries, rivers, and plant and animal species often hold that legal status of “public trust resources”. The main 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), the Oil Pollution Act of 1990 (OPA), and the National Marine Sanctuaries Act of 1996 (NMSA).<sup>1</sup> Under these acts designated trustees are to assess and recover damages to

resources resulting from injury to natural resources (such as from an oil spill or from the release of a hazardous substance). 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 (Penn 2000).

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).

The important questions for our purposes is the extent to which these measures of damages include nonuse values (NUVs) and the extent to which these NUVs (if allowed) may be estimated by use of individual preference based techniques. NUVs are those values of resources that are attributable to an individual's abstract concern or caring about the existence or quality of a resource, and irrespective of any physical interaction with the resource. An example of a NUV would be an individual who feels a personal loss by reason of the extinction of a species of which he/she has no personal experience. An example of an individual preference based technique for estimating a NUV would be the contingent valuation method (CV). The CV is based on the idea that the individual with a personal loss of welfare will be able to report a value for that loss if an artificial market is created within which that loss is valued. A CV is conducted by the administration of individual surveys across a sample of the affected population to assess individual values, followed by aggregation to determine the total value of the resource to the population.

The issue of the applicability of NUVs and individual preference based techniques was resolved in the 1989 case of *Ohio v US Department of Interior* (motivated by the Exxon Valdez Oil spill), in which the court granted equal weight to use and non-use values (NUVs) in damage assessment. The allowance of NUVs in the scope of damages implies

the use of stated preference techniques since these are currently the only feasible method for estimating such values. Further individual preference based valuation techniques were given a "rebuttable presumption of validity" (Loomis 2000). Defendants can appeal the specific application of these methods but not the methods in general.<sup>2</sup>

Various industries and stakeholder groups fiercely opposed the use of preference-based techniques and especially the use of the CV method for estimating non-use values. This criticism manifested itself in academic journals, and also in the courts.<sup>3</sup> As a response to these attacks the Department of Commerce convened a panel consisting of leading economists to assess the validity of the CV method in the measurement of non-use values. The resulting 'NOAA panel' cautiously supported the use of stated preference techniques in damage assessment cases (see Arrow *et al* 1993).<sup>4</sup> They concluded that the information provided by stated preference techniques is as reliable as that derived in the marketing analyses of new products, and other techniques of damage assessment normally allowed in court proceedings. A stringent list of guidelines ("NOAA guidelines") were recommended to assure reliability and validity, but from this point forwards NUVs and CV techniques have been allowed in US court proceedings.

#### *Court-room experience with economic valuation techniques*

Probably the most publicized case using the CV methodology concerned the Exxon Valdez oil spill off the shores of Prince William Sound in the State of Alaska. The damages were estimated to lie between \$3 and \$15 billion (Carson *et al* 1994). Exxon settled out of court by agreeing to pay a total of US\$1 billion. 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, and recovered the value of interim losses (Penn 2000). Other examples of the successful use of CV techniques for the estimation of environmental damages include the State of Colorado's case quantifying the damage caused to watersheds by the Eagle Mine (see Kopp and Smith 1989), and the State of Washington's case quantifying the damages from an oil spill that soiled the coastline of the State of Washington (see Rowe *et al* 1992). In both these cases the trustees estimated both use and non-use values. Finally, the American Trader Case is one of the few examples of the application of these valuation techniques that was not settled

out of court; there the trustees estimated the damages from an oil spill to the affected coastline using the benefit transfer method (see Chapman and Hanemann 2000).<sup>5</sup>

*Evolving approach to economic valuation of environmental damages in the US*

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 damages that, if paid as compensation, would make the public whole again. Since the mid-1990s the procedures for NRDA, and the applicable legislation, have shifted towards resource compensation and the resource-to-resource (or service-to-service) approaches to determining the scale of compensatory restoration. The guidelines suggest that the service-to-service approach is used when the injured and replacement resources and services are of the same type, quality, and of comparable value. It is similar to in-kind trading between the injured and replacement resources and services. The defendant is allowed to substitute “equally valued” replacement resources for the injured ones.

The scaling analysis (i.e. the determination of the size of compensatory restoration) 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.<sup>6,7</sup> Also, monetary valuation procedures are still to be used when there are no appropriate compensatory restoration options and when the injured and restored resources and services are of comparable type, quality, but not value (MacAlister *et al* 2001).<sup>8</sup> Finally the latest NRDA guidelines allow the use of valuation techniques in order to show that the costs of primary restoration may be grossly disproportionate to the benefits. If this is shown then incomplete primary restoration may be permitted. The responsibility for demonstrating this rested with the party responsible for the damage (Penn 2000 and MacAlister *et al* 2001).<sup>9</sup> Therefore, although the movement within the US has been toward the substitution of replacement resources for injured ones, there remains a role for valuation in assessing the degree of substitutability between the two resources.

### 3. Environmental Valuation in the EU

The environmental liability regimes within EU member states make very limited provision for assessment of environmental damages, and few of them have made any progress in delineating the role of individual preference based techniques in estimating these. Most liability-type legislation found in member states deals with "traditional" legal forms of damages, such as personal injury or property damages, rather than with environmental damages *per se*. Moreover, such damages usually have been assessed using techniques based on market prices and costs, and not on individual statement of preferences (such as the CV methodology). For example the German Environmental Liability Act of 1990 and the Danish Compensation for Environmental Damage Act of 1994 are drafted in this spirit. In Belgium the courts are using a concept of 'collective goods' similar in spirit to that found in the US NRDA so that ecological and aesthetic loss can be compensated. Though in some other national laws impairment of the environment is also covered, barely any rulings have been made to clarify this notion. Also there has been no ruling on the appropriate role of economic valuation techniques in the assessment of environmental damages.

The recent White Paper on Environmental Liability (Com (2000) 66) seeks to fill this legislative vacuum and to broaden the notion of damages to cover biodiversity (in addition to damages in the form of contamination of sites and traditional damages which are covered by the environmental liability laws in most member states).<sup>10</sup> The main features of the regime have been identified as: no retroactive application; coverage of both environmental damage (site contamination and damage to biodiversity) and traditional damage (harm to health and property); application linked with preexisting EC environmental legislation: contaminated sites and traditional damage to be covered only if caused by an EC regulated hazardous or potentially hazardous activity; damage to biodiversity only if protected under the Natura 2000 network; strict liability for damage caused by inherently dangerous activities, fault-based liability for damage to biodiversity caused by a non-dangerous activity; some alleviation of the plaintiffs' burden of proof and some equitable relief for defendants; liability focused on the operator in control of the activity which caused the damage; allowance of economic valuation of environmental harms; an obligation to spend compensation paid by the polluter on environmental restoration; an approach to enhanced access to justice in environmental damage cases.

Two notable differences concern the nature of the 'trustees' and the scope to which the regimes apply. In contrast to the US, the proposed EU liability system allows for environmental organisations and other interested parties to act as 'trustees' and pursue legal actions (see section 4.7 of COM (2000) 66). This is to enable challenges to possible procrastination or negligence on the part of state authorities (see the report by the EU Economic and Social Committee, CES, 2000). Yet, such provisions raise serious theoretical and practical issues particularly when non-use values are to be estimated (see section on standing below). Also, the scope of the proposed liability directive seems much more limited than that in the US. The EU White Paper specifies that damages to biodiversity may be recovered only if the area is protected under the Natura 2000 network.<sup>11</sup>

The White Paper paves the way for using valuation methods both when damages are irreparable and also when damages are reparable but the costs of restoration are disproportionate to damages. In cases where the costs of restoration are considerably higher than the estimated value of the damaged natural resource, the compensation to be paid should amount (at least) to the value of the damaged natural resource while the awarded damages must be utilized for providing environmental services of equivalent quality and quantity of those lost.

The document endorses the use of techniques such as CV but it is cautious about the costs involved in undertaking original on-site studies. The White Paper encourages the use of estimates derived in similar studies to determine the damages in others: the so-called benefit transfer method. To this aim, the paper stresses the importance of developing data bases (such as the Environmental Valuation Resource Inventory (EVRI)) comprised of economic valuation studies to be used for inferring natural resource damages (COM (2000)66). Such an approach would involve the accumulation of information from all previous valuation studies, in the hopes that the incremental cost of future valuation exercises would be reduced on account of the continuing usefulness of earlier ones.

Thus, the White Paper is advocating the broad based use of, and exclusive reliance upon, valuation methods to an extent that now exceeds its level of application in the US. Whereas the US has begun to use "in kind" methods of compensation, the EU is looking

to rely on a more comprehensive and carefully engineered approach to successive valuation. Does this make sense? What are the problems with the valuation approach that has resulted in the US turning to “in kind” methods? We turn to these issues in the next sections.

#### **4. What is the role of valuation in the courts?**

There are four issues that are most often considered considering whether valuation methods should be used in courtrooms. These issues are: i) Are valuation methods sufficiently accurate for use in courts? ii) Are valuation methods consistent with the compensatory objectives of liability? iii) Can valuation methods be applied at reasonable expense? and iv) Who should be counted as part of the affected population in assessing a damages? These issues have been the focus of the ongoing debate in the US and are reprised here as an introduction to the complexities of the problems that would be faced by the EU under the regime outlined within the White Paper.

##### **4.1. The debate over accuracy.**

Many objections to the use of valuation in courts have focused on measurement issues. Measurement issues concern two aspects of the problems concerning the accuracy of stated preference studies (such as CVs). One aspect is the *credibility* of the stated preferences, i.e. how well do the surveys create incentives for the truthful revelation of preferences? For example, if an individual wishes to skew the results of the exercise, does the methodology create incentives or mechanisms that will constrain this sort of behaviour? These are the problems of survey design that exist in all sorts of similar exercises (such as marketing studies). The NOAA panel found that properly constructed surveys could in fact produce incentives for truthful revelation, and that there existed additional methods by which the results of the survey might be checked. For example, individual bids are usually checked against the salient characteristics of the bidder (such as income level, interest in the issue, family status) to determine whether the bid is consistent the character of the bidder. Thus, the credibility of the results of a survey are a function of the quality of the survey design.

The other problem of accuracy concerns the margin of error surrounding the valuation. This variance will depend to some extent on the size of the sample and the nature of the good being valued, but it will necessarily remain fairly large and uncertain on account of the technique that is used. This is of course true when valuation is used in cost benefit analyses generally, and not just in courtrooms. However, some have argued (e.g. Desvousges *et al* 1993, Johnson *et al* 2001) that damage assessment in courtrooms requires a much higher degree of accuracy than that required for policy and regulatory reviews. Errors in welfare estimates for policy purposes may or may not influence realised outcomes, and (if they do) the realised benefit and costs are usually distributed widely across many gainers and losers in the population. In contrast, the damages estimated in a court proceeding might be borne by a single or a few responsible parties. This concentration of impact renders the range of variability, and its relative uncertainty, more objectionable in the case of courtroom applications.

#### **4.2 The issue of the costs of valuation.**

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 the conduct of a valuation may not pass a CBA test! The White Paper has recognised that original valuation studies may be too costly and strongly endorses the use of benefit transfer techniques, as described above. Yet, economists have stressed that the benefit transfer method, even if suitable for policy decisions, may lack the accuracy required for awarding damages (e.g. Navrud and Pruckner 1997). Moreover, the White Paper suggests that only "significant damages should be covered" under this new regime. This suggests that there should be a *de minimis* standard before economic valuation is applied. But when will this be reached? Since most nonuse values will appear small from all tangible perspectives, it is difficult to know when a valuation approach would be applied, or how to create a standard that would authorise one.

#### **4.3 Is Valuation Consistent with Compensation?**

Several legal theorists in the US have examined the extent to which damages calculated using CV techniques correspond to ordinary legal definitions of compensable damage and loss. They argue that, although 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 methods *ex-post* for the measurement of damages. According to Daum (1993) the model of damage calculation embedded in tort law for determining compensation is not compatible with the types of damages that are derived from (stated) preference based techniques because such studies are always carried out after the damage has occurred and can not reflect pre-existing values independent of the accident and of the valuation process.

Economists do recognise that statements concerning the willingness to pay to avoid damage is a different welfare concept from the valuation of damages to an environmental resource after the occurrence 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. This is an important design issue that must be incorporated into courtroom directed valuation.

#### **4.4 The debate over standing**

Finally, the most critical issues concerning the use of valuation techniques in court concerns the question: "Whose preferences matter?" Generally, we can say that we should count whoever has suffered a *real* loss. Determining this population is relevant for both the purposes of sampling and aggregating. Sampling will produce an estimate of unit average damage. Aggregation will produce the total amount of damages. The choice of the relevant affected population will affect the estimated shape of the demand function but, more importantly, the choice of population will have an even greater effect on the estimated level of damages. Hence, if we were merely interested in unit mean values, then the problems of defining the relevant population are not so severe. Yet, in environmental damage assessment aggregate values are what matter and hence determining who should be included in the aggregation population can have profound consequences for the outcome of the litigation process.<sup>12</sup>

The economic conception of standing is much broader than the legal definition. It implies that everyone who experiences a real welfare loss should be included in the aggregation population (Whittington and Macrae 1986). Legal standing has been traditionally defined as a much less inclusive concept and includes only those individuals who have experienced a compensable injury. A categorisation and clarification of some

of the issues concerning standing follows below. Only a selection of the issues involved is presented.<sup>13</sup> The issue of standing is still very much open both in the courts and in the academic journals.<sup>14</sup> The exposition highlights some of the misunderstandings and disagreements between economists and lawyers rather than purporting to offer a definitive resolution.

In practice the courts in the US have been inconsistent in defining the relevant population of non-users. In the Nestucca oil spill case, for example, the populations of Washington and British Columbia were used for estimating damages, while in the case of the Exxon Valdez spill the population of the entire United States was held to be the potentially affected population. In a more recent case, *Montrose Chemical Corp. v. Superior Court*, the Trustees defined the potentially affected population as the English-speaking households in California (Zerbe 1998).

The recognised rights of the claimant do not constitute a sufficient basis for delineating between those within and without the affected population. This is because NUV has been defined as the value one obtains from a natural resource when no present or future direct personal use is realised or intended. However a NUV cannot reasonably be claimed with regard to a resource if it never existed. From this it can be inferred that NUVs are derived from the individual's knowledge of the existence of a natural resource. Hence, human *perception* or some *knowledge* about the resource is an important part of the definition of NUVs and has been the basis for the debate over standing.

Dunford *et al* (1997) and Johnson *et al* (2001) have argued that demand for knowledge about the resource and/or its injury are required for one's NUV to have legal standing. The lack of such demand for information tells the court something about the true preferences of these individuals. Information acquisition activities involve opportunity costs and thus are indicators of one's interest in particular natural resource. Respondents in CV studies that have not (endogenously) acquired such information nevertheless receive (exogenous) information from the study itself. The authors claim that expressed non-use values from individuals with no prior or no intended demand to acquire information are somehow "induced" preferences and that the subsequent estimated losses would not have occurred if the respondent had not been sampled.

This raises the familiar issue of the role of the person conducting a study in providing information.<sup>15</sup> It has long been emphasised in the economic literature that the sampled population requires full knowledge about a policy problem in order to make an informed judgement. However, these are *ex ante* studies of proposed policy changes, and thus none of the population can have knowledge of the proposed changes. It does not necessarily follow, however, that supplying information to respondents is also appropriate when assessing *ex post* compensation for actual welfare losses from a sample of respondents representing the general population (Dunford *et al* 1997). Hence, attempts to aggregate losses over informationally unrepresentative sub-samples of larger populations may be inconsistent with the *revealed* knowledge and concerns of that population (Johnson *et al* 2001, p.61). Some sort of prior knowledge of the resource might be made a prerequisite to claiming standing, and thus to taking part in a survey regarding NUVs.<sup>16</sup>

But what sort of “prior knowledge” of the resource is to be required? It has been argued that individuals have preference over general *classes of environmental goods* (not specific forms of environmental resource) and thus they would suffer a legitimate loss in NUV from a damage to a particular environmental asset even if they had no prior knowledge of the asset and/or the injury (Randall 1997, Zerbe 2001). Randall describes the existence of such preferences emerging as a form of heuristic to deal with the realities of an overwhelmingly complex world: people care about a class of things which implies that they care about particulars in that class. People might then claim a compensable injury, if they are informed about damage to a member of a class about which they care.

However, accepting that individuals care about *classes* of environmental resources poses problems in interpreting how people make choices about *specific* resources when asked to do so. That is, if, for example, people care about ‘all species’, does this mean that individuals would have the *same* value for *any* member of the class of resources? How would they tradeoff any species within that class against the acquisition of a good from another class (such as a road project or a hospital project)? The purpose of a legal action is to obtain compensation for injuries to *specific* natural resources, and requires a well-defined position regarding that resource. General knowledge of ‘the environment’ is more of a political position than a justification for a legally recognised right. (Johnson *et al* 2001).<sup>17</sup>

The White Paper makes no explicit reference to standing regarding non-use values. This is odd given that much of the theoretical and practical issues on using CBA in the courts in the US have been preoccupied with these issues. Such issues are bound to emerge in the EU as well. For example the White Paper allows (under certain conditions) for non-governmental agencies to pursue actions and claim damages on 'behalf of society'. It is likely that a large proportion of such sought damages would be of the non-use value type and hence the issues discussed in this section will have to be further considered. The questions of 'who has standing?' are likely to preoccupy the courts in the implementation of the Liability Directive.

#### **5. Concluding Remarks: What is the role of valuation in court?**

The current paper sought to assess the US experience with using valuation in courts with the aim of providing suggestions to the EU, as European legislators formulate the future direction of the EU environmental liability regime. The US experience highlights the issues that are likely to pre-occupy the deliberations in the EU. These were identified as: i) issues of accuracy of valuation studies; ii) the cost of valuation studies iii) the issues of consistency of valuation with the compensatory objective of a liability regime iv) issues of standing and aggregation regarding non-use values.

In our review of these issues we believe that we have identified two or three crucial problems in the use of valuation in courts. The first concerns the accuracy of valuation studies for damage assessment. We believe that appropriate survey design is capable of providing credible results, and measures that assess credibility; however, it will always be difficult to provide a reasonably tight margin of error around these results. The variance around these results might make them suitable for guiding penalty negotiations, but it is difficult to provide precise estimates adequate to form the basis for personal damages.

The second concerns the cost of implementing credible valuation studies. The conduct of a credible study valuing a specific resource will run into the tens of thousands of EUROS, and possibly about one hundred thousand EUROS per study. It is simply not possible to

conduct these studies for each damaged resource, and only the very worst imaginable incidents would be assessed at this cost. This will of course reduce significantly the usefulness of an environmental liability system. It is possible to use previous assessments as a guide to damages in other cases, but this merely expands the margin of error that was the basis for concern in the previous paragraph. Thus, the problem of costly assessment implies a large loophole in the system of environmental liability.

Finally, the most significant issue concerning the use of valuation concerns “who to survey?” Any harm to a natural resource will be substantial if a large enough group of individuals is allowed to claim damages regarding it. And, if the nature of the harm we are assessing concerns “nonuse”, how do we decide which “nonusers” to exclude from the assessment? This is the most serious problem that undermines the usefulness of valuation techniques with respect to goods such as biodiversity. The EU Directive makes clear that environmental groups will be granted standing to claim such damages, but on account of which group: its membership, the local community, all persons who knew of the resource’s prior existence, the class of all interested environmentalists? To some extent, the membership of an environmental organisation is that group that is most generally informed about natural resources, but not likely to be disproportionately affected by the loss of a specific resource. For this reason, membership of an environmental organisation would seem to be a better basis for involvement at the political rather than the judicial level of government. Courtrooms have usually been reserved for use by those who are individually and directly affected by others’ actions, while the legislatures have been reserved for abstract policy debates.

This raises the general point: do nonuse values attempt to translate an abstract policy issue into a personal injury context and forum? If so, why don’t we trust our legislatures to deal with harms to general public goods, both through ex ante regulation and ex post punishment? The problem of valuation in courtrooms is a byproduct of this general problem. It is an attempt to provide the public with a right of redress when its regulatory institutions are perceived to be nonresponsive to the public will. The problems with valuation tools and individual rights are understandable when seen from this broader context.

These concerns and others have moved the courts in the US toward “in kind” substitution of resources, and away from damage assessment. This has happened in recognition of the costs of individual assessment studies and the residual uncertainty remaining after they are undertaken. When injured resources are replaced by reasonable substitutes, all of the valuation problems listed above are avoided. The problem with this approach is that it depends on the availability of reasonable replacement resources for its existence. This is difficult in any circumstances, and even more difficult in the EU (where the only resources for which biodiversity damages may be claimed are the relatively unique ones on the Natura 2000 list). So, valuation might have to remain a tool of last resort in Europe even if it is possible to move away from it in the US.

In sum, it is clear that the use of economic valuation in courtrooms is a poor substitute for adequate environmental regulation *ex ante* and *ex post*, and the costs and complexities of dealing with public goods in private fora are substantial. This is a case of making the problem fit the process, rather than the other way around. Despite this fact, there is the clear perception that there are instances in which important and valued public resources (such as biodiversity) are not adequately managed on behalf of the public, and recourse for the worst transgressions must be afforded. In this light, the role of economic valuation is to provide an outlet for a statement of public values in a few extreme cases where it appears to the public that they are being entirely overlooked.

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## Endnotes

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<sup>1</sup> 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 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).

<sup>2</sup> 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.

<sup>3</sup> See for example the debates in the edited volume by Hausman (1993) and between Diamond and Hausman (1994), Hanemann (1994) and Portney (1994) in the special issue of the *Journal of Economic Perspectives*.

<sup>4</sup> 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." (Arrow *et al* 1993).

<sup>5</sup> See Loomis (2000), Hanemann (1992), Ward and Duffield. (1992), and Breedlove (1999) for more examples of the use of preference based techniques in US legal damage assessment cases.

<sup>6</sup> 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.

<sup>7</sup> 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 parties. This approach is particularly suitable when dealing with modest injuries to homogeneous resources and thus scaling is a relatively straightforward matter. Unsworth and Bishop (in Randall, 1997) dealing with 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.

<sup>8</sup> For full details of the NRD assessment process recommended by the OPA see <http://www.darcnw.noaa.gov/opa.htm>

<sup>9</sup> 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 (Penn 2000).

<sup>10</sup> For an analysis of the White paper see Holzman (1998) and background papers commissioned by the EU at <http://www.europa.eu.int/comm/environment/liability/background.htm> and <http://europa.eu.int/comm/environment/liability/followup.htm>.

<sup>11</sup> The network was established as one of the key objectives of the EU Habitats Directive on the conservation of natural habitats and wild flora and fauna (Directive 92/43/CEE, Directive 97/62/CE). The Habitats Directive created a European ecological network of special areas of conservation called Natura 2000 (article 3). Natura 2000 is to guarantee the maintenance (or reestablishment) of a favourable conservation status of habitats or the habitats of species in their natural range within the territory of the EU (article 3).

<sup>12</sup> The Eagle Mine case is typical of the relative importance of the standing issue over the issue of estimating average unit damages. In this case the state of Colorado sought damages for the release of hazardous substances into groundwater. What is interesting is that although both the trustees and the defendants estimates of unit average damages coincided their estimates of aggregate damages differed by several orders of magnitude (see Kopp and Smith 1989 for more details).

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<sup>13</sup> For a more comprehensive view of the debate see Dunford et al (1997), Randall (1997), Johnson et al (2001), Zerbe (1991, 1998, 2001) Trumbull (1990), Whittington and Macrae (1986) Kopp and Smith (1989).

<sup>14</sup> “Of all the issues of CBA few are misunderstood more”, Trumbull (1990, p.201).

<sup>15</sup> For an over of these issues see Munro and Hanley (2000), Chilton and Hutchinson (1999), Blomquist and Whitehead (1998), Boyle *et al* (1995), Whitehead, and Blomquist (1991), and Bergstrom, Stoll and Randall (1990).

<sup>16</sup> Economists are divided over the necessity of positive (actual or potential) information demand as a precondition for real compensable losses in NUVs (e.g. see Zerbe (2001, 1998) and Randall (1997) arguing against while Moran (2000) arguing in favour of it). In the former camp there are two counter-arguments worth mentioning.

<sup>17</sup> Note that there is also ample empirical evidence that WTP from non-users declines and eventually is reduced to zero when demand for information is absent. Various studies have shown that NUV have declined with distance and familiarity with the resource. See Bateman *et al* (2000), Moran (2000), Pate and Loomis (1997), Smith and Desvousges (1986), Peters *et al* (1995) and Sutherland and Walsh (1985).