



Environmental Conservation for the Present and Future
Generations: Use and Non-Use Values in Environmental Valuation

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Abstract

A basic problem in environmental conservation or attributes preservation and improvement is resource undervaluation or the failure of either the market or the government to capture all the benefits of the natural resource/environment. As with any environmental resource, the direct-use benefits foregone due to protection and conservation involve considerable social costs, the burden of which the government may not want to take on. Moreover, the lack of information on how citizens value conservation, particularly non-use values, can easily weaken government resolve in setting the appropriate annual budget for conservation. This paper uses the total economic value framework to examine the use and non-use values of marine resources. Mechanisms on how these economic values have been appropriated and intended to be captured are also discussed, particularly with respect to marine biodiversity conservation and marine pollution prevention.

1. Introduction

The conservation, protection and sustained management of the country's environmental resources have gradually become a major concern. Through the years our country has witnessed environmental degradation and loss due to anthropogenic causes; among these are deforestation, pollution and habitat alteration. In particular, the marine resources and environment has sojourned to the present sad state of affairs—over-fishing, coastal deforestation and more frequent occurrence of oil spills and marine pollution, among others.

One of the basic problems in environmental conservation or attributes preservation and improvement is resource under-valuation or the failure of either the market or government to capture all the benefits of the natural resource / environment. This has been seen to be a major cause that has led to the mis-use, misallocation or ruin of environmental resources (particularly our marine resources).

Like any environmental resource, the direct use benefits foregone due to protection and conservation are considerable social costs, which the government may hesitate to let go in the name of environmental conservation. Moreover, the lack of information on how citizens value conservation, particularly non-use values, can easily weaken government resolve in consistently allocating annual budget for conservation. As Dixon and Sherman (1990) explained it, “for various economic reasons that economists call market failure, the benefits of protection [and conservation] are only partly accounted for whereas the costs of protection receive thorough coverage. As a result, fewer [and smaller] areas are protected than is socially desirable. And because governments find it

difficult to capture these benefits, budget allocation for management of protected areas is frequently inadequate.”

This paper uses the total economic value framework in examining the use and non-use values of marine resources. Mechanisms on how these economic values have been appropriated and planned to be captured are also discussed, particularly with respect to marine biodiversity conservation and marine pollution (like oil spill) prevention.

2. Analytical Framework

Many environmental resources are usually over-used, abused, misused and damaged since their economic values are not fully reflected in the market. This results to the improper utilization and the lack of mechanisms to effectively conserve and protect such.

Moreover, anthropogenic causes of environmental degradation/ damage like sedimentation from deforested uplands, marine pollution due to oil spills and untreated sewage have been indicative that the full economic value of such resources have not been integrated in social decision making for alternative resource use (like land use and sea area use). Had there been proper environmental and resource valuation, the institutional infrastructures and incentive mechanisms should have been in place in order to facilitate sustainable use of such resources and prevention or minimization of their damage.

The total economic value of any environment, environmental and natural resources has increasingly been utilized in social decision making throughout the world. (See Figure 1.)

Economic valuation can be defined as the attempt to assign quantitative values to the goods and services [which includes ecosystem services] provided by environmental resources [like mangroves, coral reefs and the biodiversity therein], whether or not market prices are available to assist us. From the economist’s point of view, the economic value of any good or service is generally measured in terms of what we are willing to pay for the commodity, less what it costs to supply it. Where an environmental resource simply exists and provides us with product and services at no cost, then, it is our willingness to pay alone, which describes the value of the resource in providing such commodities, whether or not we actually make any payment (Subade, 2005; Georgiou, et al, 1997). Economic valuation is thus, anthropocentric, i.e., based on preferences held by people. The resulting valuation are in money terms because of the way in which preference revelation is sought – that is by asking what people are willing to pay, or by inferring their WTP through other means (Georgieou, et al 1997).

A major reason for the excessive depletion of and damages to biological/environmental resources (like coral reefs, mangroves, sea grasses and marine biodiversity) is often the failure to account adequately for their non-market environmental values in development decision-making. Many environmental resources like coral reefs and mangroves are complex and multi-functional, and it is not obvious how the myriad goods and services (such as seaweeds and element recycling, respectively) provided by these resources affect human welfare. Since many of the

benefits or values of natural or managed environmental resources are not bought and sold on markets they are often/generally ignored in private and public development decisions. In some cases, it might be worthwhile to deplete, over-harvest or degrade environmental resource. In other cases, however, it might be necessary to 'hold on' to these resources. Economic valuation provides us with a tool to assist with the difficult decision involved. With economic valuation, we are provided a means for measuring and comparing the various benefits of environmental resources like coral reefs. It serves as a powerful tool to aid and improve wise use and management of these resources (Barbier, et al, 1997).

What are the environmental resources values to be measured? In particular, what are the benefits and/or values of biodiversity? Specifically, what are the different benefits or values of a biodiverse marine habitat such as coral reefs? How do we measure these? The concept of total economic value (TEV) provides a framework in accounting for the many uses and values of environmental resources like biodiversity. The TEV is broadly categorized into *use values* and *non-use values*. Typically, *use values* involve some human interaction with the resource, environment or habitat, whereas *non-use values* do not (Barbier, et al, 1997). Turner and Pearce (1993) explain that use values are derived from actual use of the resource, while non-use values reflect people's preferences, but include concern for, sympathy with, and respect for the rights or welfare of non-human beings. Pearce and Warford (Pearce and Warford, 1992) defined non-use values as pertaining to current or future (potential) values associated with the environmental resource, and rely merely on its continuous existence and unrelated to use.

Use values can either be *direct* or *indirect*, where the latter pertain to the benefits gained indirectly from natural habitats, usually through support and protection of other economic activities, and are often referred to as natural functions or environmental services. For example, coral reefs provide shoreline / coastal protection from waves and typhoons, and spawning grounds for fish, aside from providing a rich habitat for various marine species. *Direct use values*, on the other hand involves both consumptive (for example, fish, medicines, and shell craft) and non-consumptive values and benefits (swimming, scuba diving, snorkeling and other marine eco-tourism activities not involving the extraction or consumption of marine life or habitat). Another type of use value is *option value* – the value now of potential future direct and indirect uses of the coral reef ecosystem (Cesar, 2000) like cure for cancer or AIDS from substances from the flora and fauna of the reefs. Bioprospecting has become a major means in capturing option value. *Quasi-option value* is another value of environmental resources, which is classified either under use values or non-use values, just like option values. It is related to option value and captures the fact that avoiding irreversible destruction of a potential future use gives value today. Figure __ shows the different TEV components and attributes of economic values of coral reefs, a rich and biodiverse environmental resource.

Barton (1994) as cited by Cesar (2000) discusses in more details the different economic values of coral reefs. As shown in Figure __, it is interesting to note that biodiversity falls under option and quasi-option values, yet a closer look at bequest and existence values would suggest that the latter two non-use values also cover biodiversity values for coral reefs.

In a review of several empirical studies on biodiversity valuation which can be applied to coral reefs, Cartier and Ruitenbeek (1999) classified biodiversity valuation measures into three—production values, utility values and rent capture values. Biodiversity production values (BPV) measure biodiversity within an economic production function, and focus on supply-oriented approach to valuation. BPV are often used to estimate direct use values like that of the fisheries. Biodiversity utility values (BUV), on the other hand measures within an economic utility function, thereby attempting to capture total consumer surplus or demand-oriented value. Contingent valuation (or contingent valuation method – CVM) techniques are often used to capture non-use values, or other techniques are used to value the final end-use benefits of biodiversity. Biodiversity rent capture values (BRCV) measure how much value is retained or captured within a country or region, or by a particular interest group. BRCV methods usually concentrate on one part of a profit function, and are more interested in identifying a specific profit share than in identifying total economic value. Estimates derived by BRCV approaches may be quite small if there are local institutional weaknesses or failures that prevent benefits from being captured.

Thus, when all of the above values are accounted for in the land allocation and other natural resource decision, the resource extraction or development may take a second priority after environmental conservation. Moreover, in the case of environmental or ecosystem damage (like an oil spill). the compensable amount that the liable party has to pay will be bigger. Damage claims and payments based on total economic values of affected environment/ ecosystems, which is not only based one direct values due to lost income and livelihood, when imposed by the courts as penalty to the liable party, will serve as (more) effective deterrent to future oil spills.

Non Use Values In Consumer Theory

Incorporating non-use values in environmental valuation means including them in the usual preference function (whether social or individual). Consider an individual utility function:

$$u(x, z) \tag{1}$$

where x is a vector of market goods and z is a vector of non-market environmental goods, characterized as public goods. As a convention, the individual maximizes utility by choosing which quantities of the available market goods to consume. Expenditures for these consumption choices are constrained by available income, y , where p is a vector of market prices at which the market goods are purchased. Thus, the basic model of consumption can be expressed as

$$\max u(x, z) \text{ s.t. } px = y. \tag{2}$$

Implicit in this simple characterization of consumer behavior is the important distinction between private and public goods. Individuals can choose different quantities of *private* goods for consumption, but must use exactly the same quantity of the *public* good. In other words, whatever quantity in which the public good is available is the amount the individual must use. Given the public good nature of the (environment or)

environmental goods, the individual does not choose the quantity of environmental goods to enjoy. Moreover, because the environmental goods do not have a corresponding market price, no income must be expended to enjoy the benefits of these goods. Constrained optimization (maximizing utility subject to the budget constraint as described above) yields the following demand function for market goods:

$$x_i = h_i(p, z, y) \quad \text{for } i = 1, \dots, n,$$

where i indexes the i th market good. Here, the demand for a market good depends on its price and the price of all other market goods, the vector of environmental goods, and the individual's level of income. From the demand curve, the indirect utility function is derived:

$$v(p, z, y) = u[h(p, z, y), z]$$

where utility is represented as a function of prices for the market goods, income, and the environmental goods. Now suppose that, within the vector of environmental goods z , one particular environmental good, z_i is increased *ceteris paribus*, where the superscripts 0 and 1 indicate states before and after the increase, respectively. Then,

$$z_1 > z_0$$

and

$$u_1 = v(p, z_1, y) > u_0 = v(p, z_0, y).$$

The willingness-to-pay (WTP) that a CV survey attempts to elicit from a respondent is based on the difference between utility before and after the increase in z_i . One method of measuring this difference is the “compensating variation,” that is, the amount of income (money) that the individual would need to give up *after* the change from z_0 to z_1 , to leave her just as well off as before the change. The compensating variation measure of change in utility can be written as:

$$u_1 = v(p, z_1, y - c) = u_0 = v(p, z_0, y),$$

where the compensating variation is represented by c . The reduction in income by c exactly offsets the benefits of the increased environmental amenity, leaving the individual indifferent between u_1 and u_0 . Consequently, c can be viewed as the maximum amount the individual would be willing to pay for the increase in the environmental good, z_i . Thus, it is the compensating variation, c , that most contingent valuation questions attempt to elicit. Since we have defined the environmental good as a public good, the *total* WTP for the increase in z_i is given by aggregating (summing) the compensating variations of all n individuals.¹⁶

With the same simple model it is also possible to examine the WTA measure of value placed on a given environmental amenity. Consider again an increase in an environmental amenity from z_0 to z_1 ; however in this case, the improvement has not yet occurred. Equivalent variation measures how much money the individual would need to receive *before* the change from z_0 to z_1 , to leave her just as well off as *after* the environmental improvement. In other words, the equivalent variation is the minimum amount of money the individual would be willing to accept to forgo the increase in the

environmental amenity. The equivalent variation measure of change in utility can be written as:

$$v(p, z_1, y) = v(p, z_0, y + k)$$

where k is the equivalent variation.

The above model, elaborated so far, incorporates only the *use* of the environmental goods. As discussed earlier, non-use values can be an important component of the economic value, associated with non-market environmental goods. Non-use values can be added to the model by re-defining the utility function as:

$$u(x, z) = w[u(x, z), z],$$

where the new utility function is increasing in both arguments, i.e., $u' > 0$ over x and z . Note that environmental goods z enter the new utility function $w(\cdot)$ twice. Environmental goods enter first as part of the utility $u(\cdot)$ derived from the amount of the environmental goods consumed (used) together with market goods x . Environmental goods enter again as the second argument, z , in a way that is unrelated to the complementary use of the market goods, that is, as a non-use value. Significant theoretical debate exists about whether willingness-to-accept (WTA) or willingness-to-pay (WTP) is the better method for estimating the value of non-market goods.

Perceived ownership may provide some guidance as to which approach is preferable. If the public is perceived as the owner of the good then they should be compensated if its value is reduced (WTA). On the other hand, if the good has no perceived owner, then the public must pay to enjoy it (WTP). Given the somewhat ambiguous nature of ownership of many public goods, it is often difficult to determine which view is the correct specification for meaningful answers in CV analysis. While in theory WTP and WTA values should be equal, or at least nearly equal, CV researchers have consistently found that WTA values are considerably larger than WTP values. This divergence, sometimes as large as an order of magnitude, has been debated in the literature for decades. In 1980, Randall and Stoll's publication on price flexibility of income was interpreted as implying that WTP and WTA for changes in environmental amenities should not differ greatly unless there are unusual income effects. However, in a 1991 *American Economic Review* article, Hanemann revisited their work and determined that for changes in the quantity of the environmental good (as opposed to price), there is no presumption that WTP and WTA be close in value. He showed that for environmental amenities such as the Grand Canyon, holding income effects constant, the smaller the substitution effect, the greater the disparity between WTP and WTA because there are no close substitutes. (Mathis et al)

Most practitioners and critics of CV agree that WTA may be the more accurate value for estimating environmental damages. In most natural resource damage cases, for example, the public, as the owner, has been damaged and should receive restitution by the equivalent variation measure. However, WTA often results in unrealistically high measures, largely due to "protest responses" where interviewees insist that the injured good is priceless, and give an infinite dollar value for the damaged natural resource. Consequently, most practitioners use the lower, more feasible WTP measure instead.

Mitchell and Carson (1989) argue that the WTP may be the more appropriate measure in the case of public goods. If the good being valued is a private good, then when it is damaged the owner deserves to be compensated. In this case WTA is the correct measure because the owner has a recognized property right to the good, including the right to sell the good. However, in the case of public goods, including natural resources, the ownership rights are not as clearly defined.

Individual consumers do not have the right to sell the good, nor to transfer its use to others. However, public goods are often built and/or maintained by payments from consumers in the form of higher prices, taxes, or fees and smaller levels of payments are associated with smaller levels of the public good. In fact, in a CV survey, when the interviewee is asked for his or her willingness-to-pay it is generally consistent with the traditional manner he or she has seen them funded (through taxes, fees, or other assessment instruments).

As has been pointed out, the contingent valuation method has been the major tool in measuring non-use values (Mitchel and Carson, 1989; Pearce and Moran, 1994; Carson, 2000; Bateman, 2002; Boyle, 2003). Though CVM has become the target of attacks and criticisms through the years, it has survived and has even been strengthened to be a robust basis for measuring non-use values.

Next Section (s):

Non-Use Values measured/ demonstrated: The Exxon Valdez experience

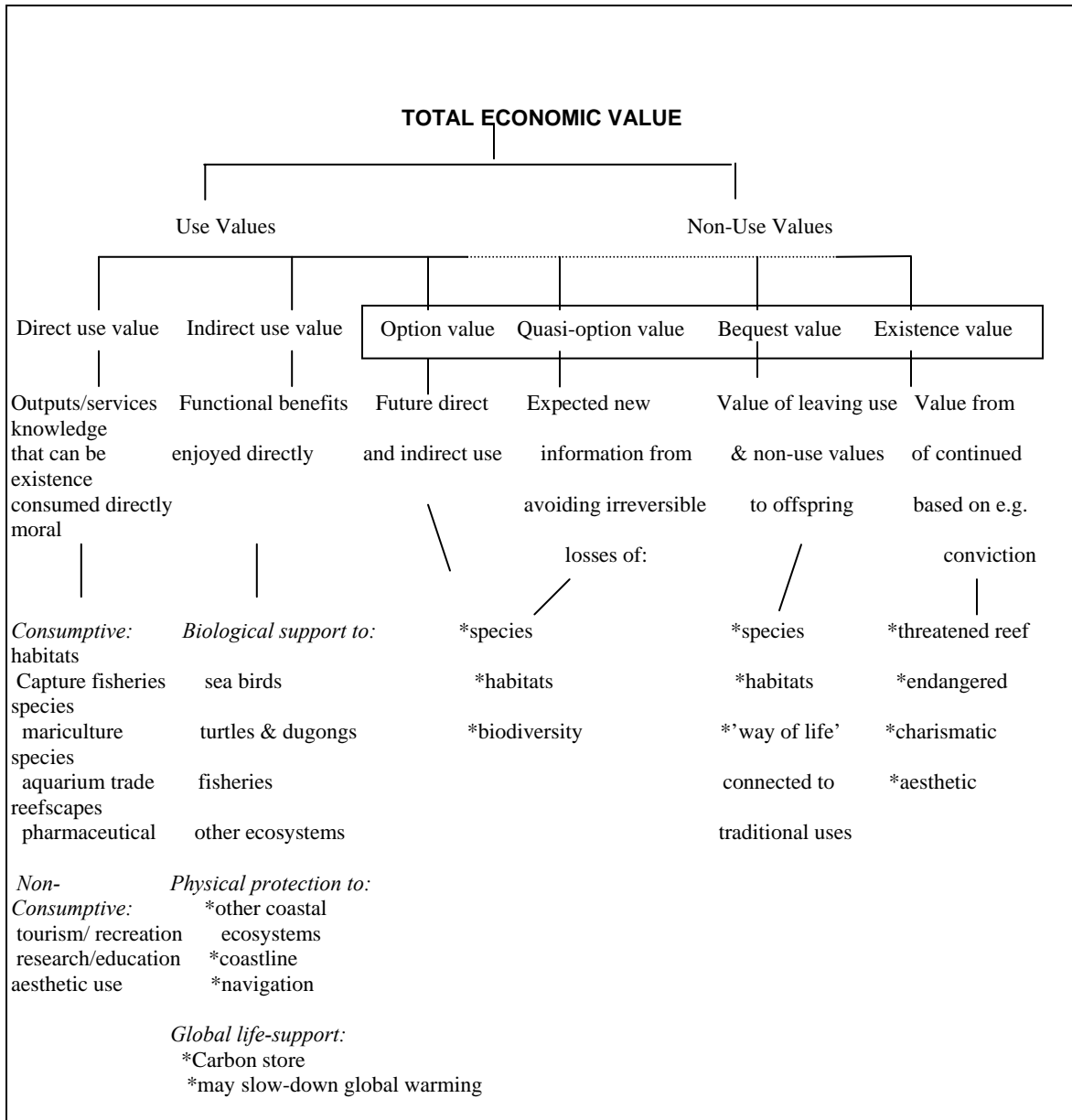
Krutilla's argument

Non-Use Values in Philippine Context: Tubbataha Reefs (appropriating non-use values)

Marine Turtle Conservation

Compensating/ paying for Oil Spill damages

Figure 1. Total Economic Value of Environmental Resources (e.g. coral reefs)



Source: Barton (1994), as cited in Subade (2005)