Economic valuation in fisheries – Tool and techniques

Chandrasekar.V, Geethlakshmi.V & Nikita Gopal*
ICAR-Central Institute of Fisheries Technology, Kochi-682029, Kerala
***vcsecon@gmail.com**

INTRODUCTION

Economic valuation provides a means for measuring and comparing the various benefits of fisheries resources and their ecosystems, and can be a powerful tool to aid and improve their wise use and management. It attempts to assign quantitative values to the goods and services provided by environmental resources, whether or not market prices are available. The economic value of any good or service is generally measured in terms of what resource users or society at large are willing to pay for the commodity, minus what it costs to supply it. Where an environmental resource simply exists, and products and services are supplied 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 payments are actually made. Many environmental resources are complex and multifunctional, and it is not obvious how the myriad goods and services provided by these resources affect human welfare. Economic valuation provides a tool to assist with the difficult decisions involved.

Loss of environmental resources is an economic problem because important values disappear, some perhaps irreversibly, when these resources are degraded or lost. Each choice or option for the environmental resource – to leave it in its natural state, allow it to degrade or convert it to another use – has implications in terms of values gained and lost. The decision as to what use to pursue for a given environmental resource, and ultimately whether current rates of resource loss are 'excessive', can be made only if these gains and losses are properly analysed and evaluated. This requires carefully considering the values gained and lost under each resource use option.

Valuation of Fishery resources

Currently, most countries do not routinely carry out the valuation of fishery resources. While bio-economic analyses increasingly inform fisheries management decisions, especially with regard to determining optimal fleet sizes and fishing effort, they are not undertaken with the intent of estimating the in situ value of fishery resources, even though they could easily form the basis to do so. Mostly bio-economic analysis is based on single- or multispecies modelling that incorporates solely technological interactions (e.g. one type of fishing gear harvesting an assemblage of different fish species). The construction of true multispecies models, i.e. incorporating biological interactions, has proven extremely complex and data intensive, but has shown to yield valuable insights, especially where a few dominant species interactions are critical for fisheries management decisions. Area-based valuation approaches (as are commonly applied for estimating the value of, for example, mangroves) can be appropriately used for valuing other multiple-use resources such as coral reefs, which often supply a multitude of specific products and services including fish, medicinal products, diving sites (i.e. aesthetic values) for tourism, shoreline protection and biodiversity.

In most instances, for the purposes of resource valuation, EAF would have to resort to a combination of valuation methods including single and multispecies bio-economic analyses, area-based valuation and ecosystem-wide modelling. However, these methods would typically relate to estimating only direct use, but not indirect and non-use values.

TOTAL ECONOMIC VALUE

The greatest difficulties in resource/ecosystem valuation exercises are posed by the need to evaluate, on one hand, changes in the abundance, species and size composition of fishery resources along with alterations to their habitats and on the other hand to estimate non-use values as expressed in concepts of "option value" and "existence value". The concept of total economic value (TEV) provides a framework to comprehensively evaluate natural and environmental resources, and there is increasing consensus that it is the most appropriate one to use. To conduct a complete economic valuation exercise, it is necessary to distinguish between use values and non-use values. The latter refer to those current or future (potential) values associated with a resource that relies merely on its continued existence, unrelated to use. Typically, use values involve some human 'interaction' with the resource whereas non-use values do not. This distinction is sometimes difficult to detect. For example, when small-sized individuals of the target species are discarded because of high-grading, the discarded fish, while not used directly in increasing human welfare, nevertheless represent one use of a fishery resource. The use-value of the discarded fish is the opportunity cost of harvesting the fish before it has attained its reproductive age and its optimum marketable size.

Use values are grouped according to whether they are direct or indirect. The former refers to those uses most familiar to us: harvesting of fish or collection of fuel/wood in mangrove areas. Direct uses could involve both commercial and non-commercial activities, with some of the latter activities often being important for the subsistence needs of local populations in developing countries or for recreation in developed countries. Commercial uses may be important for both domestic and international markets. In general, the value of marketed products is easier to measure than the value of non-commercial and subsistence direct uses. Policy makers often fail to consider either the non-marketed subsistence uses or the informal uses of fishery resources and their habitats (such as mangroves) in many development decisions.

In contrast, various regulatory ecological functions of fish habitats such as coral reefs and mangroves may have important indirect use values. Their values derive from supporting or protecting economic activities that have directly measurable values. The indirect use value of an environmental function is related to the change in the value of production or consumption of the activity or property that it is protecting or supporting. However, because this contribution is not marketed, it goes financially unrewarded and is only indirectly connected to economic activities. It is difficult to quantify these indirect use values, and they are often ignored in management decisions. They would also not usually be included in the kinds of bio-economic and economic-ecological models currently applied to fisheries and their ecosystems.

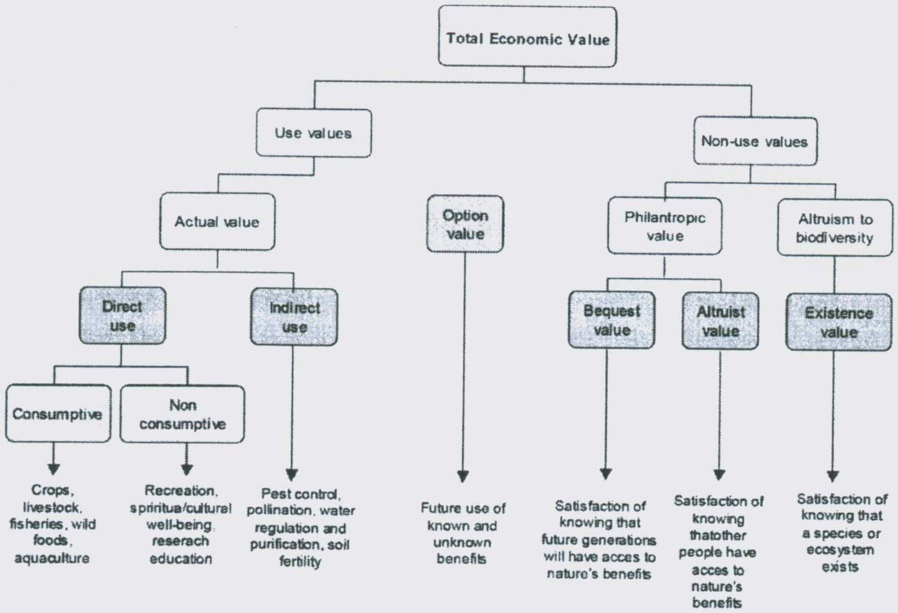
For example, the storm protection and shoreline stabilization functions of mangroves and other types of wetlands may possess indirect use value by reducing property, yet coastal or riverine wetland systems are often drained in order to build still more waterfront property. Mangrove systems are known to be breeding grounds and nurseries for shrimp and fish essential for coastal and marine fisheries, yet these important habitats are currently being converted for various other types of uses including residential and industrial development and coastal shrimp aquaculture. Natural floodplains may provide seasonally rich fish habitat, recharge groundwater used for dryland agriculture, grazing livestock and domestic or even industrial use, yet many of these floodplains are threatened by dams and other barrages diverting water for upstream irrigation and water supply.

A special category of value is option value, which arises because an individual or society may be uncertain about the future demand for a resource and/or its availability in the future. In most cases, the preferred approach for incorporating option values into the analysis is through determining the difference between ex ante and ex post valuation. If an individual is uncertain about the future value of an ecosystem, but believes it may be high or that current exploitation and conversion may be irreversible, then there may be quasi-option value derived from delaying the development activities. Quasi-option value is simply the expected value of the information derived from delaying exploitation and conversion of the ecosystem today. Many economists believe that quasi-option value is not a separate component of benefit, but involves the analyst in properly accounting for the implications of gaining additional information.

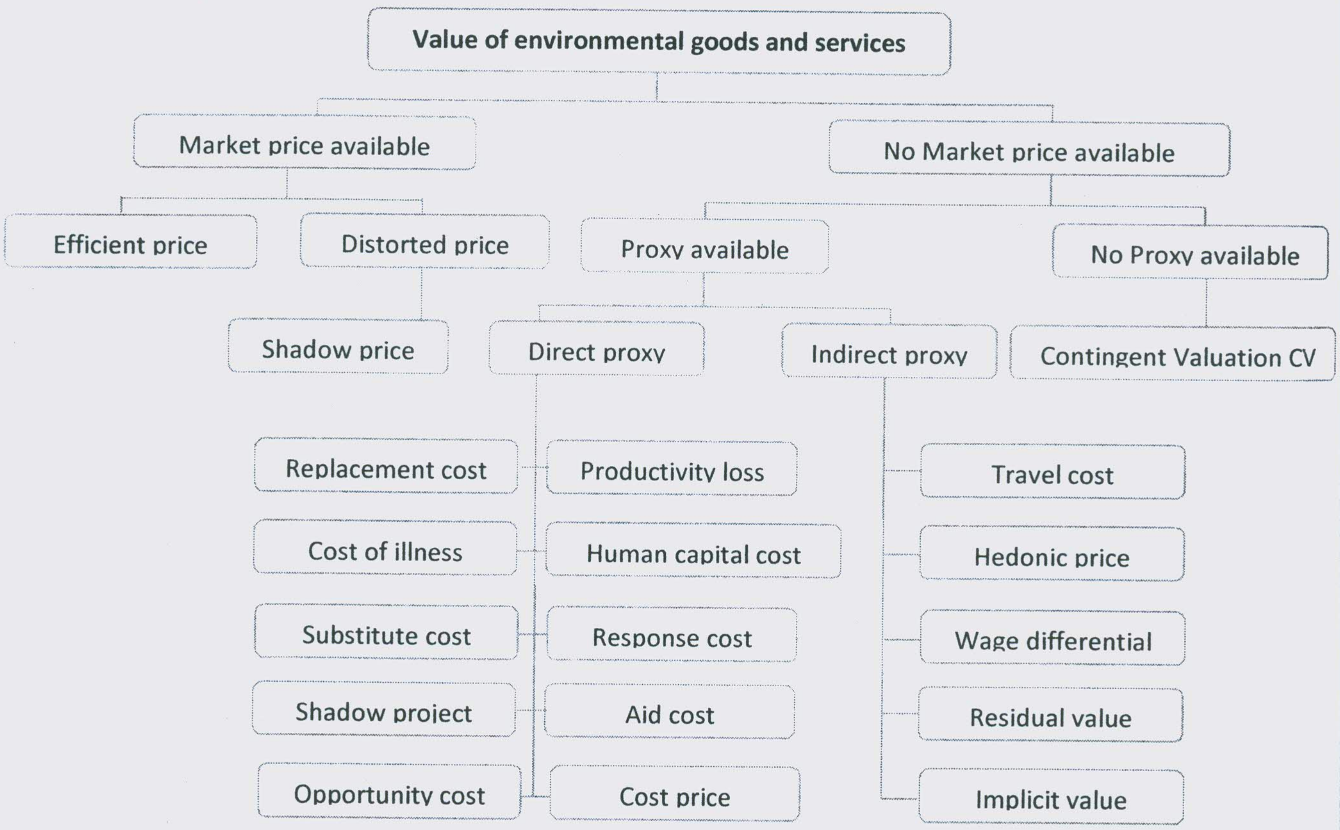
In contrast, there are individuals who do not currently make use of the goods and services of an ecosystem but wish to see them preserved 'in their own right'. Such an 'intrinsic' value is often referred to as existence value. It is a form of non-use value that is extremely difficult to measure, as existence values involve subjective valuations by individuals unrelated to either their own or others' use, whether current or future. An important subset of non-use or preservation values is bequest value, which results from individuals placing a high value on the conservation of ecosystems for future generations to use. Bequest values may be particularly high among the local populations currently using an ecosystem, in that they would like to see the ecosystem and its concomitant way of life passed on to their heirs and to future generations. While there are few studies of non-use values associated with particular ecosystems, campaigns by European and North American environmental groups to raise funds to support tropical wetlands conservation hint at the magnitudes involved. Valuation is only one element in the effort to improve management of ecosystems. At the same time, decision-makers must take account of many competing interests in deciding how best to use them. Economic valuation may help inform better management decisions, but only if those making the decisions are aware of the overall objectives and limitations of valuation.

The main objective of valuation is generally to indicate the overall economic efficiency of the various competing uses of natural resources and their ecosystems. The underlying assumption is that fishery resources and their ecosystems should be allocated to uses that yield an overall net gain to society, as measured through valuation in terms of the economic benefits of each use, minus the costs. Who actually gains and loses from a particular use is not part of the efficiency criterion per se. Thus, an ecosystem use showing a substantial net benefit would be deemed highly desirable in efficiency terms, although the principal beneficiaries may not necessarily be the ones who bear the burden of the costs arising from the use. If this is the case, then this particular use may be efficient, but it may also have significant negative distribution consequences. It is therefore often important that management policies be assessed in terms not only of their efficiency, but also of their distribution implications.

A major difficulty for evaluating a complex environmental system is insufficient information about important ecological processes underpinning the various values generated by the system. If this information is lacking – which is often the case for many non-market environmental values that may be deemed important – then it is incumbent upon the analysts to provide realistic assessments of their ability to value key environmental benefits. Equally, decision-makers must realize that under such circumstances valuation cannot be expected to provide realistic estimates of non-market environmental values – not, at least, without investment of time, resources and effort in further scientific and economic research.



Taxonomy of valuation methods



Finally, economic valuation is concerned ultimately with the allocation of natural resources to improve human welfare. Consequently, the various environmental benefits of fishery resources and their ecosystems are measured in terms of their contribution to providing goods and services of value to humanity. However, some members of society may argue that certain ecosystems and living resources they contain may have an additional 'pre-eminent' value in themselves beyond what they can provide in terms of satisfying human preferences or needs. From this perspective, preserving certain marine resources could be a matter of moral values rather than efficient or even fair allocation.

Further readings:

E. B. Barbier, M. Acreman and D. Knowler, *Economic valuation of wetlands: A guide for policy makers and planners*, Gland, Switzerland, Ramsar Convention Bureau, 1997.

Excellent reviews are provided by R. Hannesson, Bio-economic analysis of fisheries, published by arrangement with FAO by Fishing News Books, 1993;

J.C. Seijo, O. Defeo and S. Salas, *Fisheries bioeconomics – Theory, modelling and management*, FAO Fish Tech. Paper, No. 368, FAO, Rome, 1998.

O. Flaaten, The economics of multispecies harvesting: Theory and application to the Barents Sea fisheries, Berlin, Springer-Verlag, 1988.

An example for an ecosystem-wide model is Ecopath with Ecosim (see: http://www.ecopath.org)
For example, several years ago the United Kingdom's Royal Society for the Protection of Birds (RSPB) collected £500,000 (US$800,000) from a one-off membership mailing campaign to help save the Hadejia-Nguru wetlands of Northern Nigeria in West Africa.