THE VALUES OF BIO DIVERSITY

Introduction

Some will argue that conservation can and should be based on economics. One view is that supply and demand determines resource use and prevents over-exploitation. As resources are depleted and supply lessens, price rises. Once a resource becomes very scarce, it is no longer profitable to harvest. The strong view is that markets prevent over-exploitation. A less strong view is that rising prices at least give an early warning of resource depletion.

With the growing realization that species are being lost and ecosystems degraded, other economic arguments have gained credence. One argument is that the economic value of yet-undiscovered resources (new medicines, new foods) is the best reason to save biodiversity. Another view is based on calculating the full value of all ecosystem goods and services as a way to demonstrate how much actual value nature provides.

Some Weaknesses of Economic Analyses

On the other hand, an economic analysis may

fail to give sufficient weight to long-term benefits have difficulty managing common property lack approaches for assessing the costs of damage to natural systems and functions such as water or air pollution (externalities) lack approaches to assessing the values of natural processes such as watershed protection or amelioration of climate (ecosystem goods and services) ignore the aesthetic, ethical, cultural and scientific parts of the economic equation

Classification of Values of Biological Resources

Before considering each of these, we will first examine a useful framework of different categories of valuation of natural resources.

DIRECT VALUES

Consumptive Use Value refers to non-market value of resources such as firewood, game meat, etc. Such resources are consumed directly, without passing through a market. They usually are not calculated (but often can be approximated). A study in Malaysia estimated that wild pigs harvested by hunters had a value equivalent to $100 million annually. In Zaire, 75% of animal protein comes from wild sources. In a number of poor countries, firewood and dung are primary energy sources. As these become scarce, women spend most of their day simply collecting fuel wood.

Productive Use Value refers to the commercial value of products that are commercially harvested for exchange in formal markets, such as game meat, timber, fish, ivory, medicinal plants. They are included in national income accounts like the GNP. Estimates are usually made at the production end (sale of timber by the timber harvester to the sawmill), rather than the eventual value of the furniture and houses built from the timber. In developing countries, the commercial value of natural resources usually is a much greater fraction of the national economy than is the case in developed countries.

Much attention has focused recently around alternative uses of the rain forest. Usually, this is the search for valued non-wood products that can be harvested sustainably (fruits such as Brasil nuts, and latex from rubber-tapping).

INDIRECT VALUES

Non-consumptive Use Value refers to all of the "functions" or "services" of natural systems, as well as scientific research, bird-watching, etc. They rarely are included in any national accounting. Table 1 below lists some important ecosystem goods and services.

Option Value refers to the value of retaining options available for the future, such as yet-undiscovered new crops and medicines.

Existence Value refers to the value of ethical feelings for the existence of nature. Many of us attach value to the existence of a species or habitat that we are unlikely ever to see -- mountain gorillas, the deep rainforests of Amazonia, the highlands of Madagascar. This may include the satisfaction of knowing that certain species exist in the wild, or an ethical dimension of responsibility to nature, or future generations, or other peoples. WWF receives donations of $100 million a year on this basis, and it is by no means the only or biggest recipient of such donations.

Table 1. Ecosystems Goods and Services

1. Bacteria
Cycling of nutrients and gases; Organic carbon conversion in food chains; Drugs and antibiotics; Agriculture and biotechnology

2. Plants
Cycling of nutrients and gases (atmospheric O2, CO2); Photosynthetic energy; Water cycle, prevention of soil erosion; Food, clothing, shelter and medicine; 50% of world's nutrition comes from 3 plants (rice, maize, wheat); 80% from total of 20 plant species (of 250,000)

3. Animals
Soil fertility (nematodes, collembola, mites, annelids); Regulation of pest populations; Plant pollination; Food

Ecological economics attempts to compute the (non-consumptive use) value of ecosystem goods and services. While highly speculative, estimates are trillions of dollars. As a specific example, Pimentel and others estimate the costs of soil erosion at $44 billion annually. Loss of topsoil threatens sustainability of crop production.

Future and Present Value

Discounting is a widely used economic tool that may act against wise use of natural resources. It is similar to an interest rate.

Given a choice, people prefer to receive $1 today rather than $1 a year from now. Today's dollar can buy something, or earn interest in a bank. Economists capture this time-preference with a decision-making tool called the discount rate. It is used to determine the present value of future costs and benefits, to help us choose among various options. But by expressing all options in monetary units, and weighing future benefits much less heavily than present benefits, this approach can make sustainable, long-term use of natural resources uneconomic.

For example, if the rate of interest is 10%, one dollar one year from now is worth only 91 cents, because one can invest 91 cents today and it will be worth one dollar next year. By the same method, one dollar ten years from now is worth 39 cents today, two decades hence is worth 15 cents today. Any resource -- a tropical forest, the world's population of Minke whales -- has so little discounted value that it makes better economic sense to liquidate the resource and invest the money elsewhere -- perhaps in Amazon.com (the book seller, not the forest).

Net Present Value is a tool for calculating the benefit-cost ratio of a long-term project, using the discount rate to adjust for the lesser importance of both future costs and future benefits.

$$NPV = \frac{\text{Sum } (Bt - Ct)}{(1 + d)t}$$

Ct = costs in year t Bt = benefits in year t d = annual discount rate (~ interest rate)

An example shows that as the discount rate increases, long-term returns become unimportant relative to short-term returns.

Externalities are "hidden" costs that are not included in calculations of profitability. If a pulp mill pollutes a river, its profitability may be substantial or non-existent depending on whether costs of pollution abatement are excluded or included.

Common property management

Economic forces acting without restraint may result in destruction of a resource. Many fisheries have been harvested to the point of collapse. This problem may be aggravated for "commons" resources -- those which belong to everyone and no-one, like the fish of the open ocean, and the climate of the earth.

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