A REVIEW OF ECONOMIC APPRAISAL OF ENVIRONMENTAL GOODS AND SERVICES:

With a Focus on Developing Countries

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Abstract

Environmental economics has an extensive literature on procedures for placing economic values on the environment. Most of these methodologies have been developed and refined in the context of developed countries, where high levels of disposable income allow for a high demand for environmental amenities and a willingness to pay for non-use values. This paper argues that the applicability of these methodologies may be limited in developing countries. A microeconomic model, designed to highlight the different roles of environmental goods and services in developed and developing counties, is presented. In developing countries the value of environmental amenities is relatively less important than the value of environmental resources in the production process. The use of the procedures to estimate the value of environmental services in production should be respected, promoted and refined, particularly in light of widespread market failure in developing countries.

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Introduction

ENVIRONMENTAL ECONOMICS has a growing and extensive literature on methodologically rigorous procedures for placing economic values on environmental goods and services. Ideally, development aid organisations would utilise these procedures to undertake an economic appraisal of the costs and benefits of development projects. Since development aid organisations have made explicit efforts to incorporate environmental objectives in development aid programs the use of these procedures should gain in importance in the process of project appraisal.

Most of these methodologies, including contingent valuation, travel cost, and hedonic pricing, have been developed and refined in the context of developed countries, where high levels of disposable income allow for a high demand for environmental amenities and a willingness to pay (WTP) for non-use values of environmental goods and services. Often these procedures are applied to assess damages under liability rules that are peculiar to the USA. And given the extent of potential awards and settlements, the resources available to estimate economic values are extensive. These resources enable environmental economists to develop the methodology employed. Thus, these methodologies rely on large sets of data and often necessitate the collection of primary data through formalised survey procedures (which are relatively easy in developed countries).

Because of the popularity of these valuation techniques in the applied economics textbooks and journals much attention has been placed on the applicability of these procedures in developing countries. It is often argued that limitations on secondary data or difficulty in collecting survey data would make the cost of these methods prohibitive. Often the assumptions used in applying these procedures have been analysed and supported within the context of developed countries but have yet to be tested in developing countries. Also, given the prominence of techniques, especially CVM, that can effectively estimate non-use values, more mundane methods of estimating use values (such as changes in productivity and preventative expenditures) which might be more important in developing countries, have been neglected.[1]

Despite an increasing academic interest in valuation procedures that is expanding into developing countries (Abdulla 1993, Echeverría 1995), there appears to be a continued scepticism among many development aid organisations of their practicality. Concerns about the cost involved in estimating economic values and the contribution of the information provided to decision-makers persist. The failure of environmental economists to gain the confidence of donor agencies in the process of estimating environmental values suggests that the their efforts in this field may be misdirected.

This paper will argue that despite the popularity of methodologically rigorous valuation methodologies in developed countries, and the prestige awarded to the analysts, the applicability of these methodologies may be limited in developing countries. Although data limitations and difficulties

[1] For example, a recent call for papers on a conference on biodiversity in Latin America, specifically requested presentations on the use of CVM, travel cost, and hedonic pricing.

in performing surveys are important, the major limitation on the use of these techniques, especially CVM, is that the type of information provided is designed to answer questions not relevant to developing countries, especially in rural areas where environmental goods and services are important inputs into family production functions. Given poverty levels in developing countries, and limitations on government expenditures, the estimation of non-use values may not be appropriate (see Section II for an economic model that develops this argument). And given the different pressures for alternative land and resource issues that may subtract from environmental quality, as well as the cost involved in presenting an economic appraisal of development projects, it is important to ensure that valuation procedures focus on appropriate issues.

However, this paper does not argue against the estimation of environmental goods and services. The environment plays an important productive role, especially in rural areas in developing counties, and the loss of environmental services can often be directly linked to productivity losses. The estimation of the changes in productivity, or the opportunity cost of the preventative expenditures needed to avert productivity loss in developing countries, is neither a simple procedure nor a sophisticated use of economic and statistical theory. Yet this information is necessary for informed decision-making. Also, an estimation of the direct financial benefits of development projects to local communities may be necessary in order to assess their co-operation with the projects goals. Furthermore, because many of the alternative resource use options that are appraised in development projects entail income generating activities that carry political weight, it may be important to stress the value of productivity changes to a decision-maker as opposed to non-use values. Thus, current efforts to perform economic appraisal of projects and to estimate the value of land use options should be appreciated for the quality of the information presented and not assessed by the glamour of the methodology employed.

Section I provides a brief introduction.

Section II provides a microeconomic model to highlight the difference between the types of goods and services demanded in developed and developing countries.

Section III presents a review of a total economic valuation, with a quick definition of terms.

Section IV reviews both textbook valuation methods and more practical approaches to the valuation of environmental services in developing countries, with a focus on development projects.

Section V considers two studies which highlight the potential importance of use and non-use values, as well as local and global values; and

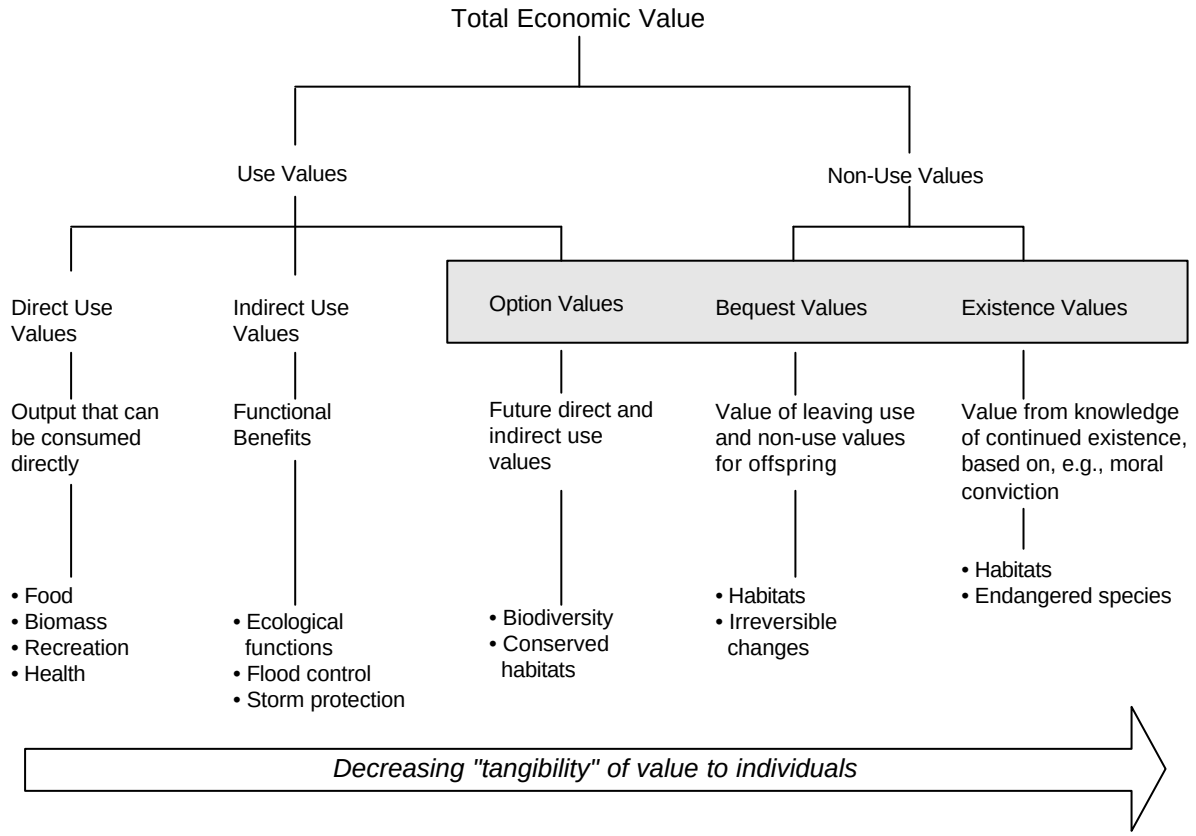
Section VI discusses some of the advantages of closer integration between environmental impact assessment and the economic appraisal of projects.

I. Total Economic Value

AS an introduction to the manner in which environmental goods and services provide economic value, and as a tool to organise a valuation process, the concept of the "total economic value" (TEV) of a resource has been presented in a variety of sources (Barbier 1989, Pearce and Turner 1990, Aylward and Barbier 1992, Munasinghe 1993). Although there is nothing particularly original in the idea that the total value of a resource is the sum of component values across the entire population of individuals that receives benefit from the resource, TEV does present a useful taxonomy of use and non-use benefits (*see Figure 1*).

As presented in Figure 1, the component values that comprise TEV can be arranged from very tangible services provided – such as food and energy, to less tangible benefits – such as existence value of an endangered species from someone who has no plans to come in contact with the species.

Figure 1 [2]



[2] Taken from Munasinghe page 29.

The five component values shown in Figure 1 are often defined and described, but they are also often confused, especially those in the shaded area.[3] Whereas **Direct Use Values** are self explanatory, **Indirect Use Values** should be seen as environmental services which support and protect production and commerce. **Option Values** are individual values of the option of future individual direct and indirect use of a resource. Similarly, **Bequest Values** are the personal value attached to the bequest to future generations of both use and non-use values. **Existence Values** are personal values for goods to individuals who have no expectation of receiving any tangible benefits from the goods.

II. A Simplified Model

AN important question in the issue of valuation of environmental goods and services in developing countries is whether there is something fundamentally different between developed and developing countries. To demonstrate a possible fundamental difference between developed and developing countries, a simplified model of consumer choice, production, and the rural household will be presented. Thus, in a developed country, a rational consumer with well behaved preferences would maximise,

$$U(X_1,\ X_2(E_R),\ E_M,\ E_A) \qquad \mathbf{1}$$

subject to,

$$M \geq P_1 X_1 + P_2 X_2 + P_M E_M \qquad \mathbf{2}$$

or alternatively subject to,

$$M \geq P_1 X_1 + P_2 X_2 + P_M E_M + WTP_A E_A \qquad \mathbf{3}$$

where:

$\boldsymbol{U(.)}$	=	a well behaved, increasing, individual utility function;
$\boldsymbol{X_1}$	=	a vector of market goods, excluding marketed environmental goods and services;
$\boldsymbol{X_2}$	=	a market good that is complementary to the consumption of $\boldsymbol{E_R}$;
$\boldsymbol{E_R}$	=	a non-market environmental service which is used in correlation with $\boldsymbol{X_2}$ or possibly embedded in the purchase of $\boldsymbol{X_2}$;
$\boldsymbol{E_A}$	=	an non-market environmental service;
$\boldsymbol{E_M}$	=	a vector of marketed environmental goods and services;

[3] Because the benefit types are often confusing, authors are careful to warn against the possibility of counting certain services more than once.

P_i	=	exogenously determined prices for X_i and E_M, i = 1,2,M;
M	=	money income earned or endowed exogenously; and
WTP_A	=	individual willingness to pay for non-market environmental good E_R, which is to be realised through some tax, fee, or transfer scheme.

In this model, environmental goods and services are: marketable, E_M , such as private recreation, fish, and transferable use permits; embedded or complementary to marketable goods, E_R, such as public recreation, amenities, and localised air quality; or are best represented as apart from market goods, E_A, such as non-use benefits and general ambient quality. In this simplistic model, environmental goods and services are differentiated conveniently to highlight different economic valuation procedures. Of course, E_M would be best valued using market prices. TCM and HP are designed to place economic values on E_R, where X_2 might be travel costs to visit environmental sites, or land and housing that features access to environmental amenities. And given the lack of feasible alternatives, CVM has been refined to value E_A, by asking survey respondents to consider the alternative budget constraint presented in **(3)** and assess their individual WTP_A. And, given the high income levels in developed countries an assessment of WTP_A is possibly quite substantial, particularly in aggregation.

Environmental goods and services are also used in production processes, in both the developed and the developing world. Thus, in a simple model, a profit maximising firm would maximise,

$$\Pi = P_Y Y(Z_1, Z_E, E_P) - W_1 Z_1, - W_E Z_E \qquad \textbf{4}$$

where:

Π	=	firm profits;
$Y(.)$	=	a well behaved output function;
P_Y	=	exogenously determined output price for Y;
Z_1	=	a vector of market inputs, some of which can be substitutes for environmental inputs or abatement inputs;[4]
Z_E	=	a vector of market environmental inputs good;
E_P	=	a non-market environmental service which is available for production use either through usufructuary rights, non-transferable permits, or location; and
W_i	=	exogenously determined input prices for Z_1 and Z_E, i = 1, E.

Again in this presentation of the firm's profit maximisation model environmental services are presented as both market and non-market goods. Market environmental services, Z_E, include land, transferable permits, and other production inputs. Non-market environmental services, E, can include regulated or unregulated emissions, water, air quality, and some amenities.

These two simplified models illustrate the broad range of possible environmental inputs into individual utility or firm production. They also highlight the types of environmental goods and

[4] It is possible to estimate the value of environmental amenities by analyzing wage rate differentials. But presenting this in this model would distract from this paper's argument.

services that attract the attention of economists and applied economics journals, namely $\boldsymbol{E_R}$ and $\boldsymbol{E_A}$. Correspondingly, the model points out the types of environmental services that are not featured in current research and journals, such as $\boldsymbol{E_M}$, $\boldsymbol{E_P}$, and, $\boldsymbol{Z_E}$.[5] Of course the reason that estimating the economic value of these other environmental services is not featured within the discipline of environmental economics is the lack of the need for economists' input.[6] As long as markets function well these values can be assessed by accountants, engineers and ecologists.

In developing countries, the same consumer and producer models are appropriate, but only in a limited sense. The consumer model is most applicable to urban areas where there is a strict differentiation between production and consumption. The producer model is appropriate outside of family farms and subsistence production. Often among poorer rural communities, there is less differentiation between consumers and firms, and environmental services effect the rural household directly through household production. In a simplified household production model which neglects home goods,[7] a household would maximise,

$$U(X_1,\ X_2(E_R),\ E_M,\ E_A) \qquad \mathbf{5}$$

subject to,

$$P_Y Y(Z_1,\ Z_E,\ E_P) - W_1 Z_1, - W_E Z_E \qquad \mathbf{6}$$

where all terms are the same. Since environmental amenities are generally considered superior goods, with an increasing relative demand with increasing incomes, $\boldsymbol{WTP}_{\mathrm{A}}$ should be considered to be quite low in poor communities, even in aggregation. However, especially in rural communities, environmental services, $\boldsymbol{Z_E}$ and $\boldsymbol{E_P}$, can contribute greatly to household production. These services would include locally gathered non-timber forest products, water, water quality, wildlife, and soil quality. Furthermore, marketed environmental goods and services, $\boldsymbol{E_M}$, such as minor forest products, fruits, and fish are expected to be more important in low income ranges, especially in rural areas. Thus in poorer communities in developing countries, especially rural communities, the most important environmental goods and services, $\boldsymbol{E_M}$, $\boldsymbol{Z_E}$, and $\boldsymbol{E_P}$, are the least appropriate to the popular forms of estimating environmental goods and services in developed countries, such as TCM, CVM, and HP. However, because of incomplete markets in developing countries the estimation of the economic value of $\boldsymbol{E_M}$, $\boldsymbol{Z_E}$, and $\boldsymbol{E_P}$ is not, in this case, a straight forward task for accountants and engineers.[8]

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[5] An exception would be agricultural economics literature on soil quality.

[6] There is however a growing literature on the interface between agricultural production and the environment, especially in developed countries.

[7] Household consumption of household produced goods.

[8] Indeed because of limited markets in rural areas the assumption of exogenous prices is inappropriate, but this does not deter from the analysis.

III. Textbook Valuation Procedures

MOST undergraduate textbooks in environmental economics introduce the estimation of the value of environmental goods and services as a tool in cost-benefit analysis (Field 1994, Goodstein 1995, Pearce and Turner 1990). Often, after a introduction to some basic welfare economics (such as discounting, public and private goods, and welfare measurement) these texts will provide a review of CVM, the travel cost method (TCM), hedonic pricing (HP), and dose-response estimation (DR). Without repeating what is presented well in these sources, it is worth noting the most applicable uses of these methodologies.

- TCM is designed to estimate the value of recreational and amenity sites that are not properly rationed by market prices.

- HP is most appropriate to estimate the value of amenity, safety, and health benefits that are embedded in the market prices of land, housing, and labour.

- CVM analysis does not rely on the presence of complementary market goods and therefore it has the benefit of providing estimates of values that other methodologies cannot. Because of this latitude it has been refined to estimate non-use values. Indeed much of the recent interest in CVM analysis has revolved around the estimation of "passive use" values from the *Exxon Valdez* oil spill and the subsequent release of a report from a "blue chip" panel, including two Nobel Prize winners.

- DR is less of an economist's tool but an approach to the estimation of material and health damages received in response to doses of pollution.

Box 1: The NOAA Standards for Contingent Valuation Methodologies

On March 24, 1989, the oil tanker Exxon Valdez ran aground in Prince William Sound, Alaska, spilling 11 million gallons of crude oil into a ecologically rich coastal zone. Following incentives based on the United States' system of liability and litigation, both the plaintiff and defendant commissioned contingent valuation analyses to estimate passive and non-use values. However, in order to minimize payments to be made to compensate for the loss of passive-use, Exxon challenged the validity of contingent valuation estimations. In response, the US National Oceanic and Atmospheric Administration (NOAA), which has a regulatory role in natural resource damage assessment, commissioned a panel of prominent economists chaired by Nobel prize winners Kenneth Arrow and Robert Solow to advise it on the use of contingent valuation. This panel concluded that the method was acceptable for producing reliable estimates, sufficient for a "starting point for judicial or administrative determination" if the analyses adhered to certain guidelines (Arrow et al. 1993). The panel's testing protocol, which focuses on the practicalities of bid elicitation, sample size, and interview procedures have been the focus of debate and research studies both within the USA and in other countries, where different liability rules apply (Bateman et al. 1995).

IV. Valuation Practice in Developing Countries

AS opposed to the textbook reviews of the estimation of the value of environmental services, more generalised valuation guides present a broader range of valuation techniques (Winpenny 1991, Munasinghe 1993, Dixon *et al.* 1994, Abelson 1996). These volumes, which tend to be quite similar in content, present the standard textbook procedures and additional techniques, such as estimations of productivity changes, replacement costs, the use of marketed substitutes for non-market goods, preventive expenditures, and shadow projects. Since they have been prepared and produced with the support of development aid agencies and development banks, they tend to merge the material presented in environmental economics texts with another body of economic literature generally presented in volumes on the economic appraisal of development projects (Gittinger 1984, Winpenny 1988).

An important determinant of techniques such as estimating the economic value of changes in productivity is that they focus on the estimation of use values. Although the economic analysis involved in these procedures might not be as challenging as in CWM, TCM, and HP, the data collection, parameter estimation, and calculation of values is not simplistic. And as presented in these volumes, the less novel approaches to estimating values such as productivity loss, are the most applicable in developing countries. A few case studies present the result of TCM studies in Costa Rica and Kenya (Munasinghe and Lutz 1993), and the use of property prices to estimate amenity values has also been presented (Abelson 1996). However, these authors seem to concur with the limited applicability of CVM in developing countries.[9] Some explicitly point out the cost and difficulty of data collection and specific problems with perceived biases (Ahmad 1993, Abelson 1996, Winpenny 1991). Winpenny points out the futility of soliciting willingness to pay estimates on existence value to poorer citizens in developing countries.[10]

Some specialised valuation guides and manuals also stress the direct and indirect use values of environmental services. Recent publications by FAO (Gregerson *et al.* 1995) present a framework for decision-making for forest policy and reviews valuation procedures. This guideline features some clear, practical guidelines such as:

i. "Start by measuring and estimating the easiest-to-measure, important values";

and

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9 Much attention has been attached to the use of CVM in assessing willingness to pay for water delivery services (Whittington *et al.* 1990, Whittington *et al.* 1991). But as Dixon points out (p 70) this application of CVM is quite similar to market analysis of private goods as opposed to the evaluation of environmental services.

10 However it should be noted that in areas where there is a significant middle and upper class population, CVM may be appropriate to estimate non-consumptive use values as well as non-use values. The economic valuation of urban air quality, other urban amenities, and urban demand for rural amenities may require CVM analysis.

ii. "Use market prices where such exist."[11]

IIED's report on tropical land use options also provides a quick review of decision tools and valuation methods, and features a review of valuation studies, including an annotated bibliography (IIED 1996). The bibliography contains over 60 studies and reports on land use valuations. Of these studies greater than one half were limited to direct use values, and only a few analysed non-use values. In a very useful review of the economic procedures for valuing water prepared for *Resources for the Future*, Gibbons (1986) provides a review of valuation techniques for the value of water in different sectors. This volume relies mostly on studies of United States water use, but even within that context shows the need to focus on direct use values.

V. Local Use Values & Land Use Options

THIS paper has argued that the direct and indirect value of environmental goods and services should be emphasised within a benefit-cost context. However, there is a continuous concern that the summation of only direct and indirect use values will not provide sufficient information to decision-makers, especially for land use options that emphasise conservation and protection of natural habitats. The following two studies highlight the potential importance of use and non-use values as well as local and global values. These two examples are presented in order to suggest that efforts to estimate less tangible benefits *(see Figure 1*) may sometimes be appropriate and to emphasise the linkages between global values and international transfer payments.

A study of the Ichkeul National Park in Tunisia highlights the relative importance of use and non-use values of land use and biodiversity (Thomas *et al*. 1991). This area was gazetted as a National Park in 1980, primarily as protection for migratory bird species. However, a series of proposed dam projects has threatened the survival of the aquatic plant that provides sustenance for these birds. Given that agricultural production from irrigation is a priority to the pertinent Tunisian authorities, the potential weight of the arguments in favour of biodiversity conservation and the existence value of wildlife have not been sufficient to ensure the protection of the park's ecosystem. There is, of course, a perceived willingness to pay for the protection of migratory birds in developed countries, but the possibility of any transfer payments for this purpose was not considered to be too remote to consider in the study. However in this analysis, researchers have estimated the production value of the ecosystem in grazing, fisheries, tourism, and wastewater assimilation, and concluded that these use values were sufficient to economically justify the protection of the park ecosystem. Given these use values, there is little reason to estimate the non-use value of migratory birds.

In another economic analysis of land use options, Kumari (1995) estimated the economic value of a peat swamp forest in central Malaysia, under four different management scenarios. This particular

[11] Gregerson *et al*. 1995, p 36.

forest is important not only for the value of its timber but it is also crucial for the preservation of the hydrological balance necessary to maintain irrigation water for an important rice-growing area. Estimates of the economic value of timber, secure irrigation water, potable water, endangered species, carbon sequestration, rattan, bamboo, and fish were included in the analysis. The management scenarios included unsustainable timber extraction and three scenarios of improved sustainable timber harvesting. Total economic values were dependent on estimations of ecological damages imposed by logging and transporting logs. When the lower bound damage estimate is used, the option featuring an unsustainable rate of logging had the highest total economic value. But with higher damage estimates the more controlled logging options had a higher total economic value. However, the more controlled logging scenarios had greater total economic value only when global values such as carbon sequestration and endangered species conservation were included. This is important because carbon sequestration, which is the largest of the component economic values estimated, brings little economic benefit to Malaysia without transfers from richer countries.

VI. Conclusions & Observations

THIS paper presented a review of textbook methodologies for estimating the economic value of environmental goods and services. The most popular of these methodologies are designed to answer questions that often do not need to be asked within the context of development, especially rural poverty. In developing countries the value of environmental amenities are relatively less important then the value of environmental resources in the production process.

However, there is a range of methodologies, perhaps more mundane than the procedures popular in developed countries, that are appropriate for estimating the productive use values of environmental resources. The use of these procedures should be respected, promoted, and refined, particularly in light of widespread market failure in LDCs.

One possible solution to the problem of the difficulty of estimating the value of environmental services is the employment of cost effectiveness analysis instead of cost benefit analysis. In cost effectiveness analysis, the benefits of a project can be assumed to be greater than the costs, and therefore only a least cost solution need to be determined.[12]

The European Commission Directorate-General for Development, which is overseeing an increasing share of European development aid, appears to be favouring the use of cost effectiveness analysis for non-commercial projects with benefits that are not easily valued. This policy, if adopted, tends to

[12] Cost effectiveness analysis may be appropriate to projects that generate quantifiable environmental benefits that are available so far into the future as to have a negligible present value using conventional discounting. In circumstances where intergenerational justice is an issue, standard economic analysis may not sufficiently estimate the benefits.

reject much of the recent developments in the valuation of environmental services, not only the valuation of non-use and existence values but also changes in productivity.

When the economic benefits from environmental protection projects are not estimated, decision-makers are left without the comprehensive information needed to allocate resources among different potentially beneficial projects.[13] Also the failure to estimate benefits may segregate projects that produce environmental services from those that produce marketed goods and services. This segregation could inadvertently put environmental protection projects – even those such as watershed protection projects, coastal zone protection, soil conservation, and sustainable resource management projects, that have significant productive value – in an unfavourable competitive position for development funds.

The casual dismissal of the validity of the estimation of the economic value of environmental resources should be seen as a challenge to environmental economists to improve both the pertinence and the practicality of the valuation process.

A first step in reducing the costs of the valuation of environmental services is closer co-operation with the physical and natural scientists who perform environmental impact assessments (EIA). Although the two processes of EIA and economic appraisal should remain fairly independent, co-operation in data collection would both reduce costs and stimulate an awareness of environmental and socio-economic issues among the analysts. For instance, an analyst that is measuring erosion and soil loss from a transport project may be able to provide insights into appropriate preventative measures, the use of fertiliser substitutes for lost soil, or productivity losses from damaged soils.

As a measure to reduce costs, a communication process between the two sets of analysts responsible for EIA and economic appraisal prior to data collection should become a strongly recommended part of the project cycle.

[13] There is always the fear that the failure to require a cost benefit analysis will allow interested parties to lobby for a project that does not have net benefits.

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Economics, Natural-Resource Scarcity and Development: Conventional and Alternative Views
Edward B. Barbier

The history of environmental and resource economics is reviewed; then using insights from environmentalism, ecology and thermodynamics, Barbier begins the construction of a new economic approach to the use of natural resources, particularly to the problem of environmental degradation. With examples from the global greenhouse effect, Amazonian deforestation and upland degradation on Java, Barbier develops a major theoretical advance and shows how it can be applied. This book breaks new ground in the search for an economics of sustainable development.
Earthscan, London, 1989. £17.50

Blueprint for a Green Economy
David W. Pearce, Anil Markandya and Edward B. Barbier

This book was initially prepared as a report to the Department of Environment, as part of the response by the government of the United Kingdom to the Brundtland Report, *Our Common Future*. The government stated that: '...the UK fully intends to continue building on this approach (environmental improvement) and further to develop policies consistent with the concept of sustainable development.' The book attempts to assist that process.
Earthscan, London, 1989. £8.95

Elephants, Economics and Ivory
Edward B. Barbier, Joanne C. Burgess, Timothy M. Swanson and David W. Pearce

The dramatic decline in elephant numbers in most of Africa has been largely attributed to the illegal harvesting of ivory. The recent decision to ban all trade in ivory is intended to save the elephant. This book examines the ivory trade, its regulation and its implications for elephant management from an economic perspective. The authors' preferred option is for a very limited trade in ivory, designed to maintain the incentive for sustainable management in the southern African countries and to encourage other countries to follow suit.
Earthscan, London, 1990. £10.95

After the Green Revolution: Sustainable Agriculture for Development
Gordon R. Conway and Edward B. Barbier

The Green Revolution has successfully improved agricultural productivity in many parts of the developing world. But these successes may be limited to specific favourable agro-ecological and economic conditions. This book discusses how more sustainable and equitable forms of agricultural development need to be promoted. The key is developing appropriate techniques and participatory approaches at the local level, advocating complementary policy reforms at the national level and working within the constraints imposed by the international economic system.
Earthscan, London, 1990. £10.95

Sustainable Development: Economics and Environment in the Third World
David W. Pearce, Edward B. Barbier and Anil Markandya

The authors elaborate on the concept of sustainable development and illustrate how environmental economics can be applied to the developing world. Beginning with an overview of the concept of sustainable development, the authors indicate its implications for discounting and economic appraisal. Case studies on natural resource economics and management issues are drawn from Indonesia, Sudan, Botswana, Nepal and the Amazon.
Earthscan, London, 1990. £11.95

Blueprint 2: Greening the World Economy
David W. Pearce, Edward B. Barbier, Anil Markandya, Scott Barrett, R. Kerry Turner and Timothy M. Swanson

Following the success of *Blueprint for a Green Economy*, LEEC has turned its attention to global environmental threats. The book reviews the role of economics in analysing global resources such as climate, ozone and biodiversity, and considers economic policy options to address such problems as global climate change, ozone depletion and tropical deforestation.
Earthscan, London, 1991. £9.95

Economics for the Wilds: Wildlife, Wildlands, Diversity and Development
E.B. Barbier and T.M Swanson (eds.)

This collection of essays addresses the key issues of the economic role of natural habitat and wildlife utilization in development. The book argues that this role is significant, and composes such benefits as wildlife and wildland products, ecotourism, community-based wildlife development, environmental services and the conservation of biodiversity.
Earthscan, London, 1992. £12.95

The Economics of the Tropical Timber Trade
Edward B Barbier, Joanne C Burgess, Joshua Bishop and Bruce Aylward

This book is based on a major study of the economic linkages between the trade in tropical timber products and sustainable forest management prepared for the International Tropical Timber Organisation by the London Environmental Economics Centre. It examines current and future market conditions in the tropical timber trade, the linkages between trade and tropical deforestation, and the role of trade and forest sector policies in encouraging sustainable forest management. Through the use of extensive case studies and empirical evidence the authors argue that, although the timber trade is not the major source of tropical deforestation, policy distortions encourage excessive timber related deforestation whilst discouraging sustainable management. The book concludes by examining the necessary international policy measures required to improve the role of the timber trade in sustaining tropical production forests.
Earthscan, London, 1992. £13.95

Beer and Baskets: The Economics of Women's Livelihoods in Ngamiland, Botswana
Compiled by Joshua Bishop and Ian Scoones

This report examines the economics of basket making and beer production in two sites on the western edge of the Okavango delta in Ngamiland, Botswana. Using Participatory Rural Appraisal methods, the study focused on the priority concerns expressed by villagers and explored women's use of wild species. Income generating activities based on the use of wild resources were situated and evaluated in a total livelihood context. Based on this analysis, options for resource conservation and management are then identified. The work forms part of the research project *The Hidden Harvest: The value of wild resources in agricultural systems*, conducted jointly by the Sustainable Agriculture and Environmental Economics Programmes of IIED.
IIED 1994. £5.00

Whose Eden?: An Overview of Community Approaches to Wildlife Management
A report by IIED to the UK Overseas Development Administration.

This report challenges the traditional practice of separating the management and conservation of wildlife from the livelihood of local communities. It shows there is a growing recognition that a community's rights to ownership and tenure of wildlife resources is integral to sustainable wildlife management. Wildlife management will only be sustainable ecologically, socially and economically if it can be made sufficiently attractive to local communities for them to adopt the practice as a long-term livelihood strategy.
IIED 1994. £14.95

Economic Evaluation of Tropical Forest Land Use Options: A Review of Methodology and Applications.
A draft Report prepared for the UK Overseas Development Administration

Rapid deforestation in the tropics and increasing public concern about the social and environmental consequences of land use changes have created demand for methods to evaluate alternative land use options in a way that reflects social and environmental impacts, as well as economic costs and benefits. This report reviews a wide range of methods which may be used to carry out a comprehensive assessment of the economic, environmental and distributional consequences of alternative tropical forest land use options, including copious examples from recent empirical studies.
Environmental Economics Programme, 1994. £10.20

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