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Methodological and Ideological Options

Disaggregated economic impact analysis incorporating ecological and social trade-offs and techno-institutional context: A case from the Western Ghats of India

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ABSTRACT

Economic valuation of ecosystem benefits and their aggregation in a benefit–cost analysis (BCA) framework is the norm in mainstream environmental economics. But valuation and BCA have also attracted criticisms. 'Internal' criticisms point to the absence of alternative scenarios in valuation, overlooking of ecological trade-offs and dis-services, and inattention to context. Others criticize aggregation across diverse stakeholders and the problem of non-monetizable benefits, and dismiss BCA as fatally flawed. They suggest approaches such as deliberative decision-making and multi-criteria analysis. We propose a middle path that uses the strengths of economic analysis for decision support while avoiding the pitfalls. We disaggregate economic impacts by stakeholder groups, link ecosystem changes to benefits as well as dis-benefits, and examine how socio-technological context shapes the magnitude of economic impact. We illustrate this approach by studying the impact of creating the Biligiri Rangaswamy Temple wildlife sanctuary in the Western Ghats forests of southern India. Our analysis shows that while some stakeholders are net beneficiaries, others are net losers. Changes in forest rights, irrigation technologies, and ecosystem dynamics influence the magnitude of benefits and sometimes convert gainers into losers. Such disaggregated analysis can provide useful information for deliberative decision-making and important academic insights on how economic value is generated.

1. Introduction

Environmental economists have long believed that economic valuation is the best way to estimate the societal importance of an environmental good, that conventional valuation[1] methods can be extended to generate the 'total economic value' (TEV) of ecosystems (Randall, 1987), and that incorporating these values into an extended benefit–cost analysis is the best approach to decision-making (Dixon and Hufschmidt, 1986; Pearce et al., 1988). In recent years, many ecologists have accepted the economic valuation framework for highlighting the importance of 'ecosystem services' and extended benefit–cost analysis as the 'rational' tool for making decisions about conservation versus development (Daily et al., 2000). Indeed, valuation of ecosystem benefits or services has become the single largest activity within the environmental/ecological economics literature in the last two decades. In addition to many micro-level studies, large-scale initiatives such as The Economics of Ecosystems and Biodiversity (TEEB: www.teebweb.org) are emerging.[2] Valuation is being seen by even natural science journals (e.g., Science and PNAS) as the best way to link science with policy.

Despite this popularity in academia and policy making, both environmental (or now ecosystem service) valuation and benefit–cost analysis (BCA) have attracted substantial criticism from many quarters. Some of the critics are 'internal', those who still believe in the ultimate usefulness of these concepts, and they have focused on lacunae in the practice of valuation, particularly the non-specification of alternatives, non-adherence to analysis of marginal changes, and inattention to ecological detail (Arrow et al., 1997; Bockstael et al., 2000; Daily et al., 2000; Hanley, 2001). Many others have, however, criticized the concepts themselves, pointing to inter alia the serious limitations of contingent valuation, the fundamental non-monetizability of certain values (merit goods, human life, biodiversity), the uncertainty, non-linearity and irreversibility of ecological processes, the problems with aggregation across economic classes and generations, and the inappropriateness of individual consumer preferences as a basis for making public policy decisions (Chee, 2004; Niemeyer and Spash, 2001; Sagoff, 1998; Vatn, 2009). They call for various combinations of multi-criteria

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[1] In theory, valuation could be done in different ways. Throughout this paper, however, we use the terms 'valuation' and 'economic valuation' to refer to 'monetary valuation'.

[2] To be precise, the generic idea of 'greening' national accounts, promoted by environmental economists since the early 1990s (Ahmad et al., 1990), is being specifically focused on ecosystem products and services.

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analysis, participatory valuation and deliberative decision-making, with limited or no role for conventional economic analysis.

We seek to explore the middle ground between these two camps: those believing in an 'improved BCA' and those rejecting valuation and BCA altogether. Distinguishing the descriptive role of economic analysis from the prescriptive role of BCA (Pritchard et al., 2000), we argue that while decision-making should happen in a deliberative framework with inputs from multiple sources, rigorously done ecological–economic analysis can provide important input or decision-support to such a decision-making process. This, however, requires that the focus shift from valuation per se to economic impact analysis, with careful attention to a) alternative scenario development, b) ecologically and institutionally generated trade-offs and c) the techno-institutional context within which economic value is generated. Instead of estimating either single numbers for TEV of ecosystems or for the benefit:cost ratio of a project, ecological economists should focus on identifying the winners and losers, estimating tangible economic impacts in the stakeholders' terms, and estimate the impacts of significant technological and institutional changes, not just small shifts in prices or discount rates.

We outline an approach that explicitly addresses these issues, and illustrate it by examining the impacts of converting a production-oriented state forest to a conservation-oriented wildlife sanctuary in the tropical forests of the Western Ghats region in southern India. Drawing upon prior research, our field work, and expert inputs, we identify two different possibilities within the wildlife sanctuary trajectory: a 'normally expected' trajectory and a 'surprise' trajectory resulting from unexpected technological, institutional and ecological shifts. Our results illustrate how conservation may produce net positive or negative economic impacts for different local stakeholders, but more importantly how sensitive these results can be to the way conservation is carried out and the wider techno-institutional context.

We begin the paper by reviewing in detail the major critiques of economic valuation and BCA mentioned above (Section 2), and present an approach that addresses these critiques (Section 3). We then describe the case study site, the stakeholders, scenarios, and methods (Section 4), and the results (Section 5). Finally, we discuss the implications of these findings in terms of what insights such disaggregated economic impact analysis might provide, especially in the context of tropical forests (Section 6).

2. Valuation and BCA: Critiques and Usefulness

The concept of BCA emerged in the context of making public decisions about water resource projects in the USA, and was given a theoretical foundation by welfare economists in the 1950s. It is closely linked with the concept of valuation, especially when applied to environmental issues, because many environmental benefits and costs occur in a non-market context and therefore special efforts are required to estimate them. Environmental economists adopted the idea of total economic valuation (Randall, 1987) and devoted substantial energies to figuring out alternative methods for non-market valuation (Smith, 1993). Most also embraced the corresponding idea of 'extended' BCA (Barbier et al., 1990; Dixon et al., 1986), albeit with qualifications (Pearce, 1994). More recently, many ecologists have promoted the concept of 'ecosystem services' and have adopted valuation (and implicitly a full or partial benefit–cost analysis) as the best or only way to communicate to policy-makers the value of ecosystems, which are otherwise assumed to be free or cheap (e.g., Costanza et al., 1997; Daily et al., 2000).[3]

At the same time, there have been critical voices from within and without. Some have pushed for improved methods and practice of valuation and BCA, whereas many others have completely rejected both concepts. We summarize below both types of criticisms, before suggesting a middle ground that might be most useful. We focus on the economic valuation of tropical forests, which figures prominently in the studies and in the critiques because tropical forests are in many ways exemplars of the salience and complexity of the ecology–society linkage.

2.1. Double-counting and Mis-counting

In the practice of tropical forest valuation, four common errors have been identified (see reviews by Chomitz and Kumari, 1998; Lele, 2009; Tacconi, 1995; Turner et al., 2003). First, there is often double-counting of benefits by including both ecosystem processes or functions and ecosystem services. For instance, value is assigned to both nutrient cycling and to the timber production that is the result of nutrient cycling. Second, many studies estimate the production in the forest when they should be estimating only what is extracted, i.e., useful production. Alternatively, some try to value stocks when they should be valuing flows. Third, water flows are often counted as a provisioning service of the ecosystem, when in fact water is the result of rainfall and the forested ecosystem only provides regulatory service. Fourth, even this regulatory service is nuanced: increasing forest cover may sometimes lead to decreases in certain flows and flood regulation benefits may lower than commonly assumed.

2.2. Valuation in isolation

An issue that goes beyond practice and into the conceptual arena is the tendency to simply estimate the Total Economic Value (TEV) of an ecosystem in (say) $/ha (e.g., Adger et al., 1995; Furst et al., 2000; Krieger, 2001). Knowing this number, however precisely, helps little when taking decisions about whether to modify (marginally change) or convert (drastically change) the ecosystem. Making such decisions requires specifying what the alternative land-use will be, understanding what its ecological implications are, and (within the BCA framework) estimating the change in TEV due to the proposed change in ecosystem condition.

Presenting the absolute value of an ecosystem implicitly conveys the message that if the ecosystem were destroyed, society would lose that much income. This was also the message in the famous Costanza et al.'s (1997) study. But this assumption does not stand either ecological or economic scrutiny. Ecosystem 'destruction' is a graphic term that sets up an artificial contrast between 'pristine ecosystems' on the one hand and 'no ecosystem' on the other, neither of which exists in reality. Tropical forests may be replaced by coffee plantations or pastures, grasslands by farming, and wetlands by prawn aquaculture, paddy cultivation or even urban sprawl. But in every case, some biota will continue to exist and provide some biodiversity, some photosynthesis, some infiltration and some carbon sequestration. Some kinds of ecosystem benefits might even increase under deforestation (as we shall discuss below). And conventional economic valuation only allows us to estimate economic impact in the context of marginal changes: non-marginal changes on a large scale (such as the global loss of ecosystem services) would require general equilibrium analysis.

This point has been made a number of times (e.g., Chomitz and Kumari, 1998; Lele, 2009; Toman, 1998; Turner et al., 2003) and several studies comparing two well-defined alternative scenarios or 'before' and 'after' situations do exist (e.g., Norton-Griffiths and Southey, 1995; Yaron, 2001). However, the tendency to estimate value in isolation persists (e.g., Croitoru, 2007; Nahuelhual et al., 2007) and, with conservationists taking to valuation of ecosystem services to press their case for biodiversity conservation, this tendency may even be increasing.

[3] For instance, Costanza et al. begin by saying: "Because ecosystem services are not fully 'captured' in commercial markets or adequately quantified in terms comparable with economic services, they are often given too little weight in policy decisions."