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Returns to investment in conservation: Disaggregated benefit–cost analysis of the creation of a wildlife sanctuary

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Tropical forest ecosystems provide a wide range of benefits to mankind. Economists have categorised these into use and non-use values, further categorised into direct and indirect use on the one hand and option, bequest and existence value on the other. Estimating the 'total economic value' of forests has become a popular topic of research and discussion in the conservation community. Theory and techniques for estimation of the non-use benefits have dominated recent research. In the process, however, most valuation exercises have overlooked two fundamental issues: a) the 'so what?' problem, i.e. estimating the economic value of something in isolation is not very useful, and b) the 'aggregation problem', i.e. the fact that the supposed 'aggregate social welfare function' has no objective basis. These problems need to be addressed if economic valuation is to provide

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meaningful and open-minded input into real-world debates about forest conservation.

The solution to the first problem is to always carry out valuation of two scenarios, viz. the current situation and the most likely alternative land-use or forest-use strategy that could prevail. The solution to the second problem lies in recognising that the marginal utility of one monetary unit of benefit or cost varies from person to person, and that this marginal utility is at least partly related to the economic status of the person. Thus, any aggregation exercise must at least adjust for the disparities in wealth or income across the different beneficiaries of the ecosystem, disparities that can be very high in the case of tropical forest ecosystems, where stakeholders may range from local forest-dwelling communities to global beneficiaries of the forests' carbon sequestration service.

We use the case of the Biligiri Rangaswamy Temple (BRT) Wildlife Sanctuary (WLS) in southern India to illustrate these approaches to addressing the 'so what?' and the 'aggregation' problems. Firstly, we compare the stream of benefits and costs resulting from the management of the BRT forests as a WLS with that which would have prevailed if these forests were managed as Reserve Forests (RF), which is the most likely alternative scenario. Secondly, we categorise the affected population into relatively homogenous income and cultural groups, and the benefits and costs are estimated in a disaggregated manner for each group and then aggregated using various weighting schemes (including income-dependent weights). Furthermore, since the conversion of BRT forests from RF to WLS status occurred in 1977, this partially *ex-post* analysis provides a more realistic appraisal of the incremental benefits and costs of conservation strategies based on the protected area approach than typical *ex-ante* estimates.

We assume that the key users or beneficiaries of the BRT forests are: (i) the forest-dwelling Soliga community that depends upon the forest for fuelwood, grazing, and income through the collection and sale of various non-timber forest products (NTFPs), (ii) the non-Soliga local community that derives fuelwood and grazing benefits, (iii) the farming communities surrounding the BRT forests that directly use the forests for fuelwood collection and grazing as well as indirectly gain from the forest's soil conservation services, (iv) the tourists that visit BRT to enjoy its forest and wildlife, and (v) the global community that benefits from carbon sequestration. Finally, the incremental costs of conservation are borne by the national community of taxpayers.

We make selective use of information from neighbouring forests that remained RFs after 1977 as well as scenario building by experts to construct the trajectory that BRT forests would have followed if they had remained a RF. It appears that, as compared to the WLS scenario, the RF scenario would

have led to more rapid degradation of the forest, resulting in lower carbon sequestration, long-term losses to downstream farming communities due to siltation of irrigation tanks, and zero benefits to wildlife tourists, but (at least initially) higher benefits to local communities from heavier NTFP extraction, fuelwood collection, grazing and agricultural expansion, as also greater incomes to government agencies from timber felling. We carry out a detailed sensitivity analysis to allow for uncertainties in our estimation procedure as well as the use of different discount rates over time and across income groups.

Preliminary estimates of benefits and costs suggest that the conversion to WLS seems highly beneficial if aggregate benefit-cost is calculated without adjusting for income disparities, but income-dependent weights can drastically alter the balance, indicating how unfair the distribution of benefits and costs is across different income groups. Furthermore, since returns from NTFP collection and sale form a crucial component of incomes for the poorest group of stake-holders (the Soligas), the costs are less lop-sided than expected only because the WLS authorities permitted NTFP collection, the conversion from RF to WLS was not an unmitigated disaster for the Soligas. This suggests that only a conservation strategy that combines strict protection from external pressures with substantial forest use by forest-dwelling communities can be somewhat socially equitable.