2.4 Slowing Tropical Forest Biodiversity Losses: Cost and Compensation Considerations

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Overview. *This paper discusses some of the work that has been done on cost estimation of biodiversity conservation for protected areas in the tropics. It also summarizes some conceptual and practical considerations related to compensating local residents who lose land use opportunities due to conservation activities. The main costs associated with conservation and the creation of national parks or reserves arise from land acquisition, hiring and training personnel, and the development of infrastructure. The costs associated with foregone uses of park land arise from the fact that local residents will no longer be able to use the areas for hunting, collecting forest products, or as a source of new agricultural land. The example of Mantadia National Park, a newly established area in the eastern rainforest of Madagascar, is presented as a case study. It was estimated that the mean value of losses for the local villagers who are dependent on the forests within the park for their livelihood was $91 per household per year. A survey concluded that on average a compensation of $108 per year and per household would make households as well off with the park as without. However, there are few cases in which actual compensation of residents living near protected areas was given. The conclusion is that opportunity costs to local residents must be taken into account in the establishment of protected areas and that these costs might have to be compensated for the project to be sustainable in the long run.*

2.4.1 Introduction

In many discussions and writings about slowing the tide of forest biodiversity losses, attention has been focused on the benefits of conservation. There is a growing body of literature that reports empirical results on the types and magnitudes of benefits that arise from biodiversity conservation. These benefits are as varied as watershed protection, tourism revenues, and existence values for species preservation (Dixon and Sherman, 1990). This focus on benefits estimation has risen because of the need to convince policy makers and program managers that conservation investments can have an economic return (even though the returns are less tangible than a ship-load of logs). The academic community has also been interested in benefits estimation because of the methodological challenges of estimating conservation benefits, especially non-market benefits of complex forest ecosystems.

The cost side of conservation has received less attention. It is not clear why this has occurred, but perhaps environmentalists are reluctant to draw attention to the cost side while economists have found cost studies less interesting or publishable. Clearly, a complete accounting of the economics of slowing biodiversity losses requires economic analysis of the full range of benefits and costs.

2.4.2 Costs of Protected Areas

In designing strategies to address tropical forest biodiversity losses, countries have considered a wide range of reforms in forest and agricultural policies. In addition, the expansion of protected areas has formed the cornerstone of many conservation strategies. The creation of a new national park or reserve imposes a number of costs on governments and local people. Costs may arise from land acquisition (although protected areas are often established from forested areas already under government ownership), hiring and training personnel, and the development of roads, visitors' centres, trails, and other infrastructure. The costs associated with foregone uses of park land are another important set of costs that are frequently ignored. Local residents living near protected areas have often historically used the areas for hunting, collecting forest products, or as a source of new agricultural land. The economic impact of a protected area on local residents is a critical factor in the long term success of conservation efforts.

2.4.3 Measuring Local Costs of Biodiversity Conservation: A Case Study

An economic valuation study was conducted by the author and colleagues in and around Mantadia National Park, a newly established protected area in the eastern rainforest of Madagascar (Kramer, Sharma, and Munasinghe, 1995). The park provides the habitat for a number of endemic species, contains some primary forest, and has considerable potential as a tourist destination for international travellers. One component of the study estimated the economic impact of the park on the local residents living adjacent to the park.

The Mantadia Park does not have any human settlements within its boundaries, but has villages in close proximity, mainly in the south, east, and north east. These villagers are dependent on the forests within the park and immediately around it for forest products and for agriculture. The primary source of livelihood in these areas is slash and burn agriculture, a major cause of deforestation in the park area. Villagers are also dependent on the forests for a number of other reasons. Fuel-wood is collected from the forests on a regular basis, a wide variety of fish and animals are foraged for consumption, and a number of different types of grass are harvested and used for assorted purposes. Forest plants and herbs also serve as sources of medicine.

In order to assess the extent of the dependence of villagers on the forests, a survey was conducted of 351 households in 17 villages around the park. The

survey was conducted in a household production framework with a series of questions on economic activities related to use of agricultural land, the forest, and household labour. An additional component of the survey employed the contingent valuation method to assess villagers' willingness to accept compensation for loss of access to the park. The survey was accomplished with the assistance of a local NGO well versed in rural survey techniques. The household survey was refined based on focus group interviews, conversations with various people who were well acquainted with the area, and a pre-test which covered about 25 households. In addition, a shorter questionnaire was administered to village leaders to obtain information on village history, agriculture, and land use practices.

The survey covered a total population of 1598 with an average household size of 4.6 persons. Many of the villages did not have access to any medical facilities, running tap water, electricity, or primary schooling. The average household produced 487kg of paddy rice per year worth about US$128. Most households also engaged in shifting cultivation. As expected, the tabulation of the data on forest products indicated that fuel-wood was the most important forest product collected.

To estimate the opportunity cost to villagers of establishing the Mantadia National Park, cash flow analysis was used. Income from agricultural and forestry activities was estimated for three different groups of villages. Then, depending on the extent to which land in the park had been used by villagers for gathering forest products and for practising swidden agriculture (based on analysis of aerial photographs of the park), estimates were made of the income losses associated with the loss of access to park land. The mean value of losses was US$91 per household per year. Aggregating over all households living in the vicinity of the park and using a 10% discount rate and 20 year time horizon, the net present value of the opportunity costs was estimated to be US$566,010.

In addition to the opportunity-cost analysis, we used the contingent valuation method to ask villagers directly about the losses they perceived as a result of the park. They were asked what level of compensation (in baskets of rice) would make them just as well off as they had been before the park was established. The responses to the contingent valuation questions indicated that on average, a compensation of rice equivalent in value to US$108 per year per household would make households as well off with the park as without. Aggregating over the population in the park area, this implies a necessary one time compensation of approximately US$673,078 assuming a 10% discount rate and 20 year time horizon. Of course, in practical terms it is unlikely that compensation would be in the form of rice

or cash, but instead might be in the form of investments in local infrastructure or agricultural intensification projects.

2.4.4 Compensation Issues

Although there may be substantial social benefits at the national or global level from protecting forest biodiversity, the previous section shows that the local private costs can be quite substantial for local residents and communities. This concentration of costs at the local level has raised questions about the need for compensation for the losses borne by those people living near protected areas. Compensation usually means an explicit payment to partially or fully replace the lost earnings resulting from the establishment of the protected area. While compensation is usually thought of in terms of a cash payment, it can also take the form of in-kind substitutes, new enterprises or technologies, new infrastructure, or provision of social services.

In considering whether or not compensation is appropriate, there are a number of efficiency, equity, and ethical considerations. Since governments are not welfare maximisers, some have argued that requiring governments to pay the full cost of their projects will increase efficiency. However, the efficiency implications of compensation are not clearly established, and it may be difficult to compensate local residents and still maintain efficiency in land allocation. Equity concerns have prompted some calls for compensation related to biodiversity conservation efforts. In fact, the demands by developing countries for the developed countries to make income transfers to fund conservation efforts are being mirrored at the local level in demands for compensation. Because residents near protected areas are being asked to incur costs that help conserve the increasingly scarce biological resources of the world, one could argue that compensation should be paid out of a sense of fairness. Others argue for compensation on ethical grounds related to historical use rights. In some cases, local residents and their ancestors have used resources for centuries in what are now protected areas. A lack of compensation implies that this previous resource use was criminal.

Even if one rejects compensation of local residents on the basis of efficiency, equity or ethical considerations, compensation may be justified on purely pragmatic grounds. If local residents bear large costs from the establishment of protected areas and are not compensated, the conflicts between the residents and project management may threaten the long-term viability of the protected area. Payment of compensation may mitigate conflicts and increase the sustainability of the project.

However, there are relatively few examples of actual compensation of residents living near protected areas. This may be because of some significant practical problems that can arise. One of these is strategic behavior. Compensation may trigger an increase in migration into the peripheral zone of a protected area, increasing the pressure on biological resources. It is also quite difficult to estimate the value of appropriate compensation, and to identify the appropriate recipients. Finally, there is the selection of the best form of compensation. For example, cash transfers may create a dependency, but are easier to target than social services such as schools and clinics.

An alternative to compensation is a package of economic incentives, both positive and negative, that can influence the use of biological resources (McNeely, 1988). Incentives can be used to encourage local residents to reduce their use of labour, capital, and natural resources for activities that are in conflict with the conservation goals of protected areas. In order to promote conservation goals, incentives can be provided that will induce people to reallocate their inputs to activities that do not deplete the biodiversity of the protected area or buffer zone. To promote such reallocations, policies can be designed that: (1) compete for the labour currently used in depleting activities, (2) compete for the capital currently allocated to depleting activities, (3) compete for the biological resources being used non-sustainably, and (4) increase education to influence conservation preferences.

2.4.5 Conclusions

As the primary means of safeguarding forest biodiversity, during this century there has been an emphasis on the establishment of protected areas. While other broader approaches are now being implemented, such as comprehensive land use planning, protected areas remain the cornerstone of the global approach to stemming the loss of biodiversity. Unfortunately, the world's protected areas are not in good shape. Human activities pose a number of threats to the protected areas. These activities include an expanding agricultural frontier, use of forests to graze livestock, the extraction of game, fish and wildlife from protected areas, deliberately set fires, mining and road building, and air and water pollution.

One of the fundamental problems in managing existing protected areas and designing new ones that will be sustainable is the imbalance of costs and benefits associated with the conservation of biodiversity. It is not easy to determine how the balance of costs and benefits varies with distance from a protected area, but this balance will often be unfavourable in the communities directly adjacent to it. As a result, local communities are not as

willing to accept the opportunity costs resulting from the protected area, because they perceive that outsiders are the primary beneficiaries (van Schaik and Kramer, forthcoming).

If the international community continues to encourage tropical countries to protect more of their natural forests for conservation of biodiversity, it should recognise that those countries, and local residents living in and near protected areas, will incur significant opportunity costs. While the benefits are quite diffused, the costs are highly concentrated. Most of the benefits appear to accrue outside of the tropics, although this situation is changing as incomes rise and the demand for conservation increases in the developing world. The increased funding for biodiversity conservation through the GEF and related programs is a start toward promoting international cost-sharing, but the available funding pales in comparison to the tasks remaining.

References

Dixon, J. A. and Sherman, P.B. 1990. *Economics of Protected Areas*. Island Press, Washington DC, USA.

McNeely, J. A. 1988. *Economics and Biological Diversity: Using Economic Incentives to Conserve Biological Resources*. IUCN, Gland, Switzerland.

Kramer, R., Sharma, N. and Munasinghe, M. (eds.) *Valuing Tropical Forests: Methodology and Case Study of Madagascar* (Forthcoming, 66pp). World Bank Environment Paper 13, Washington, DC, USA.

Ferraro, P.J. and Kramer, R.A. Compensation and Economic Incentives: Reducing Pressure on Protected Areas. Chapter 9 in Kramer, R.A., van Schaik, C. and Johnson, J. (eds.) *Last Stand: National Parks and the Protection of Tropical Rain Forests.* (Forthcoming). Oxford University Press, UK.

van Schaik, C.P. and Kramer, R.A. Toward a New Protection Paradigm. Chapter 10 in Kramer, R.A., van Schaik, C. and Johnson, J. (eds.) *Last Stand: National Parks and the Protection of Tropical Rain Forests.* (Forthcoming). Oxford University Press, UK.