



POVERTY, DEVELOPMENT, AND BIODIVERSITY CONSERVATION: SHOOTING IN THE DARK?

Arun Agrawal and Kent Redford

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Arun Agrawal
Kent Redford

Arun Agrawal
University of Michigan
SNRE, 440 Church
Ann Arbor MI 48109
(734) 647-5948
arunagra@umich.edu

Kent Redford
WCS Institute
Wildlife Conservation Society
2300 Southern Blvd.
Bronx, NY 10460
(718) 220-5889
kredford@wcs.org



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ABSTRACT

Poverty alleviation and biodiversity conservation are basic social goals and part of the policy agenda of postcolonial states and international agencies. It is not surprising therefore that a large number of programmatic interventions have aimed to achieve the two goals at the same time. These interventions are funded by governments, conservation NGOs, bilateral and multilateral donor agencies, and private sector organizations. In this paper, we first examine the conceptual discussion around poverty and biodiversity, and then analyze three such interventions: community-based wildlife management, extractive reserves, and ecotourism. Our discussion shows that the literature on these programmatic interventions depends on relatively simplified understandings of poverty and biodiversity in stark contrast to the theoretical literature on the two concepts. Further, writings on programmatic interventions tend to operationalize poverty and biodiversity in distinct and quite different ways.

Our analysis focuses on peer-reviewed writings and finds that 34 of the 37 identified studies share two common features: a focus on processes and outcomes in a single case and single time period, and a drastic simplification of the complex concepts of poverty and biodiversity. In addition, the cases we examine are relatively inattentive to the relationships between observed outcomes and the contextual features of programmatic interventions. As a result of these shared features, the mass of scholarly work on the subject does not permit systematic and context-sensitive generalizations about the conditions under which it may be possible to achieve poverty alleviation and biodiversity conservation simultaneously. The vast sums channeled toward joint achievement of poverty alleviation and biodiversity conservation are all the more remarkable in light of the basic lack of evidence on the extent to which these goals can jointly be reached. In conclusion, we discuss steps toward a rejuvenated research agenda for better knowledge and policies related to the links between poverty alleviation and biodiversity conservation.

Keywords: governance, sustainable development, community-based conservation, environmental policy, decentralization, ecotourism, extractive reserves

INTRODUCTION

The continued legitimacy of the developmental state rests on its willingness and ability to address poverty.

Poverty alleviation and biodiversity conservation are both fundamental to the policy agendas of postcolonial states even if they do not enjoy similar levels of commitment (Escobar 1995, Peluso and Vandergeest 2001, Rangan 1997, Thies 2004). The continued legitimacy of the developmental state rests on its willingness and ability to address poverty. Modern states have also created multiple agencies to conserve the natural resource environments such as forests, national parks, and water bodies where biodiversity exists.¹ Indeed, it is not just states that attempt to conserve biodiversity and alleviate poverty. Large numbers of non-government organizations operating at various scales of socio-spatial aggregation also consider one or both of these goals as prime reasons for their existence.

Because of the centrality of these two objectives to the rationale and continued existence of a variety of organizational actors, a number of different programs to achieve them simultaneously are in existence (Schwartzman et al. 2000). However, there is a wide spectrum of views about whether and to what extent it may be possible to craft policies and interventions that can secure the two objectives jointly (Adams et al. 2004). Two broad sets of inferences summarize prevalent conclusions. One is that biodiversity conservation and poverty alleviation cannot be achieved together. This general inference has led into two distinct policy directions: either that poverty alleviation should be the preoccupation of states, or that hardheaded biodiversity conservation without much attention to poverty alleviation goals is the necessary task. The second set comes from those who see potential synergies between poverty alleviation and biodiversity conservation. Within this set, for some poverty alleviation will by itself lead to conservation since the poor degrade the environment because of their poverty; for others, programs to combine the two goals are the necessary means to achieve them jointly. Despite the lack of agreement on the appropriateness of policy directions in varied contexts, literally billions of international aid dollars are being spent on programs that view a particular policy as the best solution.

The main goal of our paper is to show that widespread differences in how poverty and biodiversity are understood, and limited attention to contextual particularities of empirical interventions, mean that existing empirical studies are poor guides to policy and systematic theoretical insight into the conditions under which poverty alleviation and biodiversity conservation may be compatible goals. To achieve this we first review the extensive theoretical literature on poverty and biodiversity and demonstrate the nuanced treatment these two concepts have received in this literature. We then examine the empirical literature on programs that seek simultaneously to alleviate poverty and conserve biodiversity. Our discussion shows that the literature on programmatic interventions depends on relatively simplified understandings of poverty and biodiversity in stark contrast to the theoretical literature on these two concepts. Additionally, the significant differences in ways of measuring poverty and biodiversity in existing studies mean that their results are not easily comparable, and conclusions not easily generalizable as a basis for sustainable development policies.

Our paper is based on 37 peer-reviewed empirical studies. We primarily cover policy-oriented scholarly writings that consider it possible to connect poverty alleviation with biodiversity conservation through specific programmatic interventions, and focus on three such interventions: community-based

wildlife management, ecotourism, and extractive reserves. The analysis in the paper shows that different empirical studies of poverty alleviation and biodiversity conservation focus on diverse measures of poverty and biodiversity. But within a study there is rarely much evidence on multiple measures of these two complex concepts. Hence, available evidence provides relatively little systematic knowledge about the nature of the relationship between biodiversity conservation and poverty alleviation. Indeed, the multiplicity of socio-political, spatial, and ecological contexts of specific programmatic interventions means that conclusions of a given study cannot easily be generalized to other contexts.

Variations in contexts also mean that even if a program is successful in one location, it needs careful adaptation to enjoy success in other contexts. But there is insufficient knowledge about what the nature of such adaptations should be. Conceptual simplification and lack of attention to contextual specificity makes it easier to design and implement specific interventions – program managers can gloss over and ignore potential disagreements over the meanings of foundational terms such as poverty and biodiversity or how they should be translated into the goals of a given program. But the absence of concrete, context-sensitive criteria to measure progress also makes it more difficult to know whether a given program has achieved goals set out by its advocates, or how experiences gained in one context may be relevant to another. We conclude our paper by outlining a research agenda that should be based on explicit recognition of conceptual complexity, contextual variety, and, over time, evidence on impacts of specific types of programs. Such a research agenda is essential to satisfy scholarly curiosity about the relationship between poverty alleviation and biodiversity conservation, but, as importantly, meet the needs of the policy community that grapples daily with the challenge of combining these two social objectives.

PART 1: THE CONCEPTUAL COMPLEXITY OF POVERTY

Writings on poverty alleviation enjoy a long pedigree, although far shorter than the existence of poverty. The poor may always have been around, but some of the more familiar and controversial statements on poverty and the role of the modern state in redressing the suffering of the poor date only from the period of the poor laws in England (Robinson 2002, Young 1994). The comparatively recent vintage of writings about how to address and reduce poverty hints both at the transformation in the moral status of modern societies that permit poverty to exist, and the muscular conviction that poverty can be reduced substantially and perhaps even eradicated.

The suite of public assistance legislation passed in Britain between the 17th and the 19th centuries raised basic questions about how to define the poor, and the mode, feasibility, and eligibility criteria for assistance. These questions continue to bedevil those interested in poverty as a phenomenon and designers of programs related to poverty alleviation (Gilbert 1997, Kanbur 2001, Ravallion 2003, Sklansky 1999). The residualism associated with the Poor Laws — where public support was available only to some in extreme need (Persky 1997) — has given way to a more universalist approach in which all humans have equal rights to a minimal level of consumption. Similarly, even if contested there is a presumption today that poverty alleviation is as much the responsibility of the state as it is of specific poor individuals and their families (Lees 1998, Mandelkar 1956). Such expansion of the scope of poverty programs has been matched by a similar expansion in the size of state bureaucracies and number of non-state organizations that concern themselves with poverty alleviation (Ferguson [1990] 1994, Young 1994).

Especially after the end of the Second World War and with decolonization, questions about how to address poverty have been urgent, ubiquitous and unending. So have been responses. Shibboleths such as growth, growth with equity, basic needs, integrated rural development, sustainable development, human development, sustainable livelihoods, and the policies and programs associated with these phrases have had a common and particular goal — to distribute material benefits more broadly, whether the targeted unit is the nation state or the household. The unremitting failure to meet this goal generates continuous pressure for new ways and approaches to think about and redress poverty. When particular programs to reduce poverty and improve equality fail, their failure leads to a search for causes and generates new pressures to design more innovative programs that address the weaknesses of their predecessors (Ferguson [1990] 1994).

1.1 Defining and Measuring Poverty

Over the past century, sophisticated conceptual refinement has occurred in how to think about poverty. Much of this refinement has been in reaction to mainly economic and/or nutritional definitions of poverty that established numeric income or caloric levels below which poverty exists, and beyond which people cease to be poor. Booth's study of London's poor in 1887 has been widely credited with originating the idea of a line of poverty.² Rowntree's (1901) better-known work on the poor in the city of York proposed a measure of poverty that borrowed from Booth. It depended upon whether a household was able

to secure a basket of goods necessary for survival and what it cost to purchase that basket of goods.

Since Booth and Rowntree, a raft of scholarship has proposed multiple dimensions along which poverty manifests itself. At least since the 1970s, approaches to defining poverty have included the identification of non-income dimensions such as longevity, literacy, and health because the poor live shorter and less healthy lives and are usually less well educated than the rich.³ More recently, a new set of factors including vulnerability, lack of access to opportunities, exposure to risk, powerlessness, and lack of voice have also become part of the definition of poverty.⁴ Correspondingly, the conviction has grown that strategies to address poverty need to incorporate a suite of objectives and actions if it is to be reduced permanently and the poor are to move beyond the poverty line, however defined.

An indication of this shift in how to think about and address poverty is evident in two recent efforts: in the poverty reduction strategy paper (PRSP) approach adopted by the World Bank and the IMF, and the Chronic Poverty Report from the University of Manchester.⁵ The PRSP approach builds on the arguments advanced in the World Development Report of 2000 that recognized the multidimensional nature of poverty, and sought to attack it by promoting opportunities, facilitating empowerment, and enhancing security (World Bank 2000: 6-12). The Report argues for a more complex approach to poverty reduction because “social and cultural forces” also contribute to poverty. Indeed, the PRSP approach considers not just social and cultural, but also political factors when its advocates talk about the lack of voice among the poor, the need to empower, and the importance of unequal distribution of access and endowments. The willingness of major international institutions dominated by economists to talk about political, social, and cultural obstacles to changes in poverty signals a major shift from earlier discussions in the 1950s and 1960s which focused more on economic dimensions of poverty.

In contrast to the PRSP approach which considers how to address poverty at the national scale, the Report on Chronic Poverty is concerned with those 300 to 420 million people who are trapped in poverty for much of their lives.⁶ It analyzes the dynamics of poverty — the changes in well being that individuals and households experience over time — because understanding the causes of households’ movement in and out of poverty can provide a sounder basis for strategies to eradicate poverty than conventional analyses of national trends in poverty (Hulme 2003, McCay and Lawson 2003). Although the focus of this Report is different from that in the PRSP approach, the view of poverty is similar: “poverty is not simply about having a low income: it is multidimensional deprivation — hunger, undernutrition, dirty drinking water, illiteracy, having no access to health services, social isolation, and exploitation” (CPRC 2004: 1). These commonalities in views about how to think about poverty are the result of a long process of analysis, critique, and correctives that non-economist observers of poverty offered to a worldview in which levels of income and consumption played the dominant role in defining poverty (Chambers 1983, 1995).

For the purposes of this paper, we note two important points in relation to the multiplying dimensions of poverty. The different dimensions of poverty are

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not independent of each other, but we do not possess metrics or mechanisms through which to commensurate them. Erosion of longevity, health, and security are clearly related, for example, to lack of access to education, opportunities, or power. But despite the long-standing discussion on the subject, there is no unambiguous way as yet to establish equivalence across these dimensions. We cannot say whether three years of ill health are the same as a one-year decline in life expectancy, or for that matter whether two less years of education are the same as a ten percent reduction in income. Second, although we can say that there are cause and effect linkages among the different dimensions of poverty, we know neither their nature nor their strength across different contexts. We do not know how and to what extent, for example, marginalization from power or educational opportunities translates into low income, ill health, or a shorter life span. It is precisely this lack of mechanisms to establish equivalence or the nature of cause and effect relationships that is reflected in different groups of people being classified as poor or chronically poor depending on the dimension of poverty under consideration (Baluch and Masset 2003, Bradshaw and Finch 2003).

A corollary follows these two points, one that will be relevant to our argument later about how to address proliferating conceptual complexity. Even if it is necessary to adopt more complex approaches to poverty reduction that incorporate social, political, economic, and cultural strategies, we do not yet know which of these prongs of a poverty reduction program should receive greater emphasis in a given context. Indeed, part of the problem lies in the emphasis on treating poverty in different contexts with the same brush.

We should also note that the accretion of new dimensions and the sophistication of analytical nuance have made poverty alleviation and development nearly equivalent. If poverty is no longer only about low income or insufficient levels of material possessions, development equally certainly is not just about economic values (Escobar 1995, Hobart 1993, Karshenas 1994, Mair 1975, Pieterse 1998, Sokoloff and Engerman 2000), and perhaps never was (Frankel 1952). Social, political and cultural aspects of development are central to thinking about it (Davidson 1960, Pye 1965), and analyses of how to develop are as likely to focus on institutional and political as economic variables (Mammen and Paxson 2000, United Nations 1951). This is true whether the analysis is about the poverty (and development) of individual households or a country. In this manner, development has become the mechanism to alleviate poverty — for every dimension of poverty that has become salient, there is a parallel discussion in the literature on development.

While the policy literature on poverty has made the discussion of the concept more complex by adding new dimensions that must be considered to define and gain an adequate understanding of poverty, a technical literature on the subject has proceeded in a slightly different direction by focusing typically on the material dimensions of poverty (caloric requirements and income) and examining how to construct measures that meet some basic and reasonable intuitions about representations of poverty in a given society. This axiomatic approach was pioneered by Amartya Sen (1976) who pointed out major problems with the practice of defining a poverty line and undertaking a headcount of all individuals below that line. This tactic, still the dominant way of measuring poverty

officially, accurately represents the incidence of poverty — how many people are poor. But it is completely indifferent to the intensity of poverty — how poor are those below the poverty line — and to inequalities among the poor or even between poor and rich. Thus headcount ratio does not change if there are transfers of wealth from the poorer to the richer as long as the number of poor remains the same; indeed, it would improve were some of those nearest the poverty line to move beyond it as a result of transfers from the extremely poor!

In addition, the headcount ratio is inattentive to the volatility of poverty — how easy is it for those who are poor to escape poverty, and the spatial distribution and clustering of poverty. Volatility and spatial distribution of poverty are critically important from a policy perspective. The nature of interventions to address poverty would likely vary greatly depending upon how easy it is for a poor person to escape poverty.⁷ Persons or families that cycle in and out of poverty (and the reasons that propel them into or out of poverty are also extremely important in this regard) need very different support mechanisms compared to those who are unable to escape poverty at all. Similarly, highly clustered poverty as in urban areas and dispersed poverty as in semi-arid rural regions are likely to require and respond to quite different programmatic interventions.

These problems with the headcount ratio have prompted a whole new domain of research attempting to identify better measures of poverty. This technically sophisticated research has proceeded along Sen's groundbreaking work by focusing on the axioms that particular measures of poverty should satisfy. However, for any given set of axioms, a number of poverty measures can often exist — “the choice of a single measure,” as Foster argues, “is apt to be arbitrary” (1984: 242). This is not surprising since the choice of a poverty line itself is characterized by a “significant degree of arbitrariness” (Foster and Shorrocks 1988). The lack of consensus on the appropriate properties of poverty measures has given birth to more than a dozen such measures in the literature (Zheng 2000: 427). These measures can yield similar conclusions in relation to poverty in a society, but they are more likely to produce different results when applied to concrete empirical situations depending on the aspect (incidence, intensity, equality, or volatility) and dimension (income, health, literacy, longevity, vulnerability, or disempowerment) of poverty under consideration.

Note that the complexities in the conceptual understanding of poverty that we discuss above are qualitatively different from those attributable to difficulties in data collection, how data is aggregated, methods used to analyze data, and interpretations of statistical results.⁸ Since the different aspects of poverty are relevant to each of the dimensions along which poverty is assessed, the problems in knowing the extent and dynamics of poverty and applying programs to address poverty are compounded further.

PART 2: THE CONCEPTUAL COMPLEXITY OF CONSERVATION

Concern about the conservation of nature has a long history but its expression as “biodiversity” conservation is a relatively recent phenomenon (Nunez et al. 2003). Biodiversity is a term that was developed as a means of describing the variety of life at a time when concern was increasing about the loss of such variety (Purvis and Hector 2000). Threats to this diversity are driven by an increasing array of homogenizing forces including the spread of introduced species, the rising impact of human land use and agribusiness, and the dominance of humans as principle structures of ecosystems (Putz 1998, Sanderson et al. 2002). Biodiversity is often used in a general way, but a careful and comprehensive definition is necessary for many discussions, especially when new policy directions are at stake. Redford and Richter (1998) define biodiversity as the natural variety and variability among living organisms, the ecological complexes in which they naturally occur, and the ways in which they interact with each other and with the physical environment.⁹

Rooted in the biological sciences, over the last two decades biodiversity conservation has become an objective of international organizations, national governments, NGOs, local communities and even some businesses. Over 150 countries have ratified a treaty committing them to conserving biodiversity. As biodiversity conservation has become a common objective, the term itself has assumed an even broader range of meanings (Sanderson & Redford 1997, Takacs 1996, Redford 1996, DeLong 1996, Haila & Kouki 1994). As a result, the word has been pulled from its roots in the biological sciences, becoming a political term with as many meanings as it has advocates (Redford & Sanderson 1992). In this social and political discussion around biodiversity, what is often at stake is not its conservation but who gets to claim it and use it, the institutional arrangements to regulate its use, and allocation regimes for losses and gains from use (Sanderson and Redford 1997). This reframing of a conservation term into a largely political one has obscured the fact that biodiversity has different components (genes, species, ecosystems) and attributes (composition, structure, and function) each of which is differentially affected by various types and intensities of human use (Redford and Richter 1998).¹⁰ Glossing biodiversity as “nature” makes it possible to ignore the complexity of the term, and enables the politically expedient conclusion that humans can use and save “biodiversity” through easily discovered win-win strategies and solutions.¹¹ To lend greater sharpness to the ensuing discussion we focus on biodiversity rather than more encompassing terms such as “nature” or “environment.” In the conclusion of the paper, we will show that our findings would also apply had we substituted nature or environment for biodiversity.

2.1 Defining and Measuring Biodiversity

As discussed above, a review of the literature defining poverty and the process of impoverishment allows us to develop a way of parsing poverty into “aspect” — incidence, intensity, equality, volatility, or spatiality — and “dimension” — income, health, literacy, longevity, vulnerability, or disempowerment. An analogous way of parsing biodiversity can also be identified.¹²

As indicated earlier, biological diversity can be measured in terms of different components (genetic, population/species, and community/ecosystem), each

of which has compositional, structural, and functional attributes. *Composition* refers to the identity and variety of elements in each of the biodiversity components. *Structure* refers to the physical organization or pattern of the elements. *Function* refers to ecological and evolutionary processes acting among the elements. Table 1 is a modification of the matrix presented in Noss (1990) showing some of the different measurable attributes of compositional, structural and functional diversity for the three components of biodiversity with a focus on those measures that would be most useful in determining potential effects of human use on biodiversity.

Table 1: Indicators of Attributes and Components of Biodiversity

Attributes/ Components	Composition	Structure	Function
Genetic	Allelic diversity	Heterozygosity, heritability	Gene flow, genetic drift, mutation rate, selection intensity
Population/ Species	Species abundance, biomass, density	Population structure, dispersion, and range	Fertility, mortality, survivorship, life history, phenology
Community/ Ecosystem	Relative abundance of guilds or life forms, proportions of exotic or endemic species	Spatial geometry and arrangement of patch types	Disturbance regimes, nutrient and energy flows, biomass productivity, patch dynamics

The basic elements in the table can be illustrated easily. Thus, *diversity of the genetic component* refers to the variability within a species, as measured by the variation in genes within a particular species, subspecies, or population. Composition of this component might be measured through allelic diversity; structure through heterozygosity; and function through gene flow. *Diversity of the population/species component* refers to the variety of living species and their component populations at the local, regional, or global scale. Composition of this component might be measured through species abundance; structure through population age structure; and function through demographic processes such as survivorship. *Diversity of the community/ecosystem component* refers to a group of diverse organisms, guilds, and patch types occurring in the same environment or area and strongly interacting through trophic and spatial biotic and abiotic relationships. Composition of this component might be measured through relative abundance of species and guilds within a community; structure through spatial geometry and arrangement of patch types; and function through disturbance regimes (e.g., fire and flood) and flows of water, nutrients, chemicals, and organic matter (see also Ojeda et al. 1995, MacNally et al. 2002).

The important part of the table to note for this paper is that in the conceptual and theoretical literature on biodiversity, there is no single measure of the concept — or even two or three measures taken together — that provides a comprehensive or systematic sense of biodiversity at a given scale. In its sophistication, this way of thinking about and treating biodiversity is quite similar to the way poverty has been thought about and treated. One can argue that the choice of any single measure of biodiversity is apt to be arbitrary — in a manner that would be analogous to the choice of any single measure of poverty.

Nonetheless, in much policy discussion on biodiversity conservation, a single measure of biodiversity does get far greater attention than others. Thus for example, just as the headcount ratio receives preponderant attention in the popular literature on poverty, species richness and to a lesser extent ecosystem function find the most resonant chords among many who are concerned about biodiversity conservation. As a result, most other measures and indicators of biodiversity receive little or no attention.

There are many ways in which careful analyses of biodiversity are displaced by politically easier discussions on the subject. One common strategy is to discard the complexity of biodiversity and substitute it with words that are perceived to possess a greater utility. Words such as “nature” and “environment” are simultaneously more vague than biodiversity, and possess greater capacity to generate greater consensus around policy measures. Another strategy is to equate biodiversity with specific ecological contexts or species such as tropical forests or tigers (Myers 1985, Raven 1990). Sanderson and Redford (1997) show how it is possible to both enhance agreement over the perceived importance of biodiversity and reduce the ability to develop implementable policies that could conserve biodiversity when the term is collapsed into the more accessible notion of “nature.”

The basic policy implication of the fact that there are many different ways to understand biodiversity is that interventions to enhance some specific attribute or component of biodiversity may have quite unanticipated effects on other measures of biodiversity. It is not possible to make any blanket predictions about whether these unanticipated effects are desired by policy makers and analysts. Without careful incorporation of the multiple measures that tap specific combinations of attributes and components of biodiversity, policy interventions to enhance biodiversity and their assessments are likely to lead to outcomes whose complexity may not even be recognized.

PART 3: PROGRAMMATIC INTERVENTIONS TO ALLEVIATE POVERTY AND CONSERVE BIODIVERSITY

Our review of the conceptual discussions of poverty and biodiversity brings home the uncertainties and complexities involved in defining them, the politics in choosing a definition, the dilemmas inherent in designing programs that may accomplish the two goals, and the practical obstacles that may beset the implementation of programs to achieve poverty reduction and biodiversity conservation simultaneously. To illustrate these points, we focus on three specific approaches that have explicitly addressed the challenge of achieving conservation and poverty alleviation together: community-based wildlife management, ecotourism, and extractive reserves. Our survey of these programs aims to gauge how attempts to combine the goals of poverty alleviation and biodiversity conservation have fared in practice.

Our initial list of additional programmatic interventions that were candidates for analysis in this paper included the following: co-management programs, community-based conservation, community forestry, conservation-linked livelihoods, employment guarantee schemes, environmental certification programs, indigenous reserves, integrated conservation and development programs, integrated rural development programs, micro-finance initiatives, multi-use zoning, protected areas, and sustainable forestry. More names can no doubt be added to this list. We narrowed down the selected set of programs to the three discussed in the body of the paper on the basis of three criteria: the implemented programs should refer to an identifiable set of principles, they should have been tried out in several locations and yielded a body of empirical and review literature, and they should refer both to biodiversity and poverty-related goals.

Our presentation of each approach describes its main features, including its basic principles and principal justifications. We examine the manner in which biodiversity and poverty are interpreted in the approach and the extent to which concerns about poverty and biodiversity are amalgamated in its implementation. We focus also on the methods used in studies of the approach, and the extent to which these studies examine causal mechanisms in explaining observed outcomes. Finally, we also assess the extent to which existing studies of the different approaches provide general lessons about the possibility of alleviating poverty and conserving biodiversity simultaneously.

To select the specific studies that are analyzed in this paper, we used the Social Science Citation Index which represents the most comprehensive, searchable collection of peer-reviewed articles in the social sciences. We focused on peer-reviewed journal articles for this paper under the assumption that these articles are likely to have met one of the basic criteria for presentation of good research – a review by those knowledgeable in the fields in which we are interested. For specific programmatic interventions, we used the following keywords: Community and Wildlife, Local and Wildlife, Wildlife and Conservation (for community-based wildlife conservation); ecotourism (for ecotourism); and extractive and reserves (for extractive reserves). For each of these interventions, we identified far more articles than are analyzed in the paper. For instance, we found nearly 200 articles for ecotourism, and more than a hundred for community-based wildlife management. To select from among this large set, we focused on studies that provided a comprehensive empirical description of at least one case. Tables 2-4 do not include articles that were conceptual in nature, or which were reviews without descriptions of at least one empirical case. It should be

clear that our analysis is not based on a random selection of cases. But it should be equally obvious that a random sampling of cases for the programmatic interventions we are analyzing is near impossible. What our review provides is a systematic consideration of available knowledge from peer-reviewed journals on the relationship between poverty alleviation and biodiversity conservation.

Our choice of community-based wildlife management, ecotourism, and extractive reserves leaves out some seemingly important types of efforts to conserve biodiversity and alleviate poverty together. The chief omissions may appear to some to be Integrated Conservation and Development Programs and Sustainable Forest Management initiatives. We did not select ICDPs because they do not constitute a clearly defined set of strategies used to achieve the goals of biodiversity conservation and poverty alleviation. Indeed, some ICDPs rely on ecotourism, others on community based wildlife management, and still others on employment or agriculture-related interventions. Given the diversity of what is aggregated under the name of ICDPs, and the specificity needed for our analysis, we refrained from using ICDPs in our analysis. We did not choose Sustainable Forest Management programs because biodiversity conservation is often not an important goal of such programs, the focus instead being on biomass or timber volume. Finally, we should mention that our choice of the three initiatives is indirectly validated by the results of a different recent study that undertook a similar survey of the literature to examine the effectiveness of conservation strategies (Brooks, Forthcoming). Brooks et al. focus on 28 different cases — interestingly, all their cases in which conservation goals are combined with those of income improvement or poverty alleviation fall into one of the three types of initiatives we have selected for this paper: community-based wildlife management, ecotourism, and extractive reserves.

We did not select ICDPs because they do not constitute a clearly defined set of strategies used to achieve the goals of biodiversity conservation and poverty alleviation.

3.1 Community-Based Wildlife Management

Disappointment with existing conservation strategies to protect wildlife prompted many analysts, starting in the 1980s, to advocate for a greater involvement of communities and local populations in protection strategies (McNeely 1995, Western and Wright 1994). Hostile reactions of local populations to national parks and inefficient protection delivered by state agencies added strength to voices arguing for a greater role for communities in managing and governing wildlife. Numerous community-based wildlife management initiatives, where central governments assigned a formal participatory, monitoring, or enforcement role to local users, have been founded since the late 1980s. Many of them, in turn, are being criticized today as having produced results far below expectations.

Advocates of community-based wildlife management programs locate the failure of earlier efforts to protect wildlife in the decision to exclude humans, the inefficiencies of state-led enforcement, and the resistance of local populations. The involvement of communities can potentially address all these obstacles. By virtue of their greater knowledge, contiguous residential location, and higher stakes in the faunal diversity upon which they depend, local peoples can undertake conservation protection more effectively and at lower cost than can centrally directed government agencies. If their long-term stakes in sustaining

biodiversity can be aligned with their short-term economic needs, local people may support rather than resist efforts to protect wildlife and biodiversity. The chief principle underlying community-oriented wildlife management programs thus is to share with community members some material and/or monetary benefits to secure their willing participation for conservation.

Community-based wildlife management programs are typically undertaken in conjunction with other initiatives to protect wildlife (such as national parks or protected areas) and are often located in buffer zones along the periphery of protected areas. Analyses of such efforts and their effectiveness have multiplied in the past decade, and yet the extent to which community-based programs have effectively combined the goals of biodiversity conservation and poverty alleviation remains an open issue. Much of the writing on the approach tends to focus on specific cases rather than undertake a comparative assessment of different initiatives located in varying ecological and socio-institutional contexts, or be concerned with relatively abstract general principles at stake (cf. Barnes et al. 2002, Salafsky et al. 1993).¹³ The focus on specific cases makes it relatively difficult to analyze how biophysical or socio-political aspects of the context shape outcomes.

Table 2 (see next page) highlights how empirical studies of community-based wildlife management have addressed the relationship between poverty alleviation and biodiversity conservation.

The table suggests there is substantial agreement over the kind of indicators to be used to assess whether community-based interventions produce an effect on conservation of biodiversity or specific species in a given locale. But it also shows that in most cases analysts rely on relatively indirect measures of biodiversity: attitudes or knowledge about wildlife, and levels of hunting or harvesting rather than more direct measures such as numbers and distribution of species or genetic diversity of protected species. Of the fourteen cases we reviewed, nine focus on offtake levels and four on attitudes and knowledge of local residents. In contrast, direct measurements of some aspect of biodiversity occur only in five studies.

Even studies that underline the importance of collecting data on direct measurements of biodiversity often do not provide much information to explain observed outcomes. Thus, three of the studies that focus on direct measurements of some aspect of biodiversity do not explain why a particular intervention led to the witnessed results. Further, since most of the studies in table 2 examine outcomes only for a single time period, their arguments about the ecological and biodiversity impacts of community-based wildlife management programs in a given context are preliminary at best.

The relatively small number of measures used to assess biodiversity and conservation-related impacts contrasts with the greater number and type of criteria used to assess poverty and development-related impacts. The number of criteria for poverty is nearly double that for biodiversity. There is also greater consistency across the studies in the use of different criteria. Local income levels, equity in allocation, and participation and decision-making abilities are present as elements that should be considered in assessing the success of poverty alleviation goals in more than half the surveyed studies. "Local income levels" is a common indicator in twelve of the thirteen studies.¹⁴

Table 2: Prevalent Criteria for Measuring Success and Failure – CBWM

Author(s)	Region or Country	Biodiversity conservation indicators	Poverty alleviation indicators	Causal analysis of observed effects of CBWM Program?
Phuthego and Chanda	Botswana	1. Offtake levels (hunting) 2. Local knowledge about wildlife	1. Local income levels 2. Equity in allocation 3. Participation and decision-making	Absent (outcomes not specified)
Twyman	Botswana	1. Offtake levels (hunting)	1. Local income levels 2. Safety net in hard times 3. Cultural identity and values	Present. (for poverty alleviation)
Mayaka	Cameroon	1. Offtake levels (hunting) 2. Attitudes toward wildlife	1. Local income levels 2. Equity in allocation 3. Participation and decision-making	Present. (outcomes not specified)
Campbell	Costa Rica	1. Offtake levels (gathering) 2. Protection of wildlife 3. Species numbers	1. Local income levels 2. Equity in allocation 3. Participation and decision-making 4. Livelihood diversity 5. Income fluctuation	Present (outcomes specified)
Horowitz	Malaysia	1. Protection of wildlife	1. Local income levels 2. Equity in allocation	Present (outcomes not specified)
O'Connell-Rodwell et al.	Namibia	1. Species numbers 2. Population density	1. Local income levels	Absent (outcomes not specified)
MacLean and Straede	Nepal	1. Species numbers 2. Attitudes toward conservation	1. Local income levels 2. Participation and decision-making 3. Cultural identity and values 4. Livelihood diversity 5. Displacement	Absent (outcomes specified)
Naughton-Treves	Peru	1. Offtake levels 2. Species numbers 3. Vegetation cover	1. Household subsistence	Present. (for biodiversity conservation only)
Gillingham and Lee	Tanzania	1. Attitudes toward conservation	1. Local income levels 2. Equity in allocation 3. Participation and decision-making 4. Access to wildlife resources	Present (for poverty alleviation only)
Songornwa	Tanzania	1. Offtake levels 2. Species numbers 3. Protection of wildlife	1. Local income levels 2. Participation and decision-making 3. Better infrastructure 4. Health services 5. Access to wildlife resources	Present (outcomes specified)
Marks	Zambia	1. Offtake levels 2. Species numbers	1. Local income levels 2. Livelihood diversity	Present (outcomes specified)
Virtanen	Zambia	1. Offtake levels	1. Local income levels 2. Equity in allocation 3. Participation and decision making	Absent (outcomes not specified)

Unfortunately, few studies examine how biodiversity conservation and poverty alleviation are related (cf. Campbell 1998, Marks 2001), let alone how tradeoffs between the two goals are shaped by the social and ecological context. Indeed, more than half the studies do not even indicate the poverty-related results of the implemented programs despite the use of consistent indicators of poverty. An exceptionally small number of studies situate results in relation to findings from similar studies in other parts of the world or even within the same region, and there is little indication of how the programs in question affected poverty over time. These oversights are especially difficult to understand since nearly all the studies highlight potential conflicts between the goals of poverty alleviation and biodiversity conservation. Certainly, they cite this potential tension as a justification for the need to undertake (and study) community-based wildlife management.

3.2 Ecotourism

In the last decade, ecotourism has emerged as the fastest developing sector of the tourism industry, itself ranked as the second largest sector of the global economy after oil (Wienberg, Bellows, and Ekster 2002: 371).¹⁵ Vigorous attempts to define, criticize, defend, and improve ecotourism have led to a commensurate growth in the literature on ecotourism.¹⁶ Much of it comprises case studies and reflections on specific aspects of ecotourism. Collectively, the studies constitute a range of perspectives on the value of ecotourism in conserving biodiversity and alleviating poverty and whether different ecotourism projects successfully combine the two goals.¹⁷ However, defenses and critiques of ecotourism both share the assumption that it constitutes a promising route for generating benefits for those living close to tropical biodiversity without undermining its existence.

Although scholars of ecotourism suggest that there is no definitional consensus (Campbell 1999, Goodwin 1996), common elements are still discernible in various definitions. Buckley (1994) calls it “travel that generates financial support for protection and management of natural areas, economic benefits for residents living near natural areas, and support for conservation among these residents.” For Blangy and Wood (1993: 32), ecotourism is “responsible travel to natural areas that conserves the environment and sustains the well-being of local people.” Wunder suggests that ecotourism should have minimal physical and social impacts, educate tourists ecologically, and yield economic benefits to local residents (2000: 466). Ecotourism’s different definitions, including many not described here (Ceballos-Lascuain 1996, Mitchell and Reid 2001, Slinger 2000, Stem et al. 2003), thus outline two core goals. It should generate low visitor impact and help conserve biodiversity, and it should generate beneficial socio-economic outcomes for local populations to help reduce poverty.

It is clear that studies of ecotourism believe it is important to conserve biodiversity, enhance local incomes, and produce sustainable development. But they seldom pay systematic attention to the conceptual literature on poverty and biodiversity that demonstrates the complexity of these two concepts, and points to ways of assessing them through specific indicators. In writings on ecotourism, poverty, development, biodiversity, and conservation are generally dealt with as

self-evident concepts. The simplified treatment of such complex concepts stands in stark contrast to the repeated calls for careful investigation of the multiple dimensions, attributes and meanings of poverty and biodiversity in the theoretical literature on the subject. It would appear that the effort to reach some consensus over how ecotourism itself should be defined has hobbled the possibility of detailed consideration of the component elements of its definition.

Table 3 (see next page) indicates some of the criteria that empirical studies of ecotourism have regarded as necessary to assess whether particular projects have succeeded.

The table suggests that despite the many quibbles over an exact definition of ecotourism, there is substantial agreement about the criteria that should be used to assess the success of ecotourism. This agreement is especially evident in measures of development/poverty-related impacts: generation of local jobs and incomes are considered to be relevant indicators of success in nine of the twelve studies, and better infrastructure is important in half of the studies. The criteria used for assessing conservation and biodiversity-related concerns display a greater spread. Interestingly, the two criteria over which there is the greatest agreement are neither direct nor specific measures of biodiversity: the cultivation of a conservation ethic and provision of conservation-related education. These occurred in eight out of twelve studies. Resource conservation was the second most frequent criterion — in four out of the twelve studies — and is again an extremely general measure. The next most frequently used criterion was again not a direct measure of conservation or biodiversity: generation of funds for conservation (in three out of twelve studies).

The studies reported in table 3 are typically conducted within a single time period. Instead of examining measurements of outcomes against a set of baseline data on poverty and biodiversity before the launching of a given ecotourism initiative, they provide information about outcomes observed after the implementation of a project in relation to the attitudes of individuals toward protected areas, the number of schools or roads built, the number of jobs created or benefits distributed. Strictly speaking, there is no way to know the extent of changes in poverty or biodiversity that can be attributed to a specific ecotourism project because none of the studies provided baseline measures or established specific causal mechanisms to relate the implemented program with observed outcomes

The evidence in table 3 permits the inference that most studies of ecotourism ignore the conceptually complex nature of biodiversity and poverty, opting instead to focus mainly on economic measures of poverty and general measures of conservation. These relatively simple measures make it easy to collect data but difficult to make careful judgments about whether poverty has really been alleviated or biodiversity conserved. In focusing on a particular facet of poverty, development, biodiversity or conservation and using it to represent the multiple dimensions and attributes of these concepts, studies of ecotourism commit the fallacy of generalization, failing to advance a better understanding of the extent to which it is feasible to combine the objectives of poverty alleviation and biodiversity conservation.

It should be noted that in a few studies scholars of ecotourism attend explicitly to the underlying concepts that lend ecotourism its appeal: biodiversity

Table 3: Prevalent Criteria for Measuring Success and Failure – Ecotourism

Author(s)	Region or Country	Biodiversity conservation indicators	Poverty alleviation indicators	Causal analysis of observed effects of ecotourism?
Lindberg et al.	Belize	1. Funds for conservation 2. Level of resource use 3. Conservation ethic	1. Employment levels	Absent (outcomes specified)
Wallace and Pierce	Brazil	1. Conservation education 2. Resource conservation	1. Local income levels 2. Employment levels 3. Better infrastructure 4. Local empowerment	Absent (outcomes specified)
Stone and Wall	China	1. Funds for conservation 2. Conservation education	1. Local income levels 2. Employment levels 3. Better infrastructure	Limited (outcomes specified)
Weinberg et al.	Costa Rica	1. Conservation ethic 2. Recycling 3. Pollution	1. Local income levels 2. Employment levels 3. Degree of community control	Absent (outcomes specified)
Wunder	Ecuador	1. Conservation ethic 2. Hunting/poaching levels	1. Local income levels 2. Better infrastructure 3. Local participation 4. Equality of benefits	Present (outcomes specified)
Ross and Wall	Indonesia	1. Conservation education 2. Resource conservation	1. Local income levels 2. Local participation	Limited (outcomes not specified)
Ogutu	Kenya	1. Hunting/poaching levels 2. Increase in wildlife numbers 3. Reduction in livestock within PAs	1. Local income levels 2. Employment levels 3. Better infrastructure 4. Equality of benefits 5. Education provision	Absent (outcomes not specified)
Barkin	Mexico	1. Ecosystem health 2. Levels of deforestation	1. Local income levels 2. Diversified economy 3. Decentralized development	Absent (outcomes specified)
Bookbinder et al.	Nepal	1. Funds for conservation	1. Local income levels 2. Employment levels 3. Equality of benefits	Absent (outcomes specified)
Yu et al.	Peru	1. Resource conservation	1. Local income levels 2. Employment levels 3. Better infrastructure	Absent (outcomes not specified)
Archabald and Naughton-Treves	Uganda	1. Conservation ethic 2. Resource conservation	1. Local income levels 2. Employment levels 3. Better infrastructure	Present (outcomes specified)
Gulinck et al.	Zimbabwe	1. Conservation education 2. Resource conservation 3. Low visitor impact	1. Employment levels 2. Degree of inequality 3. Cultural loss	Absent (outcomes not specified)

and poverty. However, even in these studies, the common strategy is to defer the analysis of how specific aspects of biodiversity and poverty alleviation are enhanced or undermined by ecotourism. Thus, van der Duim and Caalders focus on biodiversity, but conclude that because of difficulties in measuring impacts on biodiversity, it is advisable to evaluate ecotourism interventions by focusing on their “legitimacy, feasibility, and effectiveness” (2002: 744). Gössling (1999) is similarly interested in biodiversity and ecosystem functions, but his analysis only yields general suggestions about how to improve the effectiveness of ecotourism: “information and education for both local residents and tourists... effective planning, management, and control... [and] increase(d) fees and charges” (p. 315-16). Without an effort to tie the implications of these recommendations to particular components and attributes of biodiversity or aspects and dimensions of poverty, there is little new that can be learnt from a given study.

Ultimately, what makes it exceedingly difficult to generalize about the effectiveness of ecotourism is the lack of attention in existing empirical studies to the specific causes of observed outcomes. In many instances, it is entirely unclear why a particular attempt to launch an ecotourism project failed or was successful. The preoccupation with documentation of what happened in preference to an analysis of why or even how it happened prevents an understanding of causal mechanisms. Even where writings on ecotourism try to explain why a project succeeded or failed, they appeal typically to extremely general factors: politics, low investment levels, corruption, inherent contradictions in attempts to combine poverty alleviation and biodiversity conservation and so forth. Of the twelve studies presented in table 3, only one tries to identify the causal factors specifically at work in the studied case, and in that instance the analytical attention is devoted mainly to the economic and poverty-related aspects of outcomes. In the three other cases where there is some limited examination of causes underpinning the observed outcomes, the cited causal factors can be transplanted from one case to another without much difficulty.

In general, available studies of ecotourism focus more on the ecotourism program, and less on its context. But many features of the context — population density, rarity and accessibility of wildlife, distance from markets, trade possibilities, levels of social and economic inequality, distribution of political power, the nature of the political system, how local populations value biodiversity, and so forth — may have significant effects on whether particular programmatic interventions have variable effects across different contexts. But even speculation about potential causal relationships is difficult in the absence of explicit attention to the causal mechanisms. The predominance of case analysis as the preferred approach to studying how ecotourism works in practice means that existing studies have a predisposition to take features of the context for granted — so evident as not to merit much attention as potentially critical elements that shape outcomes.

3.3 Extractive Reserves

Extractive reserves, especially during the late 1980s and early 1990s, were advanced as an important approach in the struggle to slow tropical deforesta-

tion.¹⁸ Many scholars viewed tropical forests as reservoirs of terrestrial biodiversity, especially in Amazonia. The economic value of these forests lay especially in the possibility of harvesting non-timber products such as rubber that could be marketed widely (Anderson et al. 1995, Fearnside 1989). A number of studies argued that the net present value of streams of economic benefits attributable to non-timber forest products potentially exceeded the benefits from logging (Anderson and Ioris 1992, Clay and Clement 1993, Plotkin and Famolare 1992). The foundational ideas underlying extractive reserves are thus simple and attractive: tropical forests contain many poor people, and also a multitude of species that can yield both exotic and useful products; such products can potentially fetch high prices; by focusing on the extraction of these products rather than timber, it may be possible to conserve forests and biodiversity, and improve the incomes of the poor who live close to forests.¹⁹

In consonance with these views, research on extractive reserves and their potential to combine goals of biodiversity conservation and poverty alleviation registered a sharp upsurge in the early 1990s. A number of scholars examined whether it might indeed be possible to halt tropical logging, enhance local incomes, and do so for some of the more marginal populations living close to or in biodiverse environments. Despite the initial enthusiasm, however, a second generation of studies has demonstrated substantial problems related both to ecological and socio-economic measures used to assess the attractiveness of extractive reserves (Browder 1992, Crook and Clapp 1998, Southgate 1998).

Table 4 (see next page) summarizes some of the empirical work on extractive reserves, paying special attention to the criteria used in this scholarship to assess whether it is possible to alleviate poverty and conserve biodiversity in tropical forests.

The cases analyzed in the table cover five countries, and the large number of studies from Brazil reflects the Brazilian origin of the term. These studies indicate importance paid in the scholarship to one of the more important direct measures of a particular aspect of biodiversity — species (usually only vascular plants) numbers and density (measured in time or across space) — as a way to assess biodiversity impacts of extractive reserves. In nearly half the studies, there is explicit attention to particular species and their numbers, diversity and density. On the other hand, three out of the eleven studies do not focus on biodiversity-related issues much, and three others are attentive only to relatively general indicators of biodiversity — levels of deforestation, establishment of protected areas, and the knowledge of indigenous peoples about biodiversity.

Incomes, especially local incomes, are the main criterion used in the above studies to judge the poverty-related impacts of extractive reserves (in nine out of eleven studies). Even some of the other commonly used indicators aim at the monetary incomes of those affected by extractive reserves. For example, nearly half the studies examine whether local residents enjoy significant access to markets and resources in the context of extractive reserves. Access to resources improves the ability to harvest more products, and access to markets likely makes it possible to sell these products at better prices, thereby improving incomes. The multiple dimensions of poverty so prominent in its policy and technical discussions are seldom visible in investigations of extractive reserves. Even when these investigations attend to criteria such as livelihood diversity,

Table 4: Prevalent Criteria for Measuring Success and Failure — Extractive Reserves

Author(s)	Region or Country	Biodiversity conservation indicators	Poverty alleviation indicators	Causal analysis of observed effects of Extractive Reserve
Brown and Rosendo	Brazil	1. Establish protected areas 2. Support indigenous communities	1. Income levels 2. Health services 3. Education 4. Infrastructure development	Present (outcomes not specified)
Fearnside	Brazil	1. Species numbers and density	1. Local income levels 2. Livelihood diversity	Present (outcomes specified)
Mogenburg and Levey	Brazil	1. Species numbers and density	Not considered	Present (for biodiversity conservation)
Schroth et al.	Brazil	Not considered	1. Income levels	Present (for poverty alleviation)
Shanley et al.	Brazil	Not considered	1. Local income levels 2. Livelihood diversity 3. Access to resources 4. Access to markets	Present (for poverty alleviation)
Salafsky et al.	Guatemala	1. Species numbers and density (in space and time) 2. Species diversity	1. Local income levels 2. Access to markets 3. Access to resources	Present (outcomes specified)
Paoli et al.	Indonesia	1. Species numbers and density (in space) 2. Regeneration	1. Local income levels	Present (outcomes specified)
Peluso	Indonesia	1. Levels of deforestation	1. Empowerment 2. Access to resources 3. Access to markets	Present. (outcomes specified)
Salafsky et al.	Indonesia	1. Species numbers and density (in space and time) 2. Species diversity	1. Local income levels 2. Access to markets 3. Access to resources	Present (outcomes specified)
Coomes and Burt	Peru	1. Level of deforestation	1. Local income levels 2. Equity of allocation 2. Access to resources	Present (outcomes specified)
Wickaramasinghe et al.	Sri Lanka	Not considered	1. Local income levels 2. Equity of allocation 3. Gender relations	Absent (outcomes not specified)

equity in allocation of benefits, and empowerment of local residents, they rarely provide sufficiently detailed information about impacts to permit clear inferences about what happened to levels of equality, the extent to which the poor are also marginal to decision-making processes, and the range of sources upon which livelihoods depend.

The studies represented in table 4 are sensitive to the causes of observed outcomes. Many of them analyze the roots of interventions promoting extractive reserves, and the contextual and structural factors that make extractive reserves

more or less effective. However, most studies tend to focus either on biodiversity or income, failing typically to treat both in a similarly detailed and meticulous manner. Thus, of the 11 studies, five focused only on either poverty or biodiversity-related outcomes. Of the remaining six, three emphasized a common set of causal variables (local conditions and politics) as driving outcomes.

The useful analytical focus on causal relationships in these studies, however, can be supplemented by greater attention to the relationship between the two important goals related to biodiversity and poverty. Because they tend not to examine the tradeoffs between use and conservation of biodiversity, and how such tradeoffs are related to the features of the context or the species under consideration, it becomes difficult to assess how findings in a given context may apply in others (cf. Salafsky et al. 1993, Mogenburg and Levey 2002). Indeed, many of the studies assume that extractive reserves in and of themselves provide the necessary balance between the needs of biodiversity and poverty alleviation, making a detailed and concrete examination superfluous.

An equally important gap that is necessary to fill concerns evidence over time. Ultimately, reliable assertions about the impacts of extractive reserves must be based on evidence about changes in levels of biodiversity and poverty that can be attributed to extractive reserves. But the studies we have reviewed sorely lack even the data to make before and after comparisons.

PART 4: DISCUSSION

Our sequential presentation and comparative study of three different approaches to poverty alleviation and biodiversity conservation reveals distinctive patterns and some striking commonalities. The similarities pertain to the methods employed in empirical studies and the theoretical underpinnings and assumptions. The differences concern the findings and distinctive focus of each approach, and the issues that receive more or less attention under that approach.

The selected studies typically examine a specific intervention in a given context. Only 2 out of 47 studies represented in tables 2-5 are comparative studies: those by Virtanen (2003) and Salafsky et al. (1993). Although the broader literature surely contains other comparative studies as well, we can at least defend the conclusion that independent, single intervention-oriented case studies constitute the bulk of the published empirical literature describing and assessing programs to combine biodiversity conservation and poverty alleviation. These studies are extremely valuable in providing detailed information about particular examples. But they are also limited in the extent to which their findings can be generalized or be the basis of broad policy interventions. These limits are compounded by the tendency in the studies to remain focused on either the social or the biological dimension of the intervention.

The reasons for a case-based approach to the study of the complex relationship between poverty alleviation and biodiversity conservation are not difficult to identify. Low levels of funding, a tradition of case-specific work in various relevant disciplines, specific regional interests of scientists and researchers, and strong contextual and place-based influences on processes related to poverty and conservation are likely some of the major factors involved.

It is interesting to note, however, that despite the evident limitations of a case-based analytical approach, many of the surveyed studies argue the generality and robustness of their findings. Such arguments are interesting examples of the fallacy of generalization: where features of a particular example are seen as representative of the class to which that example belongs. The implications of a case-based approach to understand such a complex relationship as that between poverty alleviation and biodiversity conservation have found little attention among scholars and policy makers/analysts who have an interest in the intersection of poverty and conservation. One of the very factors that likely facilitate case studies – strong contextual and place-based effects — also militates against improved and systematic knowledge through an analytical approach based primarily on case studies. Without greater attention to the interactions between different causal factors, the mechanisms that explain observed outcomes, and comparative assessment in light of findings from other studies, it is not possible to know whether and to what extent findings from one study are relevant — whether one is interested in a more systematic theoretical understanding or in better and improved policy-making.

These implications of a case-based approach are exacerbated by another common methodological feature of the studies. They are typically for a single time period. The narrowing of analytical attention to a single time period allows a given study to be completed relatively early and for findings to be reported quickly. But the early completion of a given project comes at the cost of uncertainty about whether reported impacts on poverty and biodiversity can

be attributed to the program being analyzed. Studies that do not examine how existing conditions changed after a particular intervention are not very well placed to provide reliable and valid information about outcomes. Respondents' memory about conditions prior to the implementation of a program can be misleading. It is true that the empirical work we have surveyed has improved what we know about potential interconnections between poverty and biodiversity by judicious use of plausible assumptions and projections. But it has failed to provide reliable knowledge about how specific programmatic interventions have affected biodiversity or poverty in general, let alone about the tradeoffs between the two goals. Systematically collected evidence is urgently needed if we are to arrive at firm conclusions about changes attributable to the programs we have examined.

Two other common features of the theoretical underpinnings and assumptions of the approaches are worth discussing further. The ways in which empirical studies operationalize the concepts of poverty and biodiversity differ strikingly from the theoretical discussion of these concepts. In theoretical discussion, poverty is understood as being multidimensional, with no necessary or easy transformation algorithm that can equate achievements on one dimension to those on a different dimension. There are multiple ways of measuring each dimension of poverty. Similarly, biodiversity has several attributes and components that cannot be easily translated into each other. But empirical studies of poverty alleviation and biodiversity conservation are relatively indifferent to these critical differentiations in thinking about poverty and biodiversity. The studies examined in this paper tend to focus on economic and, less frequently, political aspects of poverty. Health-related, educational, and cultural dimensions of poverty are a focus much more rarely or not at all. And the poverty measures used in the studies can be described at best as blunt. Indeed, many of the studies do not discuss or elaborate on their measures, relying instead on general descriptive statements about the poverty impacts of a given intervention. The same is true of the way biodiversity is measured. The most common measure focuses on species diversity, usually simple measures of presence/absence of selected species groups (like butterflies, primates, trees) or relative abundance of select species like lowland gorillas or corncrakes.

There is nothing inherently problematic about the choice of particular measures and dimensions to examine whether a given intervention has affected poverty and biodiversity. But it is problematic that the studies we have examined typically do not acknowledge the conceptual simplification they introduce in their measurement of poverty and biodiversity. The limited precision and care in the choice of criteria and measures along which to examine impacts do bear centrally on the possibility of knowledge about whether there is a tradeoff between measures to alleviate poverty and conserve biodiversity. So too does the lack of comparability between studies if they each use different measures. Too many existing studies begin and end with assumptions about the relationship between biodiversity conservation and poverty alleviation that cannot properly be defended given the measures of outcomes at hand. Indeed, many of the studies we have examined do not even undertake a careful examination of the causal mechanisms at play, or at least of the different causal mechanisms that affect outcomes for poverty and biodiversity. More than 65% of the studies either do

The studies examined in this paper tend to focus on economic and, less frequently, political aspects of poverty.

not examine the causal relationships that might be yielding the observed outcomes, or focus only on poverty or biodiversity.

These methodological similarities and common theoretical underpinnings go together with significant differences in the concerns of the three strategies. Studies of community-based wildlife management and extractive reserves address biodiversity-related outcomes more than do studies of ecotourism. Studies of ecotourism are also less attentive to causal relationships than the other three sets of studies. They tend to report outcomes, with relatively limited discussion of the causal mechanisms that lead to outcomes.

There are also important differences in findings. Community-based wildlife conservation, it appears, has been successful in particular locations, but is far from being a universal antidote to weak state institutions and high consumption pressures. It also appears not to be particularly effective in the case of species that have low reproduction rates or need relatively undisturbed habitat. Extractive reserves, although viewed initially with significant excitement, have found more tempered attention in recent years. There is much disagreement about the effects of ecotourism on wildlife and biodiversity or even on local incomes. The balance of contemporary scholarly opinion is likely negative on these counts, although it is important to note that this conclusion is based only on twelve published studies. These overall conclusions related to the three approaches should be assessed against a general background of weak methods of data collection, fuzzy conceptual underpinnings, and inconsistent measurement criteria. More reliable and valid inferences about these strategies to combine poverty alleviation and biodiversity conservation will doubtless require more systematic, comparative, and context-sensitive studies.

Ultimately, one should not be surprised that there are differences in the findings and concerns of these approaches. Their origins and histories are varied. The institutions endorsing them, and the disciplines that contribute the bulk of the scholarship for a given approach, are variable. The studies are undertaken by a multiplicity of scholars whose views about poverty and biodiversity are not coordinated by design. They are part of research agendas that are funded and implemented individually for the most part. One should expect to see many differences.

It is the similarities among the studies, both within a given approach and especially across the three approaches, that are striking. Not only is the fact of prevalent similarities striking, it constitutes reasonable grounds for pessimism about the existing state of knowledge about the aspects of poverty alleviation and biodiversity conservation that can be achieved jointly and the conditions under which such joint accomplishment is feasible. In light of the uncertainty and unreliability of existing knowledge, driven in significant measure by lack of systematic, context-sensitive, comparative study and fuzzy theoretical and conceptual underpinnings, efforts to implement approaches that take the relationship between biodiversity conservation and poverty alleviation for granted (whether viewing it as positive or negative) are hasty at best – as ill-founded as the assumptions on which they are based.

PART 5: CONCLUSION

The approaches discussed in this paper are all founded on the general assumption that it is possible simultaneously to achieve two seemingly incompatible goals — biodiversity conservation and poverty alleviation. Indeed, were it possible to identify a transcendent mechanism that could accomplish the integration of these two goals, one might speculate that it would be widely adopted. Such a magic bullet would unite diverse camps of social thinkers, environmentalists and dogmatic believers in development-at-any-cost, and permit the politics that bedevils all collective decision-making to be set aside. The evidence and discussion in the paper suggest, however, that optimism on the subject needs to be tempered with great caution and substantial new thinking. Indeed, the discussion in the previous section is aimed at the inference that the knowledge base on which one might ground assumptions about the nature of the relationship between biodiversity and poverty is extremely shaky, if not almost unreliable.

The evidence from the examined case studies suggests that it may even be inappropriate to pose a question such as “What is the relationship between biodiversity and poverty?” The theoretical literature on these two concepts demonstrates their multiple referents and meanings, and how attempts to alleviate one aspect of poverty may undermine efforts to alleviate another. For example, it may well be possible to reduce the headcount ratio on which most official measures of poverty are based, at the same time as the intensity and volatility of poverty increases. Similarly, genetic, species, and ecosystem components of biodiversity bear no necessary, monolithic relationship to each other so that efforts to conserve one component may well hurt another. If one cannot make definitive statements about whether a particular policy measure can alleviate all aspects of poverty or conserve all components of biodiversity, surely it is foolhardy to hazard that a particular policy can simultaneously alleviate poverty *per se* and conserve biodiversity. We suggest that particular policy efforts and programmatic interventions, when they are successful, likely alleviate only some aspects of poverty even while they successfully maintain different components and attributes of biodiversity. The balance of such tradeoffs has been neither documented nor theorized in any general way. Such massive ignorance about tradeoffs makes it all the more ironic that we inhabit a world where shaky assumptions about this tradeoff are the grounding logic of most policies that aim at positive outcomes related to poverty and biodiversity. The question going forward is how to identify settings and create landscapes with diverse trade-offs so that even while some aspects of poverty are alleviated, different components and attributes of biodiversity can be conserved. Only through additional systematic investigation will we come to know which aspects of biodiversity can co-prosper with alleviation of different aspects of poverty.

Confusion about different aspects of poverty and biodiversity, and conflation of different measures of these two concepts, thrives in the empirical and applied literature as a result of well meaning studies that present biodiversity and poverty as monolithic concepts that can easily be jointly addressed. Different studies identify different measures to assess the performance of interventions that seek to conserve biodiversity and alleviate poverty but there is little basis on which to compare the substantive results of these studies. We suggest that until analysts and policy makers begin to think much more precisely about exactly which aspects of biodiversity and poverty are addressed by their favorite approaches,

there will be little or no progress in understanding why people remain poor in certain ways (but perhaps not others), what makes (certain aspects of) biodiversity decline, and how to slow and even reverse such declines. Without greater nuance in thinking about poverty and biodiversity, future studies that take these terms to be their compass may provide greater understanding of specific programs in specific places, but will not advance the agenda of a more general understanding or more effective policy.

What is even more troubling is that if the most widespread and frequently used analytical approaches to understand and document the relationship between poverty alleviation and biodiversity conservation continue to be used, it may not be possible to throw greater light on this relationship. Case study approaches based on evidence that is collected from a single time period and without careful and systematic consideration of the causal mechanisms at play are ill suited to generate policy-relevant insights into the tradeoffs between poverty alleviation and biodiversity conservation. But as we have noted, these approaches dominate the existing empirical work on the subject.

The point is also relevant and broadly applicable to research that seeks to illuminate the relationship between environment and development more generally. The specific meanings of environment and development are at least as encompassing as those of biodiversity conservation and poverty alleviation. In fact, considering that for many scholars, appropriate measures of environmental conservation can include improvements along such dimensions as indoor air quality or availability of clean drinking water, the ambit of environmental conservation is likely much larger. But it is still necessary to work with quite specific measures and dimensions of development in thinking about how to generate positive policy outcomes in a given location without adversely affecting particular measures of environmental conservation. To the extent specificity in measures used to assess changes in poverty and biodiversity improves our understanding of their relationship, the same logic also holds for the relationship between environment and development.

In light of the limited generalizability of findings from existing studies, it is clear that the future research agenda on the subject needs to be broadened in two key ways. The first concerns the specific questions that are being asked by those interested in understanding how changes in biodiversity and poverty are related. The second relates to the methods needed to gain a better and deeper understanding of these changes and their tradeoffs.

Perhaps the most critical aspect of a new research agenda would be to explicitly document and test the likely tradeoffs involved in pursuing specific poverty alleviation and biodiversity conservation goals. It is necessary to understand how efforts to conserve particular components and attributes of biodiversity affect different aspects of poverty in particular contexts, and vice versa. Research efforts, rather than trying to find the “silver bullet” that will provide a quick and universal solution to problems of poverty and biodiversity loss, need to focus on the contextual details that make particular outcomes more or less likely. Further, for research to be policy-relevant, new studies need to focus on the dynamics of the relationship between various measures of poverty and biodiversity, and on how these dynamics are affected by macro-social and political variables such as education, demographic change, levels of unemployment, and

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technological change among others. Without greater attention to change over time, the goal of policy-relevant understanding of the relationship between biodiversity conservation and poverty alleviation is likely to remain chimerical.

If it is necessary to reconfigure the analytical lens to focus more insistently on tradeoffs in the relationship between poverty alleviation and biodiversity conservation, it is equally important to rethink the methods that have hitherto been adopted to study this relationship. Better research design, based on careful specification of the relevant hypotheses, will likely require panel data from a suite of sites and households to allow systematic comparison across cases and regions. Where possible, researchers would need to collaborate with policy makers to identify potential natural experiments so that the impacts of particular interventions can be studied more authoritatively. Such before and after studies are likely to prove invaluable in gaining a deeper understanding of the links between different measures of poverty and biodiversity.

ENDNOTES

1. There are evident differences between the nature of biodiversity in national parks, forests, and water bodies, and some of these differences are at play in the debates on what exactly it means to conserve biodiversity. We elaborate on how this paper uses the terms biodiversity and poverty in due course.
2. See Gillie 1996 for a discussion of Booth's work. Gillie also suggests that London School Boards first used the idea of a poverty line to decide which students and parents deserved fee remissions, and presents some evidence that Booth may have borrowed from their efforts.
3. A landmark in such studies was the Human Development Report of 1990 (UNDP 1990) that presented the Human Development Index as a better measure of a country's development and its success in addressing poverty than the usual focus on national product, per capita income, and growth rates.
4. The enterprise of defining poverty by identifying additional non-income dimensions has also directed attention toward education, access to services and infrastructure, social exclusion, social capital and so forth. As the World Bank website on poverty says, "Poverty is hunger. Poverty is lack of shelter. Poverty is being sick and not being able to see a doctor. Poverty is not having access to school and not knowing how to read. Poverty is not having a job, is fear for the future, living one day at a time. Poverty is losing a child to illness brought about by unclean water. Poverty is powerlessness, lack of representation and freedom" (World Bank 2004). See also World Bank 2001 for an earlier, similar discussion on poverty; and Kanbur and Squire 1999 for a review of attempts to understand poverty in its multiple dimensions.
5. There is a large gray literature on the poverty reduction strategy papers (PRSP) approach, much of it available from the World Bank's website: <http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTPOVERTY/EXTPRS/menuPK%3A384207~pagePK%3A149018~piPK%3A149093~theSitePK%3A384201,00.html>, accessed on August 25, 2004. For two recent reviews of the approach, see Craig and Porter 2003, and Piron and Evans 2004.
6. Other features of such poverty, the Report says, are that the chronically poor experience deprivation over many years, often over their entire lives, and commonly pass poverty on to their children (CPRC 2004: 1).
7. Indeed, this is the rationale behind the recent Chronic Poverty Report (CPRC 2004) and the research on the represented in the special issue of *World Development* on the subject 2003, 31(3).
8. See Ravaillon 2001 and 2003 for illustrations of difficulties related to poverty data and their interpretations. Ravaillon (2003) also discusses how differences in operationalizing some of the conceptual issues, especially those related to relative vs. absolute poverty and inequality at various levels of aggregation have produced very different judgments about

whether poverty has declined in the past decade, and about the relationship between globalization and poverty.

9. For a discussion of our interpretation of nature and natural, see Anderson 1991, and Picket and McDonnell 1993. See also Redford 2000 and references therein for further discussion of the concept of natural in the context of biodiversity.
10. For reviews of how biodiversity can be defined and understood, see Ricotta 2005.
11. For some recent writings that have questioned the ease of finding win-win solutions in addressing poverty and biodiversity conservation, see Gjertsen 2005 and Pender et al. 2004.
12. The following discussion draws substantially from Redford and Richter 1998, and references therein.
13. Among the published studies of community based-wildlife management we examined, no more than ten percent attempted to compare cases across ecological or political contexts.
14. The thirteenth study (Naughton-Treves: 2002) has an analogous indicator: household subsistence.
15. In 1993, sales of international ecotourism packages in the US alone generated 1.4 billion dollars in revenues (Yu et al. 1997: 130). This market is estimated to have grown around 10 percent per year. But estimates of the global market size vary enormously, both because of different definitions of ecotourism and variations in projected increases per year (Brandon 1996: 4).
16. Boo (1990) provides both case studies and a general review of ecotourism. Brandon (1996) reviews the literature and maps out some of the relevant issues related to its growth and development. Stronza (2001) lays out some critical gaps in the existing literature on tourism, and by extension, ecotourism.
17. Kiss 2004 and Weinberg et al. 2002, present evidence in favor of successful ecotourism; Wallace and Pierce 1996 and Young 1999 lists cases where the evidence is mixed; and Brown et al. 1997, Wilkie and Carpenter 1999 are pessimistic about whether ecotourism in their studied sites can fulfill its promise. Campbell (2002: 300) criticizes ecotourism interventions in Costa Rica as disguised efforts to implement "traditional conservation solutions ... parks and protected areas." In contrast, Tobias and Mendelsohn 1991 present some evidence that in Costa Rica, the net present value of ecotourism for a given area of land is higher than the prevailing acquisition cost of the same area.
18. Although strictly speaking "extractive reserves" refers to administrative territories created in the Brazilian Amazon (Fearnside 1989), the term has been used to describe similar areas in other parts of the world as well as

the ensuing discussion elaborates. More generally, the logic underlying extractive reserves is analogous to that for non-timber forest products that are discussed more commonly in the forestry literature (Crook and Clapp 1998).

19. For a penetrating review of issues see Redford and Stearman 1993. Several studies present a discussion of these basic assumptions (Browder 1992, Brown and Rosendo 2000a, 2000b, Salafsky et al. 1993).

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