CHAPTER 1

EXAMINING THE RELATIONSHIPS BETWEEN POVERTY, HEALTH, AND ECOSYSTEMS IN RURAL ASIA

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Background and Rationale

Millions of poor people in Asia and the Pacific still depend on ecosystems and natural resources for their incomes and livelihoods. However, economic and political processes that often are beyond their control continue to degrade these resources in much of the region. Can these processes be altered and the loss of natural resources reversed? Or is the loss of natural systems and their resources an inevitable result of growth and efforts to reduce poverty?

The challenge of poverty alleviation—promoting the conditions for improved human health, securing the basis of rural livelihoods, and conserving the environment—is particularly acute in Asia and the Pacific. The region is home to half of the world's population—many of whom still live in poverty despite recent economic growth. Can these people be lifted out of poverty while reversing trends in natural resources degradation? Understanding and resolving these relationships hold the key to poverty reduction and better ecosystem management.

The search for both an improved understanding of these relationships and answers to these questions led the Asian Development Bank (ADB) and the International Union for Conservation of Nature (IUCN) to collaborate on a study of experiences and best practices regarding the links that often tie together poverty, human health, and environmental management in this region. Such analysis is a growing area of research and action across the developing world. However, further evidence is needed to challenge and test some of the assumptions about these relationships—and especially to find what is driving environmental change. This should improve the identification of effective responses to persistent rural poverty and the continuing loss of environmental resources in the region. In particular, location-specific successes must be well documented so that they can be replicated, and political and institutional processes can be influenced to address the underlying causes of adverse environmental change.

This study looks at these relationships from four perspectives, examining the links in rural Asia among

- poverty, livelihoods, and ecosystems;
- poverty, health, and ecosystems;
- poverty, biological diversity conservation, and sustainable natural resources use; and
- poverty, governance patterns, and response measures to effect positive change for people and ecosystems.

These four main themes are addressed through 16 case studies with wide scope, geographical coverage, and diversity of authorship. The case study authors were selected to represent a range of stakeholders engaged in the poverty–environment debate across Asia. They include government representatives from the People's Republic of China (PRC) and Nepal, both national and international nongovernment organizations (NGOs), national and international research institutions, and a range of experts involved in development projects.

The purpose of this study is to help those grappling with these issues in the region to improve both their poverty reduction and environmental management efforts. The analysis begins with the premise that improving ecosystem management and the conservation and sustainable use of biodiversity resources can further strengthen poverty reduction efforts in the region. The process of developing these case studies has stimulated dialogue and learning on poverty–environment issues in Asia through

the involvement of a broad set of stakeholders in coauthoring and peer reviewing case studies, and through discussions organized during the 2004 World Conservation Congress in Bangkok and the 2005 and 2006 Meetings of the Poverty and Environment Partnership (PEP).[1]

For development agencies working in the region, this knowledge should guide investment and technical assistance on poverty–environment issues. In addition, it may facilitate broader dialogue among the community of development professionals and officials on poverty–environment issues, and assist in strengthening the mainstreaming of environmental considerations into national development and sectoral planning.

For conservation organizations, this analysis should assist in promoting a more poverty-focused agenda.

Analytical Approach and Questions Posed

While there are important links between environmental degradation and poverty in Asia's urban settings, this study focuses on rural Asia and the relationships between rural people and their environments. The analysis takes a multidimensional view of poverty, encompassing lack of income, powerlessness, and a limited asset base. Ecosystems and the environment refer to the living (biodiversity) and nonliving components of the natural world—and to the interactions between them—that support life on earth. Ecosystems and the environment are taken to provide goods (natural resources) and services (ecosystem functions); act as recipients and partial recyclers of waste from the economy; and as an important source of recreation, beauty, and spiritual values.

The analysis seeks to (i) demonstrate the links between poverty, health, and environmental resources; (ii) understand factors that can drive the loss of environmental resources; and (iii) identify ways to overcome the political, institutional, and policy challenges to tackling poverty and the loss of environmental resources. The latter includes issues related to building coalitions and alliances, assigning resource rights, and furthering gender equity.

Case Study Selection

The criteria used in selecting the case studies included an attempt to represent a diversity of countries, environmental themes, forms of stakeholder involvement, and collaboration in authorship. Given the time frame and limited resources, the case studies were developed from ongoing data collection exercises or existing material consistent with the analytical approach and useful in providing answers to key questions. The case studies draw, as much as possible, on quantitative and qualitative information to demonstrate lessons that have national or regional relevance.

The case studies are taken from Bangladesh, PRC, India, Lao People's Democratic Republic (Lao PDR), Malaysia, Mongolia, Nepal, Pakistan, Sri Lanka, Thailand, and Viet Nam. They review themes that cover local, national, and international processes, as well as the underlying processes driving environmental change. Their topics include national-level issues; agriculture, livestock, and ecosystems; wetlands and marine resources; and forests and protected areas. While many case studies cover a variety of topics, they are grouped according to the four main themes enumerated above and as follows:

- **Poverty, livelihoods, and ecosystems**
  - Enhancing sustainable livelihoods in Puttalam Lagoon, Sri Lanka
  - Poverty–environment links in the wetlands of Sanjiang Plain, PRC
  - Poverty and natural resource degradation: Irrigation tanks in South India
  - Community-based forest management in Nepal: Reversing environmental degradation and improving livelihoods
- **Poverty, health, and ecosystems**
  - Severe acute respiratory syndrome (SARS) and avian (bird) influenza: Exploring the role of conservation and veterinary health in addressing zoonotic diseases in Asia
  - Deforestation and the Nipah virus in Malaysia
  - Aquatic resources, food security, and nutrition in the Lao PDR: A case study from Attapeu Province
- **Poverty and biodiversity**
  - Improving poverty reduction and conservation outcomes in the grassland ecosystem of Mongolia

[1] See 2004 IUCN (available: www.iucn.org/congress/index.htm) and 2006 PEP Net (available: www.povertyenvironment.net/pep/).

- Poverty reduction, forests, and conservation in Viet Nam: Understanding the trade-offs
- Poverty reduction, increased conservation, and environmental protection through participatory breeding: A case study from India
- From field to policy: Linking livelihoods, health, and conservation in Baimaxueshan Nature Reserve, PRC

- **Response strategies**
  - Do decision makers hear and respond to what the poor say about poverty and the environment? Recent experience from Pakistan
  - Overcoming gender inequities in access to natural resources in Asia
  - Community mangrove management in Pred Nai village, Thailand
  - Wetland resource management in Bangladesh to improve livelihoods and sustain natural resources
  - Institutional reform linking poverty and the environment: Experience from Yunnan Province, PRC

Reducing Poverty in Asia: Why Longer-Term Environmental Change Matters

A growing body of research and policy within the international development literature highlights the multidimensional nature of poverty. One framework, known as the sustainable livelihoods approach, focuses on the livelihoods and assets of the poor in terms of their financial, physical, human (health and educational status), social, and natural capital. This approach highlights not just immediate poverty, but also vulnerability to future changes, such as seasonal and climactic variation (Chambers and Conway, 1991). This multidimensional approach to poverty reduction has been encapsulated in the Millennium Development Goals (MDGs),[2] which include the need to improve not only incomes, but also health, education, gender equity, and environmental sustainability. Many development agencies have now endorsed these goals and are using their achievement as key indicators of progress (United Nations [UN], 2000).

These broader views of poverty have helped stimulate a fuller understanding of the way poor people use their environment. Considerable evidence is being collected of the way millions of the poor depend on natural resources for their livelihoods and other aspects of their well-being. This demonstrates how improved environmental outcomes can contribute to the achievement of MDGs (Department for International Development [DFID] et al., 2002).

Just as our appreciation of the varied dimensions of poverty has become more nuanced, so has our understanding of the environment and human–environment interactions (Forsyth, Leach, and Scoones, 1998). References are increasingly made to the links between ecosystems and human well-being in terms of the products provided by ecosystems (e.g., food, fuelwood, and freshwater); the functions they serve (from regulating the climate to soil formation); and their recreational, aesthetic, and spiritual benefits (Millennium Ecosystem Assessment, 2003).

A more refined view of who among the poor are being targeted by development policies and programs has accompanied this multidimensional view of poverty. By challenging the rhetoric regarding the role of communities, this approach seeks to demonstrate that neighboring low-income people often are diverse; heterogeneous; and divided along caste, gender, ethnicity, or livelihood occupations. The way these different groups use the natural environment is also complex, and often belies simplifications about community-based management. There is better understanding of how different economic and political processes and institutions mediate the relationship between poor people and the environment.

These links between poverty, health, and the environment are particularly relevant in Asia, which is home to two thirds of the world's poorest people and to 621 million people living on less than $1 a day (ADB, 2006). This continuing poverty is juxtaposed against urbanization and fast-paced industrialization processes, as well as rapid economic growth.

Background to the Poverty–Environment Debate

Since the 1987 Bruntland Commission report placed environment–development links on the international agenda, concern over poverty–environment issues has been growing (The World Commission

[2] A set of eight goals agreed by almost all heads of state to reduce global poverty (available: www.un.org/millenniumgoals/).

on Environment and Development, 1987). Poverty–environment relationships are now a high-priority concern of many development agencies and international organizations (DFID, 2000; World Bank, 2000; ADB, 2002; United Nations Environment Programme and International Institute for Sustainable Development, 2004).

Poverty–environment links were a main focus at the 2002 United Nations World Summit on Sustainable Development (WSSD) in South Africa. A decade earlier, the Rio de Janeiro Conference on Environment and Development (UNCED) featured similar debates. However, while UNCED emphasized that poverty must be addressed to solve environmental problems, WSSD's main theme was to explore how environmental improvements can help reduce poverty (DFID et al., 2002). Recent experience and research demonstrating that poverty and environmental degradation need not interact in a vicious circle or downward spiral influenced WSSD to conclude that environmental improvements can be an important part of poverty reduction. These issues were highlighted again during the 2005 Millennium Summit in New York, where heads of state were exposed to the opportunities for and constraints to achieving MDGs, especially Goal 7 on "ensuring environmental sustainability."

How Institutions Link Poor People and Ecosystems: A Conceptual Framework

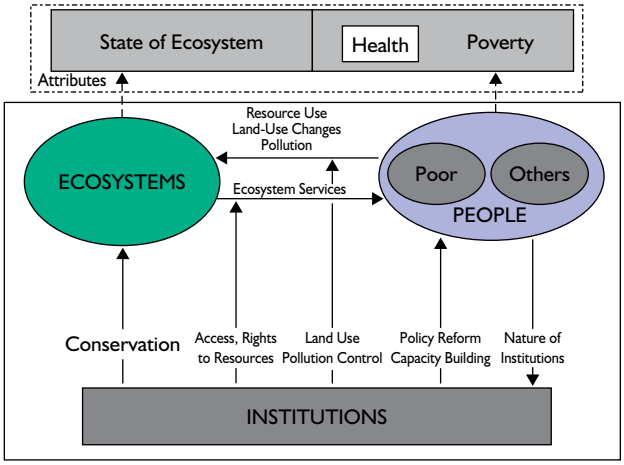
Conceptual links among people and ecosystems

The conceptual framework (Figure 1) used to guide this analysis focuses on three elements: (i) people and households, particularly poor households; (ii) ecosystems; and (iii) institutions. While recognizing the importance of the internal workings of each of these three elements, the study also has attempted to deepen understanding of the interrelationships. This is particularly true of the dynamic interaction between humans and ecosystems mediated through institutions. In the conceptual framework, health and poverty are seen as attributes of people and households. Therefore, they only have meaning in relation to their incidence among individuals and households.

Poverty is increasingly being recognized as a multidimensional process, which includes income-based deprivation, as well as other dimensions. Thus, poor people suffer from

- lack of opportunity (low incomes and weak access to information);
- lack of capacity (low health and educational status);
- insecurity (vulnerability to seasonal, climatic, and economic shocks, as well as violence and crime); and
- powerlessness (inability to influence decisions about their lives).

Figure 1: Conceptual Framework of the Study



This multidimensional process is reflected in MDGs. In addition to raising absolute incomes, these goals include improving maternal health, access to water and sanitation, and securing title for low-income urban settlements, among others.

Despite the growing recognition of the non-income dimensions of poverty, most attention tends to be focused on incomes when defining the number of people affected (e.g., those living on less than $1 a day). According to this measure, the number of people in severe poverty has fallen from 40% of the world's population in 1981 to 21% in 2001 (Chen and Ravallion, 2004). Most of the global progress has been achieved in Asia and especially in the PRC and, more recently, in India. Between 1981 and 2001, however, the number of poor people living on $1 a day in every region of the developing world—except Asia—actually increased. In Africa, the number of people living in severe poverty doubled during that period, from 164 million to 316 million (Chen and Ravallion, 2004).

Even with recent strong progress in Asia, the poverty that persists in the region is characterized by the poor continuing to be deprived of the economic benefits that globalization can bring while increasingly confronting some obvious gains shared by other segments of the society. National resources are distributed unequally in favor of the nonpoor, and the inequities are increasing. This is important because the degree of inequality largely determines the degree of benefit to flow from economic growth. In countries with a more equal income distribution, economic growth will translate more quickly into increased incomes for the poor. By contrast, in highly unequal settings, a national economic growth rate of 6% might be required to achieve a 1% improvement in the incomes of the poorest (DFID, 2000). The processes that produce this inequality stem from the way that influence, access, and resource rights are distributed in societies—often benefiting primarily the nonpoor.

Another important and largely neglected dimension is gender. At least two thirds of the world's poor are women (DFID et al., 2002). This combination of poverty and gender reduces their access to economic resources, health care, and educational opportunities. It also leads to personal insecurity and a sense of powerlessness. If poverty is to be reduced, gender inequality must be addressed. That explains why three of the seven MDG targets relate to this challenge.

The livelihoods of poor rural people and ecosystems management

Poor people in the rural areas typically depend heavily on ecosystems for their livelihoods. A recent summary of 54 studies from 17 countries found that collecting fuelwood, wild foods, and other forest products contributes one fifth of the income of poor rural families (Vedeld et al., 2004) in cash and consumption. Developing countries had, in 1990, an estimated 27.5 million jobs in fisheries and aquaculture, with the majority in Asia (World Resources Institute et al., 2000). A decade later, there is evidence that these numbers had substantially increased (WRI, 2004). While fisheries and aquaculture comprise resource management practices in use for centuries, they also can contribute activities of last resort for the poorest and most vulnerable, especially coastal households. In terms of nutrition, fish also provides a main source of protein for low-income households, such as those in Bangladesh and Cambodia.

Fisheries and other aquatic resources are a good example of how ecosystem services are important for the livelihoods and health of the poor—they provide both a source of employment and of nutrition. Many other examples demonstrate how ecosystems serve as a social safety net for nutrition during drought and other periods, or when commercial agriculture fails (Dei, 1992).

Ecosystems and pro-poor growth

In addition to benefiting directly the livelihoods and health of poor people, ecosystems also underpin the domestic savings and raw materials needed to further economic growth. In many low-income countries, ecosystems provide the revenues for poverty-reducing investments in terms of reinvested rural savings and are a principal source of tax revenues to finance development programs. Low-income countries are often (at least initially) rich in timber wealth. Forests contribute more than 10% of the exports of Cambodia, Cameroon, Central African Republic, Gabon, Lao PDR, Myanmar, and Papua New Guinea (DFID, 2004). Low-income countries also are often coastal states rich in fisheries. For example, in the Cook Islands, Ecuador, Mauritania, Namibia, Senegal, Sierra Leone, and Solomon Islands, fisheries contribute more than 15% of exports. Many poor countries also rely heavily on their mineral wealth for income—often at the expense of ecosystem health.

Natural resource products provide a large share of government tax revenues, which can be used for poverty-reducing investments. However, the amount of revenues generated is often low due to ineffective taxation of natural resource earnings and corruption, and the poverty reduction impact is further reduced by unproductive use of the revenues. Environmental fiscal reforms can be introduced to generate increased revenues that can be used for poverty reduction (Organisation for Economic Co-operation and Development, 2005).

Health and poverty

The World Health Organization (WHO) defines health as a state of complete physical, mental, and social well-being—not merely the absence of disease or infirmity. Low health status is considered one of the principal nonincome characteristics of poverty. Poor people are most susceptible to illness and premature death from dietary causes, and their children

are prone to low birth weight and also generally lack access to medical care. As a result, poor people suffer disproportionately from ill health. The poorest 20% of the global population are 14 times more likely to die in childhood than the richest 20% of the world's population. Similarly, in India, more women die during pregnancy in a week than women in Europe in a year (DFID, 2000).

Good health is both an end and a means to reducing poverty. Illness causes suffering and pain, which poor people identify as a key aspect of being poor. Perhaps the largest cost is when a household income earner is unable to pursue his or her livelihood. Illness or death of a family member also causes poverty through loss of the income-earning capacity of the deceased. This income loss and associated cost of treatment can push people further into poverty. Poor households often build up debts, sell land, or reduce spending on other items to pay for health care. For those who lack material and other productive assets, labor power and a healthy body are the core components of their livelihood and even survival strategy (World Bank, 2000).

Ecosystems and the ecosystem approach

An ecosystem is a dynamic complex of plant, animal, and microorganism communities and the nonliving environment interacting as a functional unit as defined in the Convention on Biological Diversity (UNEP, 1992). Ecosystems surround us as grasslands, forests, freshwater and marine systems, and agricultural ecosystems or "agro-ecosystems" (WRI, 2002), and humans are an integral part of these systems. Ecosystems vary enormously in size: a temporary pond in a hollow and an ocean basin can both be considered as ecosystems.

The ecosystem approach is a framework for analyzing the links between people and the environment (MEA, 2005) and builds on decades of research learning these relationships (Man and the Biosphere Programme, UNESCO). While the environment is a fairly broad term, encompassing the natural context within which humans live, the ecosystem approach is a more specific description of this relationship and how it can be managed. The Convention on Biological Diversity defines the ecosystem approach a "strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way." Ten principles of an ecosystem approach were spelled out in 2000. An ecosystem approach is a much more holistic and integrated attempt to understand how ecosystems need to be managed to provide benefits in the future—the main advantage over addressing individual environmental issues. Focused analysts and attention are still needed on specific environmental problems, such as air pollution or soil erosion. However, this must be complemented by an ability to place these in the broader context of dynamic ecosystems.

Biodiversity and ecosystems are also closely related concepts. The Convention on Biological Diversity defines biodiversity as the variability among living organisms from all sources, including inter alia, terrestrial, marine, and other aquatic ecosystems, and the ecological complexes of which they are part. This includes diversity within species and between species, as well as of ecosystems (UNEP, 1992). Biodiversity influences ecosystem stability and resilience, or the ability to respond to internal or external pressures. For example, the genetic diversity of plants, animals, and insects contributes to the productivity and resilience of agro-ecosystems (WRI et al., 2000).

Ecosystems services are the benefits that people obtain from these systems (MEA, 2003). These include (i) provisioning services, such as food and water; (ii) regulating services, such as regulation of floods, drought, and land degradation, and disease; (iii) supporting services, such as soil formation and nutrient cycling; and (iv) cultural services, such as recreational, spiritual, religious, and other nonmaterial benefits (Figure 2). In the Millennium Ecosystem Assessment view, these services influence the determinants and constituents of human well-being, which include (i) security, (ii) basic material for a good life, (iii) health, (iv) good social relations, and (v) freedom and choice (MEA, 2005).

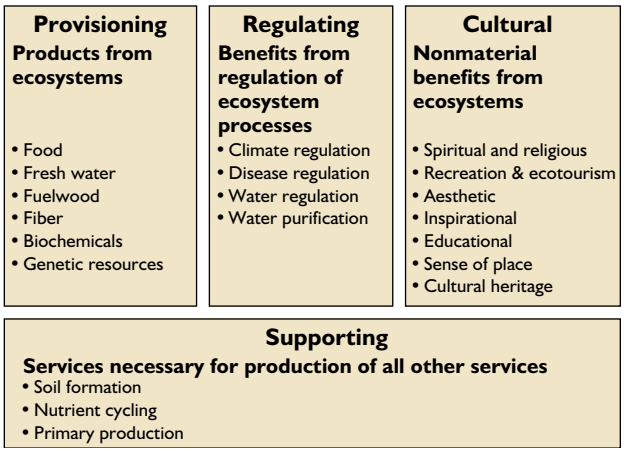
Institutions—mediating between poor people and ecosystems—and the politics of environmental change

"It could be argued that the distribution of power and influence within society lies at the heart of most environment and development challenges." World Commission on Environment and Development, Our Common Future, 1987

An increasing number of development agencies see poverty as a process, not just a state. In this view, poor people are constrained from escaping poverty by different factors, including the actions of the nonpoor and groups that benefit from the status quo. Thus, according to this approach, the reduction of

poverty becomes largely a political process requiring an altering of the institutions and relationships that constrain poor people.

Figure 2: Ecosystems Services



Source: Millennium Ecosystem Assessment, 2005.

This perspective has major implications for the manner in which environmental change can benefit the poor. It challenges the view of the downward spiral, or vicious cycle, whereby poor people are characterized as being forced to overuse their environment, further impoverishing themselves. While some examples of this spiral can be found, this generalization has been challenged on several grounds. First, many examples are available of situations in which poor people (sometimes with outside assistance) have reduced pressure on the environment by developing new resource management institutions. Second, it directs policy attention to overcoming resistance by the nonpoor to environmental improvements that benefit the poor.

Institutions—formal and informal—mediate the link between ecosystems services and the constituents and determinants of human well-being (MEA 2003). Institutions are "the rules of the game" in a society or, more formally, the humanly devised constraints that shape human interactions (in this case, between humans and ecosystems). In consequence, they structure incentives in human exchange, whether political, social, or economic (North, 1990).

The concept of institutions enhances understanding of how people's interactions with each other and with the environment are mediated by rules and agreements. In this context, institutions relevant to natural resource use and management include rules tenurial governing access to natural resources, government laws and policies intended to determine how resources are managed, arrangements for decision making about resource use, and arrangements for distributing the benefits of resource use.

How the distribution of power shapes institutions and ecosystem benefits

Creating, revising, and modifying institutions are a social process (MEA, 2003). "Existing bodies that mediate the distribution of goods and services may also be appropriated for the benefit of powerful minorities," concludes the Millennium Ecosystem Assessment. Open access resources—or those governed by traditional management norms, which are often vital to the poor—increasingly have been privatized. The rules for setting resource rights and responsibilities emerge from society, and in societies in which some groups have considerably more economic and political influence than others, the powerful set the rules in their favor.

The result is that the poor often receive fewer benefits from ecosystems services than the nonpoor. In Bangladesh, for example, many fishing sites are leased to the wealthy, which limits access for the poor. In Indonesia, even after the post-Suharto reforms, the powerful extend partner countries to appropriate local rights to forestlands and water resources. While poor people are often most dependent on ecosystems, the nonpoor benefit from institutional arrangements that provide them with greater access to the resource base, technologies, other inputs, and markets. This creates a situation in which ecosystem resources constitute an increasing source of income for the poor, but the nonpoor still consume a larger share of these resources.

Conservation and sustainable use

Institutions associated with conservation are of direct relevance to this study. The Convention on Biological Diversity defines conservation (*in situ*) as the "conservation of ecosystems and natural habitats and the maintenance and recovery of viable populations of species in their natural surroundings and, in the case of domesticated or cultivated species, in the surroundings where they have developed their distinctive properties." However, the Convention does not provide an actual definition of "conservation."

This is consistent with the IUCN approach to conservation: "The management of organisms or ecosystems to ensure such use is sustainable.

Besides sustainable use, conservation includes protection, maintenance, rehabilitation, restoration, and enhancement" (IUCN et al., 1991).

Some people, when referring to conservation, take it primarily to refer to the management of protected areas. Others, however, include the range of activities that contribute to environmentally sustainable development. A wide range of issues is associated with the question of when use is "sustainable," and the relative weight attached to "conservation" versus sustainable use. These differences in language, meaning, and terminology have been one of the main stumbling blocks in bringing together the development and environmental constituencies to face common challenges.

State of Knowledge on Poverty–Environment Links

Understanding poverty–environment relationships

GENERIC POVERTY–ENVIRONMENT LINKS

The relationship between poverty and the environment is not simple. Location-specific factors, varying dimensions of poverty, and different types of environments condition the relationship. The causal relationships are not so simple either that one can say poverty causes environmental degradation, or improvements in the environment reduce poverty. As Reardon and Vosti (1995) put it:

"Reducing poverty can reduce resource extensification where poverty is driving extensification onto fragile hillsides or forests. But alleviating poverty will not necessarily lead to less resource degradation where the only insurance available is investment in more livestock and insurance demand increases with household income. Or alleviating poverty will not reduce pollution from over-use of agricultural chemicals, the use of which increases with farmers' wealth. Enhancing the natural resource base can reduce poverty, where for example soil degradation is reducing yields on the farms of the poor. But conserving natural resources can also increase poverty, for instance in cases where poor households are barred from gathering wild flora and fauna."

This suggests a need to be more specific in defining what types of poverty and environmental issues are being assessed (Forsyth, Leach, and Mearns, 1998). This will lead toward some generalizations on the relationships between poor people and natural resources.

LIVELIHOODS AND NATURAL RESOURCES

Poor people heavily depend on natural resources for their livelihoods. Resources are vital for the subsistence needs of the poor in places, such as India (Jodha, 1990) and Zimbabwe (Cavendish, 1999). This is particularly true for women and sometimes children, for whom declining resource availability increases collection time (Thapa et al., 1996). Open access resources provide an estimated 12% of the income to poor households in India (Beck and Nesmith, 2001). Products provided include essential items for personal use and sale, such as food, fodder, fuel, fiber, small timber, manure, bamboo, medicinal plants, oils, and material for houses and furniture. These products are gathered from areas—including village pastures, community forests, wastelands, common threshing grounds, waste-dumping places, watershed drainages, village ponds, and small reservoirs and riverbeds—where there may be some limits imposed by communities on access to extractable types of resources but for which no one has exclusive access rights. However, one important concern is that many studies in this area do not assess whether this resource use by the poor is ecologically sustainable (Vedeld et al., 2004).

DEPENDENCE OF POOR AND NONPOOR RURAL HOUSEHOLDS ON NATURAL RESOURCES

In general, the poorer the rural household, the larger the share of its income derived from natural resources, although the less poor often depend more heavily in absolute terms. Further, the poorer the rural household, the greater the importance it attributes to the contribution of open access resources. As a result of this common property, natural resources contribute to rural equity (Beck and Nesmith, 2001; Angelsen and Wunder, 2003). Also, resources play a key role as a form of safety net in times of economic decline and when food supplies are constrained. In southeastern Ghana, for example, recession and drought in 1982–1983 coincided with the preharvest lean season. During this lean season, about 20% of the food intake by the poorest households came from the "bush," compared with only 2% for the least-poor households. Women and children, in particular, relied on wild products, such as roots, fibers, leaves, bark, fruit, seeds, nuts,

insects, and sap (Dei, 1992). Similar patterns may be found in the arid and semiarid regions of South and Southeast Asia.

Many of the resource-dependent poor only spend part of their working years in rural areas—migrating seasonally to urban areas or other rural settings outside of their community to find work or to engage in petty trade or other commerce. When economic downturns occur, these poor become even dependent on natural resources as their safety net. This was experienced in Southeast Asia during the 1997–1998 financial crisis, where many urban poor unable to find work returned to their rural villages to eke out a resource-based living.

GENDER DIMENSIONS

Poverty–environment issues have a clear gender dimension, with declining resource quality and resource access typically affecting more women than men. Two thirds of the people living in extreme poverty—on less than $1 a day—are women. Declining availability of resources, such as water and fuelwood, has increased the time women and children spend in collection activities (Thapa et al., 1996; Whittington et al., 1990). One review of the views of poor people themselves states: "Often, local people talked of the appalling trade-offs they were forced to make in order to save time, such as knowingly taking water from an unsafe but nearer water supply rather than walking further to clean water supplies" (Brocklesby and Hinshelwood, 2001). Carrying water over long distances causes women headaches; fatigue; and pain in the chest, neck, and waist. In general, women are particularly dependent on natural resources for their livelihoods, yet face more restrictions on their access to these resources. In a study conducted in West Bengal, India, three times as many women as men were involved in gathering nontimber forest products (NTFPs). Women processed all of these resources, and twice as many women as men were involved in marketing NTFPs (Ford Foundation, 1998).

PRO-POOR GROWTH BASED ON NATURAL RESOURCE PRODUCTIVITY

While natural resources clearly provide livelihoods for the poor, the use of these resource relationships to generate incomes to lift people out of poverty and contribute to pro-poor growth is a much more complex undertaking. Natural resources provide a safety net for the poorest and are vital to their health. However, whether they really provide a long-term economic route out of poverty is less clear (Angelsen and Wunder, 2003; Campbell et al., 2002). Indeed, the very subsistence nature of these activities, such as small-scale fishing, grazing, and NTFP harvesting and processing, is what allows the poor to undertake them. While the technology is inexpensive, the low density of the resource often means that profit margins are also very low. One solution is to raise the returns from such activities by evaluating resource productivity. However, adding value might encourage the nonpoor to engage in these activities and reduce opportunities for the poor. For example, successful schemes for establishing fishing property rights can marginalize poorer fisherfolk if they lose access. Similarly, the commercialization of NTFPs can lead to a breakdown of communal property arrangements in favor of private property arrangements that exclude the poor (Neumann and Hirsch, 2000). Pro-poor growth based on natural resource is not impossible, but it is not automatic either (DFID, 2005). In addition to raising returns from subsistence activities, natural resource-rich countries can use the profits from these resources to generate revenues for pro-poor investments (OECD, 2005). However, macroeconomic links between natural resources exploitation and growth have been complicated by the Dutch Disease and the so-called resource curse, which requires political and economic reform to overcome (Auty, 2001; Auty, 2004).

POPULATION AND NATURAL RESOURCES

Concern over the impact of population growth on the environment was a major issue in the early 1970s and 1980s. Indonesia and Nepal even formed joint Ministries for Population and Environment (Nepal still has it). Demographic data showing a declining population growth rate in many countries has tempered this concern. In addition, some evidence suggests that higher population density can drive technical progress and other improvements (Boserup, 1981). Some have argued that population density can drive up land prices, thereby increasing investments in soil and water conservation (Tiffen et al., 1994). However, a wider review found that population density leads to improved soil and water conservation only with market access and high producer prices, as well as social and economic support to avoid the collapse of social structure (Boyd and Slaymaker, 2000). Looking at the other side of the relationship—how environmental change affects population growth—some argue that resource degradation increases

population growth as demand for children in labor-intensive water and fuel collection activities, etc. also increases (Dasgupta and Maler, 1994).

HEALTH, POVERTY, AND NATURAL RESOURCES

Certain environment–health relationships, such as indoor air pollution, have renewed considerable attention in recent years and are becoming better appreciated (Smith, 2006). Other relationships, such as emerging zoonotic diseases, are only starting to be addressed. Indoor and outdoor pollution are fairly well understood as health threats (Bruce et al., 2000). Learning aside the vulnerability of the urban poor to municipal and industrial pollution, the debate over links between health and natural resources management is becoming an eclectic mix of related themes, including ties among (i) food security; (ii) agrobiodiversity; (iii) trade in wildlife and medicinal plants; and (iv) wildlife-linked diseases, such as SARS, foot-and-mouth, Ebola, and avian influenza (Chivian, 2003). Much research in this area remains to be done, and the case studies on this topic projected in this report should help to define key issues.

VULNERABILITY TO NATURAL RESOURCES CHANGE

Natural disasters affect the rich and the poor alike, with the latter facing greater immediate and long-term vulnerability. The 2004 Asian tsunami highlighted the role of vegetative protection—in this case, mangrove forests—in reducing such risks (IUCN, 2005). Much of Asia and the Pacific are subject to typhoons and/or monsoonal flooding. There also are risks from glacial lake outbursts, earthquakes, volcanic eruptions, tsunami, and other natural hazards. Resource management systems often are well-adapted to those risks. Indeed, annual floods are an integral—and often productive—part of the fishing and farming livelihoods of poor people in countries, such as Bangladesh and Cambodia. In flood-prone regions, residents have adapted their houses, livelihoods, and social networks to cope with these natural events. However, considerable evidence shows that—at least in part due to global climate change—these natural phenomena are becoming more frequent and extreme, leading to more lives lost and more property destroyed. Dependence on natural resources can be a cause of and a solution to vulnerability. For example, marginalized resource-dependent farmers will be more prone to periods of vulnerability. During these periods, they might switch back to dependence on wild sources of resources for their income. And even more troubling, Asia is predicted to face 90% of the increase in global climate-related disasters (DFID, 2004).

Recent experience and analysis lead to eight main conclusions regarding poverty–environment relationships:

- The causal relationship between poverty and the environment is not simple;
- Natural resources are important for the livelihoods of the poor;
- The poor depend more on natural resources, though they exert less absolute pressure on these resources compared to the nonpoor;
- Natural resources are particularly important to women;
- The links between pro-poor growth and natural resources are complex;
- Population density and environmental management are linked, but many factors, such as technology and site-specific factors, mediate this relationship;
- Health, rural poverty, and natural resource links are well understood in some cases, such as indoor air pollution and pesticide risks, but new areas, such as zoonotic diseases, are only beginning to receive attention; and
- The vulnerability of poor households to natural disasters is a key related issue, and it will be exacerbated by the need for adaptation to global climate change.

Responding to poverty–environment issues: The importance of political, institutional, and governance factors

IDENTIFYING UNDERLYING CAUSES

Many recent analyses of environmental change have challenged simpler explanations, which focus solely on the proximate causes and overlook more complex underlying or root causes of environmental degradation (Geist and Lambin, 2002; Leach and Mearns, 1996; Wood et al., 2000). Indeed, some authors (e.g., Leach and Mearns, 1996) argue that there are inherent reasons why these simpler "crisis" narratives have proved so widespread.

These underlying causes of environmental degradation often include a complex mix of demographic,

economic, technological, policy, institutional, and cultural factors (Geist and Lambin, 2002). In the 1990s, the focus of decision makers trying to understand environmental change was on economic policy, in particular often politically controversial structural adjustment programs (Cruz and Repetto, 1992; World Bank, 1996; Reed and Sheng, 1998). The extensive macroeconomic reforms that many developing countries were undergoing, as well as the 1992 UNCED, drove this focus. In this context, researchers and NGOs wanted to understand the links between these macroeconomic reforms and the factors affecting environmental change. The economic focus in the environment debate has shifted toward the impacts of trade liberalization on the environment, which has been a rallying point of NGO critics since the Seattle World Trade Organization meeting in 1999.

However, the thinking of more orthodox economic and environmental decision makers and their recent critics have begun to converge. Many now agree that economic and environmental policies are mediated largely by political and institutional factors, which have received limited attention. A range of recent publications has highlighted governance and environmental issues. Governance, institutions, and the environment were the core themes in the *World Development Report 2003*, released for WSSD. The *World Resources 2002–2004* also focused on governance (WRI, 2003), while other publications have pursued similar themes (United States Agency for International Development, 2002; Reed, 2004). A host of recent articles also have reviewed the political, institutional, and governance issues associated with the management of political economy of these various resources, such as forests (Brown et al., 2002), water (United Nations Development Programme, 2004), and minerals (Global Witness, 2004). In general, this discussion is moving away from a purely managerialist approach to natural resources toward a deeper appreciation of the relations and the dynamics of influence and access (Mehta, Leach, and Scoones, 2001). This coincides with a generally more politically oriented approach toward analyzing poverty reduction (DFID, 2001). This section will review four emerging recommendations from this literature, covering the need to

- Improve access and the security of tenure for poor people;
- Analyze the success factors for so-called community change, and ensure that these schemes really reduce poverty;
- Improve access of the poor to natural resource-related inputs and marketing; and
- Reform state policies that penalize pro-poor environmental activities.

IMPROVING ACCESS TO RESOURCES

Poor people, particularly women, generally suffer from an inequitable distribution and insecurity of resource access, and this appears to be worsening in many instances. Access to resources, such as land, water, and forests, plays a fundamental role in the poverty–environment nexus (Ambler, 1999). While gains have been made in land reform over the last 50 years in some countries, with improved tenure, especially in urban areas, this is undermined by an erosion of traditional management institutions in favor of open access system resources or the privatization of either traditionally managed or state-owned natural resources. In southern and eastern India, for example, privatization of land has reduced—by 25–50%—traditionally managed resource systems (Jodha, 1990). In many offshore fishing grounds, large trawlers compete with fisherfolk engaged with subsistence fishing, reducing the latter's catch (Brashares et al., 2004). Corruption facilitates the conversion of state lands, which often were de facto open access resources available to the poor. The distribution of timber and mining concessions in many countries, such as Indonesia and the Philippines, is one such example (Transparency International, 2001).

Tenurial security also has been shown to be an important variable in the decisions of the poor and others to invest in natural resources, particularly to improve land and plant trees (Shively, 2001). However, early attempts to impose market-oriented land titling have produced mixed results. Increasing evidence shows that customary property systems in many cases can provide cheap, effective, sustainable, and socially accepted management regimes (Jansen and Roquas, 1998). Rights to a particular piece of land might have multiple claims from groups and individuals, including rights to water, fuel, grazing, and cultivation that may vary by season, species, or usage. In such complex situations, it is not clear whose rights will be documented in law when land titles are formalized.

COMPLEXITY OF COMMUNITY MANAGEMENT

While much of the poverty–environment literature has focused on "community management," this perspective is being reviewed based on a growing appreciation of complex poverty and household dynamics often characterized by heterogeneity and

conflicts among multiple-resource users. The widening scope of decentralization and devolution as applied to natural resources resulted in a further delegation of authority to local people to manage or comanage resources (Ribot, 2002). For more than 20 years, political change has devolved responsibly for natural resource management to district organizations (e.g., *panchayats* in India), village committees (e.g., forest user groups in Nepal), and self-initiated organizations (e.g., in Orissa, India). A review of the schemes, including those of South Asia, found that the poor's perceptions of benefits from this process depend on the degree of access they had before devolution and the length of time since devolution occurred. In some countries, such as in parts of the PRC and in the Philippines, households responded enthusiastically as decentralized natural resource management represents a considerable improvement over earlier restrictive regimes. However, disillusionment sometimes sets in as bureaucracies fail to meet expectations raised by the new policies. The pro-poor changes inherent in these schemes were driven (or obstructed) by key actors, including the relative influence of beneficiaries, traditional leaders, local governments, NGOs, and aid agencies (Shackleton et al., 2002). Other studies have set out to define the most effective institutions for collective natural resource management (Ostrom, 1990; Baland and Plateau, 1996). Recent reviews have challenged simple notions of community and have highlighted gender, income, caste, and other factors that can limit collective action even within a limited locale (Agarwal and Gibson, 1999).

ACCESS OF THE POOR TO NATURAL RESOURCE-RELATED INPUTS AND MARKETING

Wealthier groups or the state can limit the poor's benefits from natural resources through the control of inputs (such as credit and water), and monopolistic production and marketing chains. This problem—common to marginal rural agricultural producers—constrains the returns from natural resource investments. Natural resource-based production, like many aspects of the rural economy, often is tied to an inequitable commodity marketing chain that passes little of the value of the resource through to the poor. This can be seen in NTFPs of India, rubber tapping in Latin America, and charcoal production in Africa. To generate wealth from land, many inputs—including labor, seed, fertilizers, pest control, tractors and threshers and, in many arid areas, water for irrigation—are required. To finance fertilizer and other inputs, credit is crucial. However, rural areas with dense, interlinked social networks often provide an opportunity for dominant, wealthier landowners and traders to establish near-monopoly conditions, presenting virtually all-or-nothing choices for the weaker parties (Bardhan, 1989). A related phenomenon is common in Central Asia, in which formerly collectivized farmers are forced to buy inputs at inflated prices from the state and also to sell most or all of their products at less than market prices. Lack of credit is a key constraint for poor farmers, which stops them from improving their land through soil and water conservation. As with land, access to irrigation water is often heavily biased in favor of wealthy farmers or state-owned enterprises. Water coming through surface irrigation passes along channels from head-enders, whose supply is more assured than tail-enders. Where conjunctive use of surface and groundwater occurs, high pumping costs favor wealthier farmers who are more likely to be able to afford groundwater irrigation, although poor farmers often find even expensive groundwater easier to access than large surface-water schemes (Roy and Shah, 2002).

POLICIES THAT CONSTRAIN PRO-POOR ENVIRONMENTAL MANAGEMENT ACTIVITIES

State policies, including those that hold the poor responsible (often wrongly) for environmental degradation, frequently exacerbate constraints on the poor's benefits from natural resources. Such scenario has many examples. The Indonesian timber industry and senior ministers held poor farmers responsible for the 1997 forest fires. However, subsequent evidence suggested that large forest and oil-palm concessions were primarily responsible (McCarthy, 2000). In India, the poor also have been criticized for overstocking with goats, which leads to deforestation (Khanna, 1992). In many cases, the creation of protected areas can harm the poor. This has been well documented in protected areas in India, Nepal, Sri Lanka, Thailand, and Viet Nam. In addition, some environmental regulations are introduced in a way that undermines the poor. In the PRC, for example, the ban on tree felling in upper watersheds to encourage soil and water conservation has been applied so widely that many poor households have been impacted negatively (Chinese Academy of Sciences, 2004). In many other cases, restrictions on felling trees on private lands (as in Sri Lanka and in West Bengal, India) have encouraged

bribery, have acted as a tax on the poor, or have become a disincentive for households to plant trees (Angelsen and Wunder 2003).

COALITIONS AND ALLIANCES TO DRIVE PRO-POOR ENVIRONMENTAL CHANGE

For these reasons, many environmental change processes—and especially those involving access to and control over natural resources—are inherently connected to political processes. Those with the least economic or political influence are generally found to have the least secure access to resources (USAID, 2002; WRI, 2003), and changing this balance requires adjustments to underlying societal relations. For example, the spread of joint forest management schemes in India can be viewed as a reaction to such political forces (Lele, 2000).

Many other examples show how the poor can drive pro-poor environmental change, with assistance from other stakeholders, such as civil society, political leaders, and funding agencies. Some of these are illustrated in the case studies that follow along with many other examples of both poverty–environment linkages and the emerging range of positive responses to these relationships.

Questions Guiding the Analysis

As a means for gaining greater continuity among the case studies, several key questions were posed to all authors. While these were altered as plans for the publication evolved, the basic questions put before the case study authors were as follows:

1. Can poverty be reduced and health outcomes improved by reversing the loss of environmental resources?
2. What is the relationship between poverty reduction, livelihood improvement, and reversing the loss of environmental resources?
   - 2.1 How do poor men and women depend on natural resources for their livelihoods?
   - 2.2 Is poverty causally related to environmental resource decline and environmental degradation?
   - 2.3 Under what conditions will environmental improvements lead to poverty reduction?
   - 2.4 Which environmental issues matter most for poor people?
   - 2.5 Can sustainable use of natural resources help poor people escape poverty or only remain at subsistence income levels?
3. How can human health, particularly of poor people, be improved through reversing the loss of environmental resources?
   - 3.1 To what extent do poor people depend on environmental resources for their health?
   - 3.2 Does biodiversity resource conservation improve food security and nutrition?
   - 3.3 What is the link between the loss of environmental resources and emerging diseases, such as SARs and avian flu?
4. Can biodiversity conservation and sustainable use lead to poverty reduction and better health outcomes?
   - 4.1 Under what conditions will conservation-driven environmental improvements lead to poverty reduction?
   - 4.2 Under what conditions will conservation-driven environmental improvements lead to better health?
   - 4.3 When do conservation interventions negatively affect poor people?
   - 4.4 What role do natural resource-based interventions have in reducing poverty in biodiversity-rich marginal areas compared to other approaches, such as providing non-natural resource incomes and supporting ongoing out-migration?
5. How can political, institutional, and policy changes reduce poverty and improve the environment?
   - 5.1 What are the barriers that prevent the poor from coping effectively with environmental degradation?
   - 5.2 To what extent are environmental issues driven by larger political and economic processes, such as weak governance and corruption, and what role can environmental interventions have in influencing or addressing these larger processes?
   - 5.3 To what extent do poor versus nonpoor producers and consumers drive environmental damage?

5.4 What examples of coalitions for change are there in overcoming political challenges to pro-poor environmental outcomes?

5.5 What value added do environmental issues and biodiversity conservation bring to Poverty Reduction Strategies and other development strategies?

The case studies that follow are organized into four groups—each comprising one chapter of the report—as an aid to exposition. The chapters cluster the case studies according to the following topics: poverty, livelihoods, and ecosystems; poverty, health, and ecosystems; poverty and biodiversity; and response strategies. In addition to serving as guides for the authors during case study preparation, the questions presented (in slightly different form) also are used to organize presentation of the synthesis of findings given in Chapter 6.