



POVERTY, HEALTH, AND ECOSYSTEMS



EXPERIENCE FROM ASIA



Poverty, Health, and Ecosystems: Experience from Asia

Edited by Paul Steele, Gonzalo Oviedo, and David McCauley



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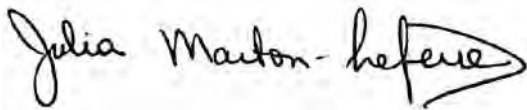
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FOREWORD

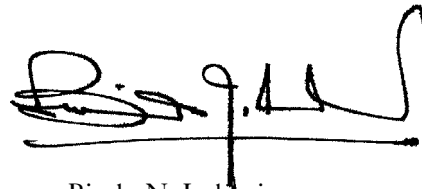
There is growing recognition in the development and conservation communities of the vital relationships between sound management of ecosystems and the determinants of poverty and the effectiveness of poverty reduction efforts. Although the poor are vulnerable to pollution in urban areas, these relationships are closer still in rural settings, where the majority of the poor remain dependent, in some manner, upon the productivity and sustainability of grasslands, forests, lakes, rivers, coasts, seas, and agricultural ecosystems.

Both the Asian Development Bank (ADB) and the International Union for Conservation of Nature (IUCN) are acutely aware of the need to better understand these relationships to achieve their objectives. As a multilateral development finance institution, focused on helping its member countries reduce poverty and improve their living conditions and quality of life, ADB is pleased to support the analysis presented in this publication. IUCN's mission is to influence, encourage, and assist societies throughout the world to conserve the integrity and diversity of nature and to ensure that any use of natural resources is equitable and ecologically sustainable, and support for the type of analysis represented by this report is an important part of the mandate it has received from its members.

Recognizing their mutual interests in these areas, ADB and IUCN signed a memorandum of understanding in 2004 to serve as the basis for stronger collaboration between the two organizations. We are pleased to see this publication as tangible evidence of such collaboration, and we hope that its findings will help bring together the development and conservation communities to cooperate more closely in dealing with poverty–environment challenges facing Asia and the Pacific.



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PREFACE

For many of the many millions of rural Asians who still live in poverty, ecosystems and the natural resources associated with them are essential to daily health and well-being. It is also the poor—especially women and children—who have the most at stake when ecosystems degrade. They suffer disproportionately from the health risks caused by inadequate or dirty water and polluted air and bear the burden of collecting the resources used daily, such as water and fuelwood. This special vulnerability extends to risks from natural disasters—they are the most exposed to initial impacts and the least able to rebuild their lives in the aftermath of such events.

Some 640 million Asians live in severe poverty on less than \$1 a day—the majority in South Asia. And over 40% of Asia’s population—or more than 1.5 billion people—still live on less than \$2 a day. There is no question that Asia’s rapid economic growth has helped alleviate poverty in many parts of the region, and this economic expansion is expected to continue. Given population growth, and even under optimistic economic growth rates for the next decade, there will still be between 150 million and 300 million Asians living on \$1 per day by 2015 and a staggering 1.2–1.5 billion people getting by on \$2 a day.

The majority of Asia’s poor live in rural areas where ecosystems such as water bodies, grasslands, soils, and forests are facing strains from the combined impacts of unsustainable exploitation or outright conversion to other uses. Despite the changing lifestyles in Asia’s expanding cities, life in rural Asia remains largely resource dependent. Most households rely on the fruits of their labor in agriculture—both on their own or others’ land—as well as on the collection of products for sale or personal use from natural systems. The poorest agriculturalists often eke out an existence utilizing the most marginal, smallest plots of land with infertile soils and little or no access to irrigation. At various times of the year they—and others—may also depend on products harvested from forests, lakes, rivers, or seas for their livelihoods.

The case studies presented in this publication highlight the challenges faced by these poor and, often, resource-dependent households across Asia. They include analyses of pressures facing agricultural systems in the People’s Republic of China (PRC), India, and Pakistan. They also cover examples of links between freshwater or marine aquatic ecosystems and those in Bangladesh, PRC, India, Lao People’s Democratic Republic, and Sri Lanka, who depend upon them. Grassland ecosystems provide pastures for livestock, and a case from Mongolia examines these relationships, while cases from Nepal and the PRC document how the poor rely on forests for fodder, medicines, fuelwood, and other products. One case study looks at the complex linkages between gender, poverty, and environment, while other cases from the highlands of Viet Nam, tribal groups in Orissa, India, and in Yunnan Province of the PRC illustrate how ethnic minorities are among the most poor and marginalized, but also often the most natural-resource dependent.

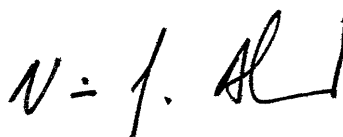
The viability of ecosystems upon which the poor depend can also influence the health of rural populations, and this report offers new insights into the relationships between healthy ecosystems and healthy people. Some of the cases provide positive examples of how traditional cultivars, as well as wild aquatic species, comprise vital protein sources and support the food security of rural communities in South and Southeast Asia. A case study on mining in Mongolia shows how indiscriminate exploitation of nonrenewable resources can damage the health of the poor by polluting water sources and destroying traditional pastures. Another regional case suggests that contacts between humans and animals can lead to the spread of diseases, such as severe acute respiratory syndrome (SARS) and avian flu—threatening the health of the poor and the rich alike. And a case study also is presented that shows how complex human–ecosystem interactions led to the spread of the Nipah virus in Malaysia, which decimated pig production in the country and led to widespread human illnesses and many deaths.

While the cases document the links between poor rural populations and natural systems, they also delve into the social processes that underpin poverty and often perpetuate the unsustainable management of natural systems—by both the poor and the nonpoor, and by both local and external groups. These issues are part of broader governance challenges that are pervasive across rural Asia, tied especially to the inequitable distribution of resource rights and management regimes that often favor vested interests at the expense of the poor. The case studies present a range of efforts to overcome such social and political rigidities, often supported by alliances between civil society and development agencies and resource-based nongovernment organizations that can facilitate wider legal redress. They also show how government agencies can learn to decentralize greater natural resource decision making to poor people and their political representatives as part of poverty reduction and resources management interventions.

This publication is meant to shed further light on these important and varied relationships, and ADB and IUCN are pleased to have commissioned these case studies in an effort to promote debate about and greater understanding of Asian resource management systems and why they matter for poverty reduction. We trust that the documentation and analysis of this Asian experience will lead to improvements in both poverty alleviation efforts and ecosystem conservation.



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This publication is the product of a collaborative effort that began in 2004 when the International Union for Conservation of Nature (IUCN) was planning the Third World Conservation Congress held in November 2004 in Bangkok, Thailand, with the overall theme of *People and Nature*.

A dialogue was initiated at that time about the need to better document the Asian experience on the linkages between poor rural households and natural resource systems upon which the poor often depend for their livelihoods. It was noted that the existing poverty–environment literature was almost devoid of such examples as they relate to influences on human health. This contributed to the choice of “Health, Poverty, and Conservation: Responding to the Challenge of Human Well-Being” as one of the four themes of the World Conservation Forum associated with the Congress.

IUCN and Asian Development Bank (ADB) decided to further explore these relationships. IUCN proposed the concept for this report, and ADB agreed to collaborate and support its preparation and publication as an activity of ADB’s Poverty and Environment Program, financed by ADB and the Governments of Norway and Sweden.

A seminar was organized at the World Conservation Forum to gather together potential case study authors and others interested in the subject to decide on how to proceed with this project. The seminar was organized by Mr. Gonzalo Oviedo, IUCN Senior Advisor for Social Policy; and Mr. Robert Everitt, Environment Specialist in the Environment and Social Safeguard Division (RSES) of ADB. They were assisted by Mr. Paul Steele, now Environment Advisor for UNDP – Asia and Pacific Regional Centre and formerly of the Institute for Policy Studies in Colombo, Sri Lanka, by Dr. Hemantha Mishra of ADB’s NGO Center at the time, and Dr. David McCauley, Senior Environmental Economist in RSES. Many of the case study authors attended the seminar.

Any work of this type is the result of contributions from a wide range of partners and colleagues. From IUCN in Asia, support was provided by Dr. Ranjith Mahindapala, Dr. Lucy Emerton, and Dr. Pisupati Balakrishna. Ms. Aban Kabraji and Dr. Zakir Hussain, Regional Director and Director for Constituency Development of IUCN Asia Regional Office, respectively, and Dr. Bill Jackson, Global Programme Director at IUCN Headquarters, offered continued support and advice.

Dr. Bob Fisher, member of the IUCN Commission on Environmental, Economic, and Social Policy (CEESP) and Senior Researcher at the Australian Mekong Resource Centre of the University of Sydney; Dr. Luca Tacconi, also a member of CEESP and Associate Professor at the Australian National University; and Dr. Charit Tingsabadh, Professor, Chulalongkorn University, Thailand, reviewed and provided valuable comments on the manuscript. Mr. Steve Bass, Senior Fellow, International Institute of Environment and Development, United Kingdom and Dr. Robert Bos of the World Health Organization (WHO) provided valuable ideas during the conceptual phase. Valuable comments also were received at the June 2006 meeting of the Poverty and Environment Partnership in Washington, DC, where a brief presentation was made on the report’s contents and findings.

At ADB, overall direction and guidance for the study team were provided by Mr. Nessim Ahmad, Director, RSES. The report would not have been completed without the persistent and able efforts of Ms. Loreta Rufo, RSES, who served as the link between organizations, editors, and authors in guiding the publication from concept to reality. She was also assisted at several key junctures by Ms. Charina Munda and Ms. Carmina Esguerra, also of RSES. At IUCN Headquarters, Ms. Susan Both offered logistical support throughout the process, assisted by Ms. Sandra McKenzie based in Ecosystems and Livelihood Group 2 of IUCN Asia in Colombo. Ms. Deborah Murith, Ms. Cyndi Cracker, and Ms. Tiina Rajamets of IUCN’s Publications Support Unit, Mr. Vicente Angeles and Ms. Priscilla del Rosario of ADB’s Publishing Unit diligently arranged printing and distribution.

Ms. Susan Broomfield did the first editing of the compiled manuscript at IUCN and facilitated liaison with the authors for retrieval of materials. Editing was then completed at ADB by Mr. Marc Crowe, Ms. Agnes Adre, and Ms. Ma. Theresa Castillo. Cover design and layout were prepared by Ms. Regine Abos and Ms. Cecilia Caparas of ADB's Department of External Relations.

The strongest acknowledgments, however, must be accorded to the authors of the case studies and the subjects of their analysis. Biographical sketches for each author are provided at the end of the publication. We were very fortunate to attract such a multifaceted group with valuable experiences to share. We have done our best to pull together the wide-ranging elements of the cases into what we hope is a coherent whole that we believe will add considerably to the growing literature on environmental determinants of poverty and human health and which carry important implications for poverty reduction efforts in Asia and elsewhere in the developing world.

ABBREVIATIONS

ADB	Asian Development Bank
APEC	Asia-Pacific Economic Cooperation
ARDS	acute respiratory distress syndrome
CBHFRM	Community-Based Haor and Floodplain Resource Management
CF	community forestry (Nepal)
CFUG	community forestry user group (Nepal)
cm ³	cubic centimeter
CNY	yuan (PRC)
CPR	common property resource (Nepal)
DFID	Department for International Development (United Kingdom)
DFO	district forest office (Nepal)
DS	Divisional Secretariat (Sri Lanka)
EDCG	Environment Donor Coordination Group (Pakistan)
EIA	environmental impact assessment
ENSO	El Niño Southern Oscillation
EPB	Environmental Protection Bureau (PRC)
FAO	Food and Agriculture Organization of the United Nations
FECOFUN	Federation of Community Forest Users of Nepal
FMD	foot-and-mouth disease
g	gram
GDP	gross domestic product
ha	hectare
HYV	high-yielding variety
IMF	International Monetary Fund
ITKH	indigenous technical knowledge holder
IUCN	International Union for Conservation of Nature
kg	kilogram
km	kilometer
km ²	square kilometer
Lao PDR	Lao People's Democratic Republic
LF	leasehold forestry (Nepal)
LFUG	leasehold forestry user group (Nepal)
LRMP	land resource-mapping project (Nepal)
m	meter
m ²	square meter
MDG	Millennium Development Goal
MSSRF	M.S. Swaminathan Research Foundation (India)
NAC	National Advisory Committee (PRC)
NCS	national conservation strategy
NEMAP	National Environment Management Action Plan (Bangladesh)
NGO	nongovernment organization
NR	Nepalese rupee
NTFP	nontimber forest product

ORM	Onggi River Movement (Mongolia)
PEP	Poverty and Environment Partnership
PGUS	Panchabati Grama Unnayan Samiti (India)
PRA	participatory reflection and action (Pakistan)
PPA	participatory poverty assessment
PPB	participatory plant breeding (India)
PRC	People's Republic of China
PRI	Panchayat Raj Institution (India)
PRSP	poverty reduction strategy paper
R	Indian rupee
RBNP	Royal Bardia National Park (Nepal)
RCNP	Royal Chitwan National Park (Nepal)
RECOFTC	Regional Community Forestry Training Centre for Asia and the Pacific
RNA	Royal Nepal Army
SARS	severe acute respiratory syndrome
SDC	Swiss Agency for Development and Cooperation
SEPA	State Environmental Protection Administration (PRC)
SLR	Sri Lanka rupee
SPA	strictly protected area
UNCED	Rio de Janeiro Conference on Environment and Development
VDC	village development committee (Nepal)
VJFM	village joint forest management
VSB	village seed bank (India)
WHO	World Health Organization
WSSD	United Nations World Summit on Sustainable Development
WWF	World Wide Fund for Nature
YEDP	Yunnan Environment Development Program (PRC)
YPG	Yunnan Provincial Government (PRC)
YSDAP	Yunnan's Sustainable Development Action Plan (PRC)

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

Paul Steele, Robert Everitt, Gonzalo Oviedo, and David McCauley

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 environmen-

tal 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 coun-

tries, 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).

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

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

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

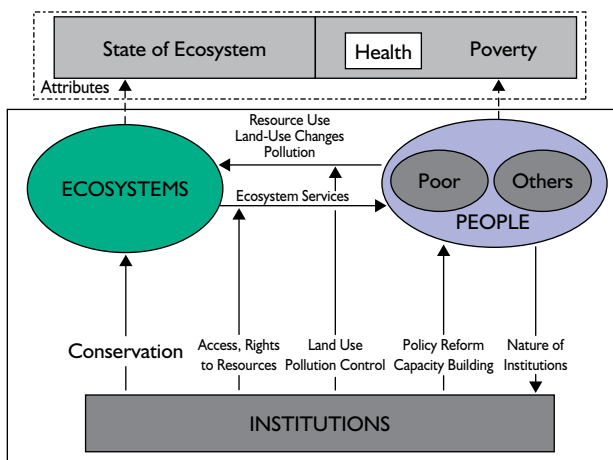
The conceptual framework (Figure 1) used to guide this analysis focuses on three elements: (i) people and households, particularly poor households; (ii) ecosystems; and (iii) institutions. While recognizing the importance of the internal workings of each of these three elements, the study also has attempted 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 inte-

grated 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 non-poor 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

<p>Provisioning Products from ecosystems</p> <ul style="list-style-type: none"> • Food • Fresh water • Fuelwood • Fiber • Biochemicals • Genetic resources 	<p>Regulating Benefits from regulation of ecosystem processes</p> <ul style="list-style-type: none"> • Climate regulation • Disease regulation • Water regulation • Water purification 	<p>Cultural Nonmaterial benefits from ecosystems</p> <ul style="list-style-type: none"> • Spiritual and religious • Recreation & ecotourism • Aesthetic • Inspirational • Educational • Sense of place • Cultural heritage
<p>Supporting</p> <p>Services necessary for production of all other services</p> <ul style="list-style-type: none"> • Soil formation • Nutrient cycling • Primary production 		

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 tenorial 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 manage resources (Ribot, 2002). For more than 20 years, political change has devolved responsibility 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 Platteau, 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.

POVERTY, LIVELIHOODS, AND ECOSYSTEMS

Enhancing Sustainable Livelihoods in Puttalam Lagoon, Sri Lanka

L. P. D. Dayananda

Introduction

Sri Lanka's coastal zone is vital to the country's social, economic, and environmental development. Much of the 1,620-kilometer (km) coastline was devastated by the tsunami in December 2004, although the area of this case study—Puttalam Lagoon on the northwest coast—suffered few impacts. Sri Lanka's coast comprises estuaries, peninsulas, beaches, and offshore islands. It supports 90% of the fisheries, most of the tourism and other industries, agriculture, and human settlements. The coral reefs, mangrove forests, estuaries, lagoons, wetlands, and sanctuaries in the coastal zone have some of the country's richest biodiversity. The coastal fisheries accounted for 66% of Sri Lanka's fish production in 1995, which totaled 235,750 tons. Coastal and marine fisheries contribute more than half of the population's animal protein consumption. Thus, while the coastal zone is extremely valuable to Sri Lanka's economy, it is also highly fragile and vulnerable to many dynamic processes, including natural and human forces. The recent tsunami was the most extreme example.

The coastal region is made up of 74 divisional secretariats (DS), each with a coastal boundary. These divisions lie within 14 of Sri Lanka's 25 administrative districts and cover about 23% of the country's land area. For historical reasons, the population is concentrated in the coastal region, particularly along the southern, western, and northwestern coasts. About 4.6 million people, representing 25% of the population, live in the coastal region.

Sri Lanka's diverse coastal resources sustain a range of economic activities, chiefly marine and brackish water fisheries. In 2000, the fishery sector contributed about 2.7% of the gross national product at the current factor cost price, providing an important source of foreign exchange. Marine fisheries accounted for an estimated 91% of the fish production in Sri Lanka in 2003, with coastal fisheries contributing 64% of this share. The fishery sector—including coastal aquaculture, which consists mainly of shrimp farms in North Western Province—employs about 150,000 people and provides sustenance to at least 1 million.

Coastal resources have provided economic and subsistence value to coastal communities since time immemorial. Coral reefs contain many resources of export value, such as ornamental fish, lobsters, etc. Estuaries and lagoons, mangroves, sea grass beds, and salt marshes also function as vital breeding and nursery grounds for numerous species of fish, crustaceans, and mollusks, many of which have commercial value. The coastal communities traditionally use coastal vegetation for many purposes, such as food and beverages, timber for houses and boat construction, firewood, materials for manufacturing fishing accessories, etc.

Most of Sri Lanka's coastal habitats have suffered from degradation, in some cases at an unprecedented rate, reducing the availability of resources. Human population growth in Sri Lanka's coastal zone over the last 2 decades has increased the disruption of coastal processes tremendously. Natural causes and human activities have degraded the coral reefs of many important sites. Mining of coral for the lime industry is a principal cause of the destruction of coral reefs. Destructive fishing techniques often damage the sea grass beds in lagoons and around the coral reefs. Pollution from the inflow of sewage, untreated

industrial effluents, urban waste, and chemical compounds from shrimp farms increasingly harm lagoons and estuaries and their biodiversity. The conversion of these areas to other uses—such as shrimp culture, lowland agriculture, and house construction—has caused extensive damage to the naturally fragmented mangrove swamps. Salt marshes in specific areas of the country, which use to perform many vital ecological functions, have diminished considerably in the district of Puttalam, where they have been converted to shrimp farms.

Background

The Regional Technical Assistance for Coastal and Marine Resources Management and Poverty Reduction in South Asia, sponsored by the Asian Development Bank (ADB), aimed to promote regional cooperation among four Asian countries—India, Maldives, Pakistan, and Sri Lanka—in strengthening the management of environmentally sensitive coastal and marine resources using integrated coastal zone management approaches. As part of the regional technical assistance, a poverty and environment nexus study attempted to analyze the inherent links between poverty and environmental degradation, and their impact on socioeconomic groups.³

The study intended to address the main causal mechanisms at work in poverty and environmental degradation. Having determined the causal mechanisms exacerbating poverty, the study attempted to determine—from the quantitatively driven empirical analysis—the groups (gender, ethnic, or economic) that were hit hardest by environmental degradation. The fishing communities, in general, lack decent housing and basic social infrastructure. Seasonal variations of household income, primarily from fishing in coastal and lagoon areas, compound their economic problems.

The study focused on the nine *grama niladaris* (smallest administrative unit headed by a village headman) around Puttalam Lagoon on the north-western coast of Sri Lanka. Sample communities were drawn from these four villages.

Gangewadiya. Gangewadiya, originally a fish-landing site (*vadiya*), is now an established fishing

village within the grama niladaris of Aluth Eluwankulama. Bordering the right bank of Kala Oya Estuary, the isolated village is connected to the main road to the cement factory by a 5-km stretch of gravel road. Gangewadiya, established some 30 years ago as a seasonal vadiya with temporary huts, now has more permanent dwellings for the fisherfolk and their families. The number of housing units has increased appreciably over the last 10 years. In 1990, according to the resource profile, the village had only 39 fishery housing units (listed as “fisheries quarters” in the profile). It now has about 55. Although the houses in Gangewadiya are semipermanent, the study found that more than 25 families possess a second, more permanent house in Eluwankulama.

Serakkuliya. The grama niladaris of Serakkuliya consists of several villages—Serakkuliya, Sinnagowilluwa, Mahwilluwa, and Perriyanagar. Serakkuliya village is about 12 km north of the Wanathawilluwa DS Office, close to the lagoon. Serakkuliya has 266 housing units and a population of 1,197, the majority of which is Sinhala (881). Muslims (167) and Tamils (149), most of whom are engaged in lagoon fishery, account for the rest of the population.

Most households receive a state welfare payment (*samurdhi*) of Sri Lanka rupees (SLRs) 350–600 (US\$1 = SLRs100) per month. Over the last 10 years, fishing has expanded rapidly with a corresponding increase in the number of mechanized boats from 50 to 150. Limited space for anchoring, poor storage and landing facilities, and poor marketing arrangements create problems in Serakkuliya.

Karative (North). Geographically, Karative (North) is within a dense mangrove area bordering the lagoon, and has a large stretch of salt marshes. Its long coastline comprises three fishing villages: Serakkuliya, Odekare, and Palamkare. With a population of about 3,200, Karative (North) is inhabited by a Tamil-speaking Muslim community. Reportedly, the Muslim population has congregated in this village since ancient times, giving Karative a high population density (200 persons per square kilometer [km²]). Of the 609 households, 509 are Muslims and the rest are Sinhala. About 60% of the families receive the samurdhi.

³The aim of the poverty and environment nexus study basically is to understand the causal links between poverty and environmental degradation. Causal links between poverty and environment rarely are discussed at length in available literature. While widespread poverty clearly is due to social and economic deprivation, solid evidence to substantiate that poverty alone can cause environmental degradation is lacking. However, it can be argued reasonably that poverty contributes to resource degradation.

The salt marshes provided employment and income to about 60 families until recently. For most household members, fishing is the primary source of income. In Karative (North), for example, about 50–60% of the communities fish as their primary means of livelihood. Approximately 75–100 fishing families own outboard motorboats, and an additional 50 families own more conventional fishing gear, such as a small wooden boat (*theppama*) with cast nets. About 20% of the households also cultivate rice in the adjoining Eluwankulama area.

Pubudugama. Pubudugama is within the Samagipura grama niladaris in the south of Wanathawilluwa DS. It is a traditional fishing village with a population of about 260 (70 families), all of whom receive samurdhi. About 95% of the villagers fish. The St. Sebastian Fishery Cooperative Society—one of the few functional fishery cooperative societies in the country—draws its members from Pubudugama and Karadipual. The people in this village seem to enjoy a better socioeconomic standard of living than those in the other three study locations. However, unclear land titles, poor accessibility to drinking water, and the encroachment of prawn farms into mangroves are major environmental, social, and economic issues.

What it means to be poor

HOUSING

In a village economy, the types of houses, their amenities, and the ownership of some selected durables generally reflect the living standards of community members. Further, the extent of the livable floor

area, type of floor, materials used for the walls and roof, number of rooms, and the availability of amenities (e.g., water, latrines, and electricity) indicate the wealth and social status of the average rural household. In a fishing community, however, housing generally is not a satisfactory indicator of poverty because substandard housing is common in the coastal belt due to the lack of ownership of the land on which houses are built. In addition, semipermanent construction is often deliberate since houses are vulnerable to natural calamities, such as gales, high tides (sea erosion), etc. Families commonly own a better-quality house elsewhere, while occupying a substandard house on the beachfront. This is particularly true in Gangewadiya, where almost all the houses in the villages appear substandard. At least half these families own a second house in the nearby Eluwankulama village.

Housing continues to be a high priority in most fishery development projects in Sri Lanka due to the generally poor standard of housing in fishing communities. “Visara” and “Diyawara” are two of the large-scale housing programs recently implemented under the state-sponsored fishery extension programs. However, some people have complained that the criteria for selecting the beneficiaries of such housing projects were not transparent. In the study area, none of the villages had benefited from fishing community housing programs in the recent past.

The study also found that 40% of the houses in all four villages had a floor area of less than 18.6 square meters (m²) (Table 1). Most were one-unit houses. Since the average family has four to five members, these houses were overcrowded and far below the national standards. The conditions in

Table 1: Housing in the Pilot Villages

Floor area (m ²)	Gangewadiya	Karative	Serakkuliya		Pubudugama	% of houses in each floor-area category
			Houses (no.)	Houses (no.)		
9.3–18.6	12	5	6	6	8	40
18.7–27.9	3	4	6	6	6	24
28.0–37.2	2	2	4	2	2	13
37.3–46.5	–	2	–	3	3	6
46.6–55.7	2	1	–	2	2	6
55.8 and above	–	3	4	1	1	11

– = 0; m² = square meters; no. = number; % = percent.

Source: Household survey, International Union for Conservation of Nature (IUCN).

Gangewadiya and Karative were especially poor, with most houses having a floor area well below the minimum of 18.6 m². Houses without a kitchen, toilet, and adequate ventilation holes were common in the study area. Only a few houses (11% of the sample) were relatively large, with a floor area of 55.7 m² or more. Only two or three houses had cemented floors and were built as permanent constructions with brick walls and galvanized sheet roofing.

HEALTH AND SANITATION

Environmental sanitation in the coastal belt communities generally needs to be improved in terms of toilets and sanitation practices. This is true in the case of all four villages studied. Of the 80 houses surveyed, only 19 were found to have toilets (pit toilets). The five public toilets found in Gangewadiya were constructed under the Fisheries Development Program of the Fisheries Ministry of the North-western Provincial Council. Some nongovernment organizations (NGOs) and several special projects sponsored by the church have supported the construction of latrines, especially in Karative and Serakkuliya. However, there remains a great need for more toilets and proper sewage disposal in the four study areas.

WATER

The paucity of potable water continues to pose significant social, health, and economic problems for the households of the study area. Women, in particular, face severe hardships, as they spend long hours collecting water from distant places. The lack of adequate water severely handicapped their daily cleaning and cooking activities. Kala Oya is the main source of freshwater for villagers in Gangewadiya. Each day, the

villagers trek 2–3 km inland along the river to collect drinking water. Most of the villagers of Serakkuliya do not have access to freshwater, although they buy water from outside suppliers. Several suppliers transport *bowser* (tanks) full of water to these villages, which allows villagers to collect two to three 35-gallon cans per day. Dug wells are the main source of water in Karative. Instant wells are dug in the sandy soil, and the water is drawn using an *ookkuwa*, a spoon-type of equipment. In Pubudugama, where tube wells are also common, villagers obtain sufficient water from their own wells.

Drinking water provided by the Government through water supply projects is still a luxury, despite the implementation of ADB-funded community water supply projects in the district. Thus, water is a precious commodity for the majority of poor fishing households. Alternatives, such as the construction of rainwater harvesting tanks and distribution of water through the water bowser with the DS office, were suggested as possible improvements. The divisional secretary explained that the DS is responsible for the distribution of water to all the affected villages, especially during the dry season. However, this could not be undertaken due to the lack of funds to repair the mobile water tank lying in the yard of the DS office.

LAND

Rural communities tend to have multiple livelihood strategies because seasonal weather patterns and other external factors often affect their income sources. Access to land resources (for agriculture and fishery) is the key to ensuring and protecting livelihoods, especially during lean periods. Land provides rural families with the opportunity to earn a subsis-

Table 2: Housing Amenities in the Study Villages

	Gangewadiya	Karative	Serakkuliya	Pubudugama	Sample average (%)
Houses (no.) with toilets	Nil *	6	9	4	24
Houses (no.) with electricity	Nil	Nil	Nil	Nil	0
Permanent houses (no.) **	4	12	10	20	57
Semipermanent houses (no.) ***	19	5	7	3	43

no. = number; % = percent.

* Four public toilets are available.

** Wattle and daub (plastered) or brick walls with cadjan, sheets, or tiles as roofing materials.

*** Wattle and daub or cadjan for walls and cadjan as roofing materials.

tence income. Land ownership, however, is equally important as it provides collateral when borrowing money from formal and informal lending institutions.

The people in the four study villages faced severe social problems caused by poor land quality, as well as the lack of clear titles and deeds, even for the small landholdings they occupy. Generally, the individual landholdings in all study areas—except Pubudugama—were 253–1,012 m² (Table 3). In terms of land quality, the small allotments provided little support to people’s livelihoods. In almost all cases, the soil is sandy, infertile, and highly saline, which prevents productive crops from being grown in home gardens. The lands also are not suitable for raising livestock. The cultivation of anything in the areas adjacent to the beach, especially at Serakkuliya and Gangewadiya, is very difficult. For a better view of approaching vessels along the beach strip, much of the topsoil in these areas has been removed, leaving a salty underlayer. Soils farther away from the beach are better, allowing a good selection of perennials and annuals, including fruits and vegetables, to grow.

The majority of villagers with lands on the borders of the lagoon did not have legal title, despite occupying these lands for 2–3 decades. Some houses were constructed on government land. However, the provincial administration did not initiate action to transfer land ownership to the villagers, even though several land allotment programs had taken place within the division. Land ledger permits issued to community members many years ago were not renewed. The occupants claim ownership on the grounds that they have occupied the land for a time. The divisional secretary did not believe this problem could be handled at the DS level due to staff shortage.

Often, people construct substandard housing when they are deprived of the proper land titles and deeds. Proper titles and deeds can serve as collateral for credit when dealing with formal lending institutions, especially for house construction. The divisional secretary said that additional staff (even temporary staff) in the DS office could help expedite the conveyance of lands.

INDEBTEDNESS

Savings can be a strong indicator of the economic stability of a household. Savings are particularly important in fishing households, who invest capital at least once a year to replace fishing gear, such as nets. On the average, each fishing family needs SLR15,000–30,000 a year to replace nets and repair boats. The study found little evidence that poor fishing communities, in general, have formal bank accounts. In fact, funds normally are borrowed from moneylenders to replace nets destroyed by motorboats or damaged by crabs. Savings are generated through collective saving mechanisms. Since the fishery organizations or cooperative societies are not functioning, formal sources of funds are not available. As a result, capital needs are met through informal credit and livestock sales. However, a well-functioning informal credit mechanism is operating within the society, led by organized fish buyers.

Households do not consider indebtedness a pressing economic issue. Poor fishing communities often operate on a barter system in which fish catches are negotiated based on short- and long-term financial needs. Most importantly, they depend heavily on informal credit to purchase the necessary fishing gear. Fisherfolk also rely on net and boat vendors providing long-term credit for the purchase of fishing gear. Sometimes, intermediaries (moneylenders)

Table 3: Size of Landholdings in the Study Villages

Village	0.4–0.8 ha	0.2–0.4 ha	0.1–0.2 ha	506–1,012 m ²	253–506 m ²	< 253 m ²
Gangewadiya	–	–	4	2	9	8
Karative	–	–	8	6	3	–
Serakkuliya	–	1	–	13	6	–
Pubudugama	14	2	3	–	3	–

– = 0; ha = hectare; m² = square meter.

lend money, in the form of cash or checks (drawn to a third party), for the purchase of equipment and other daily needs. This informal credit mechanism also provides the intermediaries with regular buyback systems. Nevertheless, the owners of most of the motorized boats (outboards) in Karative and Serakkuliya are aware that the marketing of fish catches is tied unavoidably to the credit provided for purchasing boats and nets. Obviously, the terms of trade in such arrangements become extremely unfavorable for the boat owners or fisherfolk, who are expected to sell their catches to intermediaries (who determine the price). While this relationship is informal, it allows the intermediary to maintain a monopoly over the collection, storage, and marketing of fish.

UNEMPLOYMENT, UNDEREMPLOYMENT, AND EDUCATION

Unemployment and underemployment remain pertinent social issues in all four sample study sites. Most of the youths engaged in fishing expressed dissatisfaction and frustration, and emphasized that the lack of other livelihood options was the only reason they fished. Some young boys (17–23 years old) who have just finished their secondary education join their elders in fishing. Women and children often help in ancillary activities, such as net clearing. Social issues will be aggravated in years ahead as the young generation receives a decent education and develops greater aspirations. Clearly, the next generation will be better educated, and social unrest among the educated youth is likely if sufficient alternatives to fishing are not available.

Warnakulasuriya Sunil Gamini of Gangewadiya is a 38-year-old fisher and father of three children. His 12-year-old daughter and 14-year-old son are still attending school. His 17-year-old son dropped out after completing secondary education and joined his father in fishing in the estuary using a theppama. Sunil says the fishing effort has not increased just because his son joined him. His only intention is to keep his son occupied. If his son can find an alternative income-earning source, he will not allow his son to join him in fishing as a livelihood. “You cannot take much from the lagoon,” he says.

FISHERY-RELATED LIVELIHOODS

Fishing in the estuary has been the main livelihood for the majority of the fishing community in the four study areas. With the increase in the number of boats, competition for the lagoon’s aquatic resources has been growing over the years. Reports indicate that fish stocks have declined due to excessive fishing by an expanding fleet. The lack of alternative livelihood opportunities, an increase in the use of bottom set nets⁴ and push nets, and the inability of average fisherfolk to invest in efficient fishing gear have kept incomes at subsistence levels.

Prawn fishing and crab collecting, although highly seasonal activities, have been the most lucrative enterprises for those using nonmechanized methods. During the prawn season, the poor can achieve sizable catches in the lagoon, but this period lasts a maximum of 3–4 months per year. The income level from crab collecting could be increased two- or three-fold if the community used appropriate methods to fatten the crabs. However, such programs have not been introduced in the recent past, so fisherfolk depend on common fish species. Table 4 presents the most common fishing techniques practiced by poor and affluent fisherfolk in the lagoon, and the impact of these techniques on the resource base.

OWNERSHIP OF FISHING GEAR

The type of gear fisherfolk own reflects their ability to sustain a sound livelihood which, in turn, can minimize the vulnerability of their livelihoods during difficult times. Those engaged in fishing as a primary livelihood need several types of fishing gear to cope successfully with income fluctuations during the fishing seasons. Those who possess mechanized boats and nets of different sizes can exploit other fishing areas during difficult or slack times and are considered to be affluent. Besides, they can exploit fishery resources in the lagoon and the sea more efficiently than their counterparts who use conventional fishing gear.

The inability of most fisherfolk in and around Puttalam Lagoon to purchase highly efficient fishing gear has limited their access to fisheries. Those engaged primarily in lagoon fishing have limited access to sea fishing because their fishing gear is more obsolete and not seaworthy. The primary fishing gear required for lagoon fishing was found to be a theppama, or a fiberglass *oruwa* (small boat), plus a set of all-purpose nets.

⁴Bottom set nets are used by fisherfolk who cast their nets on solid structures, such as coral, sandstones, etc. The Fisheries Act bans such fishing practice because it damages these solid structures.

Table 4: Fishing Techniques Prevalent in the Lagoon

Type of fishing	Segment of fisherfolk involved	Fishing equipment used	Extent of resource degradation
Catching prawns	Women and men	Collection pot	No evidence of resource degradation
Cast netting	Men	Cast net and collection pot	No evidence of resource degradation
Push netting	Women and men	Push net and collection pot	Resource degradation due to scraping of the lagoon bed
<i>Sangili</i> (pull) netting (more synonymous with drag netting)	Men	Sangili net, <i>theppama</i> , and collection pot (<i>madiya</i>)	Resource degradation due to by-catches and scraping of the lagoon bed
Trammel netting	Men	Theppama and nets	No resource degradation
Fish shoaling	Men	Motorized boats	Resource degradation due to by-catch

Source: Household Survey, IUCN.

Most fisherfolk in the four study areas only owned trammel and cast nets that cannot be used in coastal fishing. Nearly 64% of fisherfolk surveyed in the four villages owned a theppama that is suitable for lagoon fishing. Few people owned motorized or mechanized boats. Table 5 presents data on the types of fishing gear owned by fisherfolk in the study areas.

DEFINING THE POOR

Based on the given socioeconomic indicators, the number of poor as a proportion of the population in the four sample study sites was identified using the following criteria:

- national poverty line to qualify for samurdhi allowances (monthly household income below SLR1,000);
- lack of housing (living in someone else's property);

- condition of housing (semipermanent housing with wattle and daub walls, no cement floor, less than 27.87 m² of floor area);
- community perception;
- fishing in the ode (fishing area adjoining the lagoon) with substandard fishing gear or without fishing gear (fishing by hand, push nets, old theppama unsuitable for lagoon);
- lack of productive assets, such as own nets, theppama, or any other permanent fishing gear (e.g., those who hire fishing gear, do net clearing, or share fishing gear and the harvest with another fisher);
- number of dependents and sick persons in the family; and
- limited alternatives (no homestead to raise livestock).

Table 5: Fishing Gear Owned by Fishers in the Four Study Areas

Type of fishing gear	Gangewadiya		Serakkuliya		Karative		Pubudugama	
	No.	As % of the sample	No.	As % of the sample	No.	As % of the sample	No.	As % of the sample
Mechanized boat	Nil	Nil	2	9	3	17	1	4
Theppama or oruwa	18	67	4	17	3	17	10	45
Trammel or cast nets	22	88	11	48	6	35	16	72
Push nets	Nil	Nil	10	43	9	52	1	4

no. = number; % = percent.

Table 6: Number of Poor Households in the Study Areas

Village	Households (no.)	Population	% of poor in the population
Karative (North)	609	3,200	60
Serakkuliya	266	1,197	70
Gangewadiya	55	225	50
Pubudugama	70	260	95

no. = number; % = percent.

Accordingly, the number of poor people in Karative (North) was found to be significant in relation to the village’s relatively large number of households (Table 6). Of the 609 families, nearly 60% were categorized as “very poor” based on the above criteria.

Fishing livelihood challenges

SOCIAL CONFLICTS DUE TO OPEN ACCESS

In and around the lagoon, social conflicts occur among fishing communities over open access fishery resources. The study found that during high tides, many fisherfolk from all areas of Puttalam encroach upon the lagoon, resulting in community conflicts that sometimes lead to criminal activities. In some instances, the police reported, escalating conflicts led to homicides over fishing territories. The fishing communities often are ineffective or highly polarized on political grounds. Thus, they are unable to resist the more organized activities of migrant fisherfolk from the Kalpitiya area. This situation is particularly tense during peak prawn-harvesting periods. Open access to fishery resources has been an accepted practice. However, the pressure that has mounted during the past years over limited fishery resources in the lagoon and the inability of ordinary lagoon fisherfolk to migrate to other open access areas (due to inefficient fishing gear) had led to uncontrollable community upheavals.

Some of the fishery cooperatives are unable to protect the social needs of their membership. The fishery cooperative societies in Serakkuliya and Karative are divided on political lines. Local political authorities often wield power and influence in decisions regarding who receives fishery extension services, including nets and boats at subsidized prices, loans, and houses.

Case of the saltern

The provincial administration leased the 20-acre saltern in Karative to 60 households for salt harvesting. These households earned about Sri Lanka rupee (SLR) 3,000–5,000 a month from the salt they harvested, enabling them to secure a fixed source of income at least 9 months of the year.

At the time of the study, the saltern was abandoned. No one was using it due to a social conflict that arose when the local political authorities interfered in the process. The political authorities were interested in changing the leasehold prematurely as the local political power changed. The conflict ended up in litigation. As a result, the saltern was abandoned, depriving the people of much-needed income.

TYPE OF FISHING GEAR AND PRACTICES

The use of harmful fishing gear and fishing practices is increasing in any fishery society where law enforcement and awareness about the adverse impacts of such practices remain minimal. The use of dynamite is one of the most devastating marine fishing techniques. In lagoons, fish shoaling and the use of detrimental nets were common—even though these fishing techniques are illegal.

A fisher stated in the survey that he has been one of the 40 push net holders in the lagoon for the last 10 years. He said no alternative was available: “I have no other source of income. I am living on rent in this small hut. I have a family with two children. Nobody provides me with a loan to buy good fishing gear. Others know that I use the push net. I also know that this is harmful. But I do not think that others will report this to the fishery inspector because they know my plight.”

Fishing with push nets is considered detrimental to the resource base and frowned upon by the communities as an illegal activity. Nevertheless, a sizeable number of families depend on the use of push nets and chain nets, since these do not require a large upfront investment and any poor fisherfolk can afford them. Consequently, even though the use of such equipment is banned, the sympathy for those who use it is widespread because of the level of poverty of the users.⁵ However, while this technique allows the household to earn a subsistence income, damage to the resource base is considerable.

Several families that do not possess a mechanized boat or a push net make their living by borrowing nets from friends and relatives. Some of the poor families clear trammel nets. Clearing nets is especially common among women and children, primarily to fish for consumption.

Few of the poor households (the sample only included households engaged in fishing) own decent, multiple-use fishing craft. Almost all those living in Gangewadiya have at least a cast net, and the majority owns a theppama, a plastic boat, or an oruwa. Significantly, fisherfolk in Gangewadiya and Pubudugama did not own push nets or chain nets, unlike their counterparts in Karative and Serakkuliya.

FISHERY EXTENSION SERVICES

Extension services constitute a strong safety net for rural villagers, especially those with marginal household income. Some of the primary extension services that have been provided through the state institutions are assistance in obtaining fishing permits, insurance for their craft, subsidized craft and gear, market links, training, relief during the off-season in the form of dry rations, housing, and sanitation. In addition, a veterinary surgeon and agricultural instructor provide extension services to strengthen alternative livelihood options in coastal communities.

Some 18–20 years ago, the fishing communities of the sample sites received subsidized fishing craft and gear. However, the distribution of these services apparently has been extremely politicized. The local political leadership influenced fishery cooperative societies in identifying who should receive the benefits. As a result, the fishery inspector reported that no training in fisheries had been delivered during the last few years. The Department of Fisheries, through its extension

arm in the area, has sponsored the training of artisans, but no one from the four study villages has benefited from this. Each of the fishing communities in the four villages belongs to a fishery cooperative society. However, these cooperative societies seem to play a passive and reactive role, and are mostly ineffective in terms of convening regular meetings.

Although boat owners are required to obtain permits and insurance cover for their craft, the fishery inspector has been unable to encourage boat owners to comply with these rules. The lack of official transport, funds, and staff had hampered site visits by the fishery inspector. Moreover, extension services provided by other government and nongovernment institutions have not been readily accessible to these village communities despite the presence of many functional NGOs in the area. Except for World Vision and Rural Development Foundation, NGOs do not provide any community services in Gangewadiya because it is far from the main cluster of villages. World Vision, which runs a large development program in Wanathawilluwa, has provided credit services, preschool services, and water and sanitation facilities to some villages, including Karative and Serakkuliya.

FISH MARKETING

The most important marketing channel available to the fisherfolk has been the organized buyers from their own villages, or those who visit from the nearby

Table 7: Prices of Shellfish at the Fish Landing Centers of the Study Sites

Grade or variety	Price per kg (in SLR)
Prawns	
No.10 (50 g or more)	700
No.15 (20–50 g)	500
No. 20 (15–20 g)	250
Mixed (less than 15 g)	170
Crabs	
Jumbo (more than 500 g)	560
Large (350–500 g)	360
Medium (300–350 g)	240
Low quality	100
g = gram; kg = kilogram; no. = number; SLRs = Sri Lanka rupees. Source: Socioeconomic study by the IUCN.	

⁵Push nets are made locally with a minimal investment of SLR500 (\$6). A triangular-shaped push net requires only three strong poles, which are fitted with a net. The user pushes the net deep into the fish breeding areas, entangling fish, fingerlings, sea grass, etc. The operation of push nets is extremely strenuous for the user, and unconfirmed statements have indicated it is detrimental to health.

Kalpitiya area. In Gangewadiya, four or five regular buyers—intermediaries working on behalf of larger companies—visit the village every day. They specialize in purchasing different types of sea fish. Only one or two buyers purchase prawns; others look for crabs and other types of sea fish.

Records maintained by fish buyers show that prawns are bought at prices ranging from SLR200–250 per kilogram (kg) depending on the size. Although Grades No. 10 and 15 fetch higher prices, prawns of these sizes have not been purchased for some time, especially from those using cast nets, push nets, or similar methods.

The amount of fish bought over 4 days, randomly selected from the notebook maintained by a prawn buyer visiting Gangewadiya, showed that each of the 20 fisherfolk sold only 100–500 grams (g) of prawns, while another 17 sold 600–900 g each. Only 10 fisherfolk sold more than 1 kg, and only two sold more than 1.5–2.0 kg each (Table 8).

None of the study villages had a formal marketing place, such as a fair or fish landing auction center. The most serious deficiency is the lack of common cold storage facilities, which forces fisherfolk to dispose of their catch as soon as possible. The buyers stock the fish in boxes and hand them over to transporters. Another key issue that boat owners face is the lack of proper anchorage facilities for their boats. The buyers often determine the price and varieties of fish they are going to purchase. Poor road infrastructure and transport facilities also hamper marketing. Gangewadiya is far from the main road, and renovating the gravel road leading to the main road was one of the key demands made by the community. However, this has to be assessed in terms of the expected economic benefits.

Role of natural resources in the livelihoods of the poor

The lagoon’s resources have been the primary source of livelihood for many people living around it. Poverty and organized fishing have created increasingly severe pressure on the exploitation of resources. For the youth awaiting better employment, fishing in the lagoon has been a stopgap. Those who have no formal source of subsistence income find inefficient fishing gear and resort to fishing. As this occurs throughout the year, lagoon resources do not have time to regenerate properly. The lagoon is also a source of supplementary income for women and

Table 8: Prawns Sold by Fisherfolk in the Study Villages during the Season

Volume of catch per fisherfolk	Fisherfolk (no.)
100–500 g	20
600–900 g	17
1.0–1.5 kg	10
1.5–2.0 kg	2

g = gram; kg = kilogram; no. = number.
 Source: Household survey by the author.

children, but for the average poor person it offers a coping mechanism at all times.

The primary resources of the lagoon environment are aquatic animals, sea grass beds, and mangroves. Fish yields reportedly have decreased from 4,800 metric tons (t) to 3,800 t over the last 10 years. Sea grass beds have been destroyed, and fish habitats are no longer sustainable. Shrimps, the most profitable species, are harvested with little care for their habitats. The clearing of mangroves largely accounts for the low productivity, although conflicts over fishing rights also have undermined the productivity of shrimp harvests in the lagoon.

Other key resource management issues arising from the different resource-use practices are presented below.

EXPLOITATION OF JUVENILE PRAWNS IN THE ESTUARY

For many fisherfolk, especially the poorest of the poor, fishing is a coping mechanism throughout the year, irrespective of whether it is the fishing season or not. This practice hinders resource regeneration. Scientific studies have established that juvenile prawns migrate from the estuary to the lagoon and then offshore to complete their maturation. However, the fisherfolk in Gangewadiya harvest most of the prawns from the estuary’s shallow waters in their juvenile stage—before they migrate to the lagoon and offshore waters, and reach an economically valuable stage. As such, the economic loss to the fishing effort in the lagoon could be high. Indeed, according to estimates, 100 kg of juvenile prawns caught in their breeding grounds would have yielded 400 kg had they been allowed to migrate into the lagoon and mature. The downstream fishing communities, which depend economically on lagoon fishery, complain that the previously abundant stocks of large prawns in the lagoon are dwindling fast.

DAMAGE TO FISHERY RESOURCES

Studies highlight that destructive fishing practices, both by the rich and the poor, play a major role in resource degradation in the lagoon. The better-off fisherfolk have organized destructive fishing practices, such as shoaling and using monofilament nets. Poor fishing communities also adopt ecologically harmful fishing methods based on their investment capacity. Two of the undesirable fishing techniques—yet the most frequently practiced by the poor—are push nets (known locally as *thallu del*) and chain nets (known as *sangili*). Women and children often use these types of nets because they require minimal fishing skills. A small net fitted to a wooden frame and dragged on the lagoon bed and bunds, in knee-deep shallow areas, can generate a substantial catch of small fish and prawns to satisfy daily subsistence needs. This practice was used first during high tide, when little or no fishing usually occurs. However, it is now used throughout the year due to poverty, especially among refugee families. Although this method has been made illegal, the fisheries authorities do not strictly enforce the ban because of the extreme poverty of the users. Still, the use of push nets destroys natural fish breeding habitats. Furthermore, due to the small size of the net, small fish, prawns, and crabs can become entangled in the nets. Fisherfolk who use push nets usually discard the dead fish and other waste materials (including sea grass) after collecting the larger prawns and fish.

DESTRUCTION OF MANGROVES

Large-scale prawn farm operators destroy substantial segments of mangrove when they clear them to establish prawn farms, especially in Pubudugama. Other communities are aware that mangroves are prawn breeding grounds and have taken steps to preserve mangroves. The communities gather products from the mangroves for their own use, such as wood for fuel and house construction. Amarasinghe (1988) reported that 55% of the households around Puttalam estuary collected firewood from the mangroves in 1987. With the influx of refugees into the area, this figure has increased. In 1986, an estimated 12,000 kg of bark were extracted annually from the Dutch Bay. Other products harvested in the mangroves include timber for making tools, wildlife for meat, fish for subsistence, honey, and some edible and medicinal plants. Households from Gangewadiya, as well as people from the adjoining village of Elluwankulama, exploit the mangrove's resources.

THE NEED FOR LONG-TERM INVESTMENT PLANNING

An appropriate long-term development program, adopting integrated coastal zone management planning approaches, is essential to address some of the above issues. The essential elements in such a development program will include

- the declaration of the Puttalam Lagoon and its environs as a special area for coastal zone management;
- further analysis of the sustainable extraction levels of lagoon resources;
- habitat enhancement and ecosystem rehabilitation, including mangrove restoration;
- improved community awareness and education, leading to beneficial community action;
- promotion of alternative livelihoods that can bring beneficial returns to the local communities and the ecosystem in general;
- extension of financial services, including strengthening of the revolving loan fund;
- restoration of essential infrastructure and facilities to support fish storage, marketing, and processing;
- establishment of private sector links in the management of natural resources;
- strengthened institutional arrangements at the national and local levels, especially at the DS level, with adequate human resources to handle environmental and land issues;
- empowerment of the fishing communities through strong fishery cooperative societies, and depoliticization of the existing ones;
- women-targeted vocational and fishery-related interventions; and
- more supportive legal and policy advocacy for pro-poor integrated coastal zone management.

In addition, poor communities

- should be able to generate sufficient assets by mobilizing savings and gaining access to formal credit. Credit schemes should accommodate the poor fisherfolk who are unable to provide collateral. Subsidies should be made available to fishing communities whose practices are attributed to natural resource degradation.
- should have access to an equitable share of natural resources. Regulatory mechanisms should be introduced to discourage organized fisherfolk from encroaching upon the fishing territories of the poor.

- could benefit from additional income generation options with diversified skills. Special training modules could be introduced into the curricula of technical training institutes to enable poor coastal communities to acquire artisan skills.
- should benefit from the social infrastructure. The policies aimed at providing housing to the various categories within society should be extended to communities living along lagoons.

Conclusion

This analysis demonstrates that the income levels and livelihood strategies of poor households have an impact on the natural resource base, leading in due course to food insecurity. This cause-and-effect model (Figure 3) was developed based on the findings of the survey in the four study areas. Further, it shows that there is a spiral effect between poverty and the environment, taking into consideration the causes leading to poverty and the effects that ultimately lead to resource degradation.

Under conditions of absolute poverty, the poor have few options in terms of livelihoods, food security, and social well-being. In turn, this harms the environment due to the extensive pressure exerted on the natural resource base. Although the poor are aware of the consequences of unsustainable harvesting practices, investment capacity generally determines the techniques used for harvesting natural resources. Poverty is absolute when the poor are not creditworthy, do not have marginal savings, and are unable to compete with other resource users. Poverty tends to intensify when the poor are marginalized from mainstream development, are politically polarized, and are socially excluded.

Households at subsistence income levels are vulnerable to the slightest changes in environmental and socioeconomic conditions. The more vulnerable they become, the more destructive and harmful are their livelihood strategies. When livelihood strategies are inefficient, they tend to damage the resource base. Therefore, any attempt to reduce poverty can contribute to the sustainable use of natural resources.

Diversifying livelihood strategies can reduce poverty. More options have to be made available to eliminate livelihoods based on a single source. Poverty reduction programs, therefore, should be aimed at strengthening pro-poor policies, ensuring that the poor are not solely responsible for arresting resource

degradation. The entire society, poor and rich, should work individually and collectively toward achieving such a goal.

Poverty–Environment Links in the Wetlands of Sanjiang Plain, People’s Republic of China

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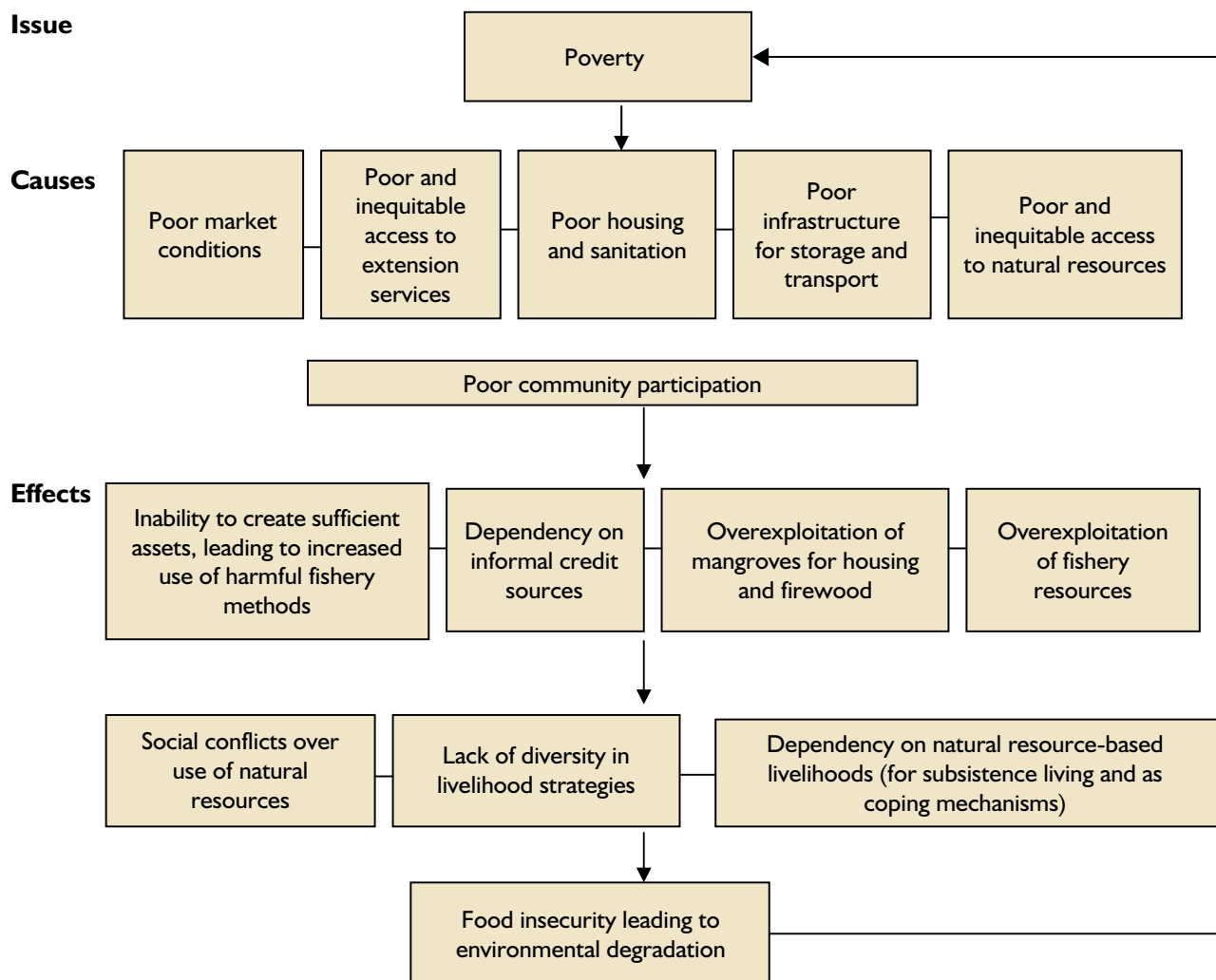
Introduction

The combination of a relatively rich environment—with abundant natural resources and biodiversity—and low population density would seem to provide the baseline conditions for economic development and poverty reduction. The Sanjiang Plain wetlands in the People’s Republic of China (PRC), however, present a peculiar case of poverty persisting against the backdrop of this type of double-blessed baseline. Alarming, the scope for the poor to transform their rich natural endowments into a developmental advantage is narrowing. Despite the national and global importance of the wetlands’ ecological functions, policy decisions and institutional failures (government and market) continue to degrade the local environment.

The PRC and international community have mobilized significant public resources in support of environmental protection and poverty reduction objectives in the Sanjiang area. However, these efforts have had little impact. Environmental degradation is continuing, and large pockets of poverty remain. Why has a virtuous cycle involving the environment, economic development, and poverty reduction failed to take root? Instead, why has a vicious cycle been set in motion, whereby environmental degradation erodes the basis for sustained poverty reduction, and poverty, in turn, reinforces and accelerates environmental degradation?

This case study attempts to provide some preliminary answers to these questions. The first section provides a brief overview of the geographical, ecological, and socioeconomic features of the Sanjiang Plain that are pertinent to our analysis. This is followed by a description of poverty–environment links in the region. A third section seeks to uncover the root causes of environmental degradation and persistent poverty by examining the drivers of change at the interface between environmental quality, economic development, and poverty. Conclusions from the analysis are then summarized. A final section recommends measures for the Government

Figure 3: Cause-and-Effect Model for Environmental Degradation



and international development organizations. These are intended to contribute to a better understanding of how to avoid unnecessary trade-offs, and to build on complementarities between environmental protection and poverty reduction goals in public programs and policies.

General features of the Sanjiang Plain⁶

The Sanjiang Plain is a vast, low-lying alluvial floodplain in the northeastern segment of Heilongjiang Province. It sits at the confluence of three rivers: the Heilong (Amur), the Wusuli (Ussuri), and the Songhua (Map 1). The plain covers approximately

108,900 km², and is home to the largest wetland area in East Asia (more than 1.97 million hectares [ha]). Nearly 9 million people, about half of them farmers, live in the area. The plain is divided into 18 rural counties (including three national-level, poverty-line counties) and 7 cities (urban counties). At 20 persons/km², the population density is the lowest in the province.

Although the region is ecologically rich and strategically important, its economic position is relatively weak—especially when compared to other eastern provinces in the PRC, where per capita gross domestic product (GDP) is approximately four times higher at

⁶The term Sanjiang Plain refers to a general topographic region, not a political unit, and definitions vary. This study adheres to the definition used by the ADB Sanjiang Wetlands Protection Project. The statistics used throughout are computed accordingly.

more than \$4,000. This is apparent in the structure of economic activity, which will continue to be dominated by the primary sector for the foreseeable future, as well as in other economic indicators. While local government revenues have increased over the last decade—from yuan (CNY)18.3 billion (US\$1=CNY8) in 1995 to CNY46 billion in 2002—the fiscal deficit also has expanded (from CNY0.83 billion to CNY10.5 billion). As a result, the local government remains heavily dependent on fiscal transfers from the center. The plain's average annual per capita GDP is CNY5,551 (\$680). In some of the rural counties, it is as low as CNY3,321 (\$410).⁷ In terms of income, the average per capita annual income in rural areas of the plain is as low as CNY1,900 (\$240). All these numbers are markedly lower than the provincial average (CNY8,562 and CNY2,148, respectively). Based on the Government's poverty line of CNY1,000, the poverty incidence is relatively high at approximately 10%, compared with the 3.4% national average. In some poor villages, the incidence is as high as 57% (ADB, 2004b).

Four main factors contribute to poverty in the area. First, the production structure, which is dominated by farming, is vulnerable to the dual risks of marketing and natural disasters. Returns from farming are low and unpredictable, and the opportunities for off-farm labor are limited. Second, environmental shocks, such as droughts, waterlogging, flooding, early frost, and soil erosion, occur frequently. These are an important cause of cyclical poverty. Third, illness and school tuition costs also can seriously constrain available income. Finally, the lack of education and skills leads to low income and low agricultural yields (ADB, 2004b).

The plain is home to several ethnic minorities. The Hezhe—with only 4,000 to 5,000 people—is the smallest ethnic minority in the PRC. The Hezhe people maintain their own language, culture, and lifestyle and, traditionally, have made a living primarily from fishing. Because of overfishing, however, the Hezhe gradually have changed their traditional lifestyle. As Hezhe women normally have less access to education and information, they are the most vulnerable within this group. Ethnic minorities, who make up less than 9% of the population, account for an estimated 40% of the remaining poor in the PRC.

The Sanjiang Plain is ecologically significant regionally, nationally, and globally. The plain has three Ramsar wetlands and eight national nature reserves. The wetlands perform crucial ecological functions—maintaining the hydrological balance, regulating water flows, mitigating floods, and purifying water and air. As biodiversity hotspots, they also have global significance. The Sanjiang wetlands are the most important breeding grounds and migration routes of migratory waterfowl in northeastern Asia and provide habitats for numerous wildlife species. These wetlands host 37 vertebrate wildlife species ranked by the International Union for Conservation of Nature (IUCN) as globally threatened; of these, 20 species are wetland birds. For some of these wetland birds, the plain represents a significant portion of their remaining habitat on a global level (ADB, 2004b).

In addition to its ecological significance, the plain plays a critical strategic role nationally. The high quality of the plain's soil is an important feature of its rich ecological profile. However, the PRC faces formidable resource constraints in its efforts to feed a fifth of the world's population with only 7% of the world's farmland. Moreover, available per capita water resources represent just one quarter of the world average. National food security, therefore, is always of paramount concern. The soils of the Sanjiang Plain are fertile and high in organic matter.⁸ Further, the plain receives abundant rainfall, with an average of 550 millimeters of annual precipitation, about 70% of which falls during the growing season (from April to October). These conditions lead to high agricultural productivity, which has earned the Sanjiang Plain the designation as a national base for grain production. Consequently, the central and provincial governments, as well as bilateral and multilateral funding agencies, have invested in agricultural development in the Sanjiang Plain over the last 4 decades. The cropland area increased from 820,000 ha in 1949 to 4.02 million ha by 1997. About 2.46 million ha of original wetlands have been converted for monoculture agriculture.

Economic activity in the region continues to be driven primarily by agriculture, which is dominated by corn, rice, and soybean production on large-scale mechanized state farms. Forest and lumber industries are also significant. As of 2003, the proportion of primary, secondary, and tertiary industries was

⁷This is the figure for Raohe County.

⁸Sanjiang Plain soils are mainly wet black clays, and the plain is the only black-soil region in the People's Republic of China (PRC). Black soil is characterized by high concentrations of organic matter and nutrients, which leads to high ecological and agricultural productivity.

42%, 26%, and 32%, respectively. The environmental impact of these economic activities is evident: the plain has suffered extensive deforestation and wetland loss. Over the last century, wetlands have receded by about 80%. Forest cover, meanwhile, represents only 11% of the total land area, compared with an estimated 71% in 1896 (ADB, 2004b). In recent years, the provincial government has adjusted its primary industry structure, encouraging farmers to shift to animal husbandry. It also has reversed its forestry policy to encourage the planting, rather than felling, of trees in line with central policy directives, such as the Sloping Land Conversion Program and Natural Forest Protection Program.⁹ While these appear to be positive steps, they have not been effective, as discussed below.

Nature of poverty–environment links

To start identifying, characterizing, and understanding poverty–environment links in the PRC, it is necessary to break away from conventional definitions and measurements. These tend to be too narrow to capture the complex interactions that can exist between the poor and their environment.

As in many other countries, environmental protection in the PRC conventionally is understood to designate a narrow pollution control mandate, whereas natural resource management is considered a sectoral issue of resource development. Broadly speaking, the division of administrative responsibilities for environmental protection and natural resource management reflects this distinction. Only recently—with the 1998 expansion of the State Environmental Protection Administration’s (SEPA) mandate to include “green” issues—the notion of ecological conservation was recognized fully as firmly in the public domain and incorporated into the environmental protection agenda. These conceptual distinctions are motivated by concerns of public administration. In practice, pollution control, natural resource management, and ecological conservation evidently overlap. Therefore, this analysis proposes moving beyond these artificial separations. The term “environment” will refer to a concept that includes

ecological quality and natural resources; “environmental quality” refers to the condition of the natural environment in a broad sense.

In a similar vein, this analysis expands on conventional categorizations in assessing poverty. Government statistics on poverty are based on income measures, i.e., the poor are defined as those living on an annual income below a set poverty line.¹⁰ Income is undoubtedly a key indicator, and usually a reasonable proxy for nonincome indicators of well-being. However, it provides no information about the intensity of poverty, which environmental conditions and human–environment interplay can be instrumental in determining.

In this regard, the poverty situation in the Sanjiang Plain is atypical. The majority of the poor in the PRC are concentrated in remote western and upland areas, where the natural environment is very fragile. Poverty in these areas is characterized by heavy dependence on a narrow asset base (often a single resource) and insecure access to environmental resources, such as clean water and productive land. This is the type of poverty that is evident in the two other PRC case studies of this publication. In the Sanjiang Plain, on the other hand, the poor rely on the environment to meet a range of basic needs, including food, clothing, energy, building materials, etc. In money-metric terms, therefore, the purchasing power of a given level of income is relatively high in Sanjiang. A range of basic environmental services are available for free in this region, whereas the poor in most remote upland areas of western PRC have to pay (often dearly) for these. Thus, poverty in Sanjiang is mostly of a relative form. The environment, rather than being a constraining factor, has the potential to be the foundation of a resource-based development path. For example, black bee apiculture sustains the livelihoods of the poor in Raohe County. In this small rural county, an estimated 4,500 people depend directly on black bee apiculture for their livelihoods. Black bees generate a staggering 27.9% of the value of agricultural output in the county.

Despite the particular character of the poverty–environment interplay in Sanjiang, some common features should be noted. In the Sanjiang Plain, as in

⁹The Sloping Land Conversion Programme is a state program with environmental and socioeconomic aims. It allows for the provision of direct financial incentives (subsidies) to rural households to reforest cultivated land with a slope of 25 degrees or more. A key component of the Natural Forest Protection Program is the logging ban on the 30.38 million ha of natural forest area in the upper reaches of the Yangtze River, as well as the upper and middle reaches of the Yellow River. Of relevance to this case study, the program has a component on the reduction of logging in state-owned forest farms in the northeast, Inner Mongolia, and Xinjiang.

¹⁰As of 2004, the Government’s poverty line was defined at an income level of CNY924 (\$120) per year.

the remote western areas, livelihoods depend heavily on the environment. Moreover, poverty is characterized by vulnerability to environmental shocks and stresses in both cases. Just as environmental conditions provide livelihood opportunities, environmental deterioration will seriously limit the regions' future development potential and erode an important portion of the poor's livelihood base.

The poverty–environment–growth interface has important tensions and trade-offs. The high productivity of the wetland, and its multiple functions and uses, generates many potential conflicts over land use. The wetland can be preserved to play its ecological function (e.g., flood control, bird habitat, water purification, local climate regulator), or used as farmland after drainage. Forests can be harvested for their timber, or preserved for ecological purposes, environmentally friendly uses (e.g., black bee apiculture), or harvesting of nontimber forest products (NTFPs). Given the national strategic importance of the area, and perhaps also as a legacy of central planning, decisions relating to land use are often determined by the national government.

The dual character of the Sanjiang Plain—as a place of ecological significance and a strategic hub for grain production (as the PRC's breadbasket)—creates tension. The most obvious conflict is over water resources. Wetlands depend on adequate water supply from river systems and groundwater to maintain their saturated soils and wetland habitat characteristics. However, water tables have been lowered to allow for the development of agriculture.

In the past, these tensions between preservation and exploitation have tended to be settled in favor of economic development. The economic development path over the last 4 decades has depended heavily on overexploitation and degradation of environmental resources. Only in the 1990s did wetland conservation become an explicit policy goal. The PRC has ratified international conventions (Ramsar, 1992; Convention on Biological Diversity, 1993), and issued official decrees to reinforce the protection of wetland ecosystems. In 1996, the Ministry of Agriculture submitted a report to the State Council (the highest executive body of the Government), stressing the importance of coordinating wetland conservation and agricultural development. Despite these positive signs, however, the pattern of economic growth in the region continues to be at odds with preservation goals—and environmental deterioration persists. Water continues to be diverted from wetlands for economic uses. Further,

water quality is deteriorating as a result of pollution from untreated urban wastewater, industrial effluent (mainly paper mills, electricity plants, coal mining, breweries, etc.), and agricultural nonpoint sources, endangering biodiversity. The provincial government has implemented measures to slow the development of farming, promoting animal husbandry instead. However, this only creates a different set of environmental problems. Moreover, while the provincial government has encouraged planting rather than felling of trees, overall compliance is very low.

Of equal concern, economic development of the Sanjiang Plain has failed to generate significant benefits for the local poor, even while it is undermining the environment upon which they rely so heavily for their livelihoods. The economic development of the region was viewed from the vantage point of national interest. As a result, and the bulk of economic activity—particularly agriculture and forestry—was aimed at developing and exploiting local resources for the benefit of national economic growth and food security. However, the distribution of benefits was not considered carefully. In effect, economic activity transfers the benefits (or economic rents) from exploitation of the rich local environment out of the region, without adequate compensation to the local residents. These transfers represent significant losses in development potential for the region.

Poverty, in turn, translates into increased environmental stress when locals by necessity must revert to unsustainable uses of their environmental resources. This is evident, for example, in illegal logging, extraction of groundwater, etc. More alarmingly, provincial poverty reduction plans and programs conflict directly with environmental protection goals when the former promote income-generating activities, such as the development of animal husbandry, that are unsustainable because of adverse environmental impacts.

Conversely, environmental protection policies and programs typically fail to take into account the needs and incentives of the poor. As a result, they have caused the poverty situation to worsen sometimes, and often have come undone because of incentive incompatibilities leading to low compliance rates. For example, the Natural Forest Protection Program (known as the “logging ban”) deprived local residents of access to an important resource and created widespread underemployment in the sizeable state-owned forestry industry. Another example is the Sloping Land Conversion Policy, which is mentioned in the other

PRC case studies of this volume. This policy caused much uncertainty over land ownership and land-use rights, and failed to compensate farmers adequately for their ecological conservation efforts.

Centrally determined policies have prioritized economic development over ecological conservation. The pattern of economic activity that has been fostered is detrimental to the local environment and disadvantageous to the local poor, who are excluded from sharing in the benefits generated by this growth. A vicious cycle is set in motion, whereby environmental degradation erodes the foundation for sustained poverty reduction, and poverty, in turn, drives locals to reinforce and accelerate this process through coping mechanisms that harm the environment. Policy measures aimed at addressing these problems in isolation are often mutually defeating—and self-defeating in the long run. In the end, they increase tensions at the poverty–environment interface rather than easing them. Although the situation of the poor in Sanjiang Plain is not desperate today, the environmental degradation presages a long-term downward trend in the well-being of the poor.

Such trade-offs and conflicts are unnecessary and can be avoided. Environmental protection, economic development, and poverty reduction goals have promising complementarities that offer great potential for sustainable resource utilization and development. These are based on the development of “green” industries (e.g., organic farming, ecotourism, agroforestry, black bee apiculture, etc.) and sustainable natural resource management (e.g., sustainable fisheries, cultivation of herbal medicines, NTFPs, etc.). While these are options with real potential, moving away from the current pattern of economic activity toward environmentally sustainable economic development that is inclusive and pro-poor will require understanding how to overcome the deep-rooted barriers to change.

Root causes of poverty–environment trade-offs

The foregoing discussion suggests that the economic development drive—motivated by central policy concerns—and myopic government programs and policies provide the main explanation for the vicious cycle of poverty–environmental degradation. But what explains these failings? The aforementioned trade-offs take root in systemic weaknesses and institutional failures that run deep, as discussed below.

One of the biggest public policy challenges the PRC faces is overcoming institutional fragmentation and related coordination failures. Historically, the challenges of administering a vast empire with a large and diverse population required the development of an extensive, rigid, and well-disciplined government bureaucracy. The vertical channels of action and information function impressively well in executing central plans. Between agencies, however, the organization is poor and communication lacking—let alone policy coordination. Earlier, this study hinted that institutional coordination failures take root in the narrow definition and unclear division of mandates between government agencies. The mandates for poverty reduction and economic development, like those for environmental protection and natural resources management, are separate. As a result, policy making and planning do not integrate poverty reduction, environmental protection, and economic development objectives, even where obvious complementarities exist.

Institutional fragmentation is particularly severe for wetland protection and management. Although SEPA has a clear mandate for ecological conservation, sector ministries (notably those in charge of water resources and forestry) increasingly are taking on responsibility for conservation. Different agencies at different levels of government control the Sanjiang Plain, including the state-owned Farm Bureau, the state-owned Forestry Bureau, the Forestry Department, and the Agricultural Commission. Some of these administrative units operate under the provincial government; some are at lower levels of government. Without adequate cooperation, these complex institutional arrangements are bound to create conflicts.

Almost universally, environmental policy concerns fail to carry sufficient weight in economic planning and policy processes. The PRC is no exception. An embedded pecking order is demonstrated by the relative resources various agencies command. Although environmental protection has become a clear policy priority for the Government, the resources for SEPA are grossly inadequate to carry out its responsibilities. Moreover, SEPA did not have ministry-level status until 1998. Therefore, environmental concerns fail to be integrated systematically into national macroeconomic policies and planning.

The mismatch between responsibility and means for environmental conservation at the center is mirrored at lower levels of government. Local environment protection bureaus often lack the resources to perform

their crucial monitoring and enforcement functions. As a result, the threat of sanctions and penalties for violating environmental regulations or standards are not regarded seriously. For instance, the incentives for illegal logging in the Sanjiang Plain are strong.

Moreover, a rigid hierarchy governs center-local government relationships, and local governments are often given little room for maneuver. For example, land-use patterns in the Sanjiang Plain were determined to a great extent by decisions taken at the center, with little regard for the development of the region. The local government in Sanjiang Plain—like most other underdeveloped regions of the PRC—depends on financial transfers from the center that are unstable and unpredictable. This reinforces the short-term character of local government planning and spending, and the focus on economic growth. Moreover, the system of transfers does not reduce disparities and ensure a fair and efficient distribution of benefits from environmental resources. The complex system of equalization and special purpose transfers from central and provincial governments is poorly coordinated and tends to have a perverse effect, benefiting rich areas with high rates of economic activity over poor areas. As a result, poor provinces often lack financial support from the central government for key environmental protection functions.

In addition, the countrywide system of nature reserve management has deep flaws. First, the PRC's nature reserve category system fails to distinguish between different management responsibilities and objectives. Under the current system, all nature reserves in the PRC are classified as strict nature reserves (i.e., IUCN Category I), even though scientific assessments require only 7.3% of all protected areas to be so strictly protected. As a result, available funds per unit area are limited.¹¹ And those limited funds are not used effectively. Nature reserve management authorities typically lack the financial capacity to effectively carry out scientific research, monitoring, recruiting, and training. Further, they are unable to put in place schemes to involve neighboring communities in nature reserve protection. Instead, infrastructure construction, staff salaries, and office expenses typically dominate expenditures. In fact, central funding for national-level nature

reserves is restricted to infrastructure construction, while biodiversity protection and scientific research programs receive no central funding. Moreover, the amount of spending on conservation-related activities as a proportion of total expenditure is decreasing (Department of Wildlife and Plant Conservation, State Forestry Administration, 2003).

Second, a uniform nature reserve management system does not exist. Owing to history and pragmatism, the nature reserve management system in the PRC is horizontally separated by sector and vertically classified by level. Interrelationships between ecosystem elements are divided artificially by sector boundaries, administrative regions, and administrative levels. For example, an integrated forest ecosystem belongs to the local forestry bureau and the forest industry. When a small river divides a wetland, one section is designated as a national-level nature reserve and the other as a provincial-level nature reserve. These divisions do not fit the requirements for effective ecosystem management. The sector-separated and level-classified management system determines the management duties and responsibilities for the reserves. As a result, the fund allocation pattern is fragmented and incomprehensible.

Third, land property rights are not defined clearly. The 7th and 12th articles of the Measures for Nature Reserve Land Management¹² state: “the land of nature reserves is either owned by the State or the collectivity... Right of land use and ownership will not change because of the establishment of nature reserves”; and “the need for taking collectivity-owned land or state-owned land for establishment and expansion of nature reserves, core zones or buffer zones should refer to relevant regulations in the Law of Land Management.”¹³ In reality, however, many reserves have not processed the regulations for taking state-owned or collectivity-owned land as a result of fund shortage or sectoral restrictions. Consequently, nature reserve management authorities often cannot avoid conflicts with other sectors or local residents due to unclear land (including natural resources) property rights. At the same time, unclear land property rights make identifying cost and benefit stakeholders problematic when protecting nature reserves.

¹¹The PRC is investing little in its protected areas compared to neighboring countries, such as India, Thailand, and Viet Nam.

¹²Enacted by the 24th council meeting of the State Council on 2 September 1994, promulgated by Decree No.167 of the State Council, enforced from 1 December 1994.

¹³The revised Law of Land Management was enacted on 1 January 1999.

The context of transition from an administered to a market economy creates an additional set of problems and challenges. A hallmark of transition is the prevalence of market failures, which are important drivers of environmental degradation and persistent poverty. Market-oriented reforms (e.g., price liberalization) have been a driving force behind economic growth. However, market forces alone cannot be counted on to perform certain regulatory functions, particularly regarding environmental protection and poverty reduction. Environmental market failures arguably are the most important root cause of excessive pollution and overuse of scarce natural resources, resulting in environmental degradation. Some numbers illustrate this point: the subsidization of chemical fertilizers in the PRC has translated into 30–40% efficiency in fertilizer use. In other words, the PRC wastes as much fertilizer annually as the United States uses. The findings for pesticides are similar. Market forces also increase pressures on the environment by attributing monetary value to environmental goods, thereby encouraging the overharvesting of local resources to supply distant markets. Finally, an unsupervised market creates conditions for private sector actors to mine local resources for short-term gains.

While these challenges are formidable, the current context of rapid change also offers many opportunities, which is cause for optimism. Environmental issues and poverty reduction are receiving increased public attention and are commanding a high profile in public policy debates. The demand for environmental improvement is growing outside SEPA. This is reflected, in particular, in the upgrade of SEPA to ministerial status in 1998. Over the last decade, policy makers' approach to reform has changed tangibly, reflecting a better understanding of, and increased reliance on, markets and incentive-based instruments. Specifically, the move toward a market-based socialist economy, as well as the impetus to streamline and rationalize state expenditures, lends political momentum to the reform of subsidy policies. A strong legislative framework is in place to support the attainment of environmental objectives. The many new laws and regulations (e.g., Water Act, Environmental Impact Assessment Law, etc.) clearly signal the importance of environmental protection, and help close some important loopholes. The dramatic growth in government revenues over the last decade—on average two to three times higher than the rate of economic growth—creates unique opportunities for fiscal reforms to correct environmental mar-

ket failures. It also offers the chance to improve public spending on environmental protection and poverty reduction. The World Trade Organization accession creates its own important environmental opportunities. For example, the logic of comparative advantage demands that the PRC shift from resource-intensive to labor-intensive agricultural production, which will benefit the environment.

Finally, the importance of poverty–environment links, as well as improving environmental quality to reduce poverty, has received increasing political recognition. The Government has made poverty reduction and environmental protection policy priorities. In addition, many government programs, such as the Great Western Development Program and the New Rural Poverty Reduction and Development Plan, have positioned environmental protection and poverty reduction as parallel policy objectives.

Conclusions and recommendations

This case study has shown how policy decisions motivated by national concerns and dominated by the economic development drive and pervasive institutional failures (including market failures) created a mutually reinforcing cycle of poverty and environmental degradation. The messages emerging from this study focus on two key areas—sustainable resource management and reconciling environmental improvement with economic development.

Sustainable natural resource management encompasses poverty reduction and environmental protection goals. An integrated approach to public interventions on environment and poverty will increase the effectiveness and efficiency of public spending on both. In addition, it will be important to balance the distribution of costs and benefits among the various interest groups, regions, and generations.

Reconciling environmental improvement with economic development requires (i) working upstream to integrate environmental policies into national macroeconomic policies (e.g., finance, tax, and banking); (ii) working downstream to integrate environmental objectives and best practices into social and economic development policies at regional and sub-national levels; and (iii) improving interagency cooperation and coordination. Specifically, this entails

- **Enhancing participation of environmental authorities in economic and sectoral policy.** Environmental authorities need to be empowered to participate in economic and sectoral decision

making from an early stage. In particular, SEPA should build the capacity to engage in pricing, taxation, and expenditure policy. They should be involved more systemically with public hearings. To participate meaningfully in these policy processes, environmental authorities need to build a strong scientific base. Further, they must be able to command reliable data and information (e.g., on emissions, damage costs, etc.), and the relevant expertise to interpret and use this data. Therefore, the enhancement of monitoring capabilities is crucial. This also requires building capacity for economic analysis within SEPA.

- **Dealing with change and economic transition.** The interface of poverty, environmental protection, and economic development is complex, context-specific, and constantly in flux. Therefore, a long-term view and analysis of trends and dynamics is important. Equally important as dealing with existing poverty–environment trade-offs is improving our understanding of how to forestall a poverty–environment vicious circle. This is especially true during rapid change, such as the current transition in the PRC, where the Government plays an important role in supervising this transition. Moreover, public interventions to build the capacity of the poor to participate favorably in market institutions (particularly in labor and product markets) are needed.
- **Matching means with mandates.** The rules governing the division of responsibility for environmental expenditures between levels of government need to be clarified. Not only should funds match mandates in the aggregate, these funds also should be channeled to where they will be used best for the purposes defined. Central finance should be used to address environmental problems that have a clear national dimension, or where the public welfare costs or benefits span several jurisdictions (e.g., river basins). Central fiscal support is also justified on distributional grounds (see below).
- **Establishing stable, predictable, and long-term fiscal arrangements.** Environmental protection and poverty reduction should be seen as long-term strategies. Stability and predictability of fiscal flows to support such programs and policies is essential to enable local governments to plan over the long term. Government budgeting, as well as accounting practices and procedures, needs to be improved to ensure efficient alloca-

tion of budgetary resources and stable, predictable financing for environmental protection and poverty reduction.

- **Determining fiscal transfer payments for environmental protection in accordance with distributional justice principles.** The current system of intergovernmental fiscal transfers is regressive. As a result, poor provinces often lack the financial support from the central government to undertake key environmental protection functions. Where a region or district is particularly well-endowed with natural resources, those resources must be accorded their full social value when extracted and transferred elsewhere—even within the same country. In the longer run, this study recommends that the principle of ecological compensation be extended to regions. This would ensure that interregional rent transfers are compensated fully through the intergovernmental fiscal transfer system. Further research into this matter is recommended.
- **Strengthening the scientific basis for environmental valuation.** To correct market failures, the ability to estimate the value of the environment’s assets must be strengthened, and instruments that capture these values must be introduced. This hinges on the availability of environmental data. Further, the development of a comprehensive environmental information management system is a major requirement to ensure authoritative release of environmental information. Therefore, nationwide ecosystem and pollution monitoring systems need to be developed.
- **Creating equal opportunities and ensuring rights for farmers.** Support systems and supportive institutions (e.g., education, information, training, professional advice, etc.) are crucial to ensuring that the poor have access to markets, information, and appropriate technology. This would enable them to make the best use of their resources. Farmers need clear rights to ensure that those who lose their land are fairly compensated.
- **Subjecting public policies and programs to poverty and environmental assessments.** Large public spending programs need to be scrutinized for their impacts on the environment and on the poor. This study, therefore, recommends that independent analytical and

advisory capacity for conducting environmental and social impact assessments be developed. In addition, clear criteria to evaluate the efficiency and effectiveness of public investments and to ascertain its need must be developed.

- **Enhancing recognition of regional and local differences.** The ability of the Government and development agencies to recognize regional and local differences in policy implementation and instrument design can be crucial to the success and sustainability of centrally formulated policy, as the shortcomings of the Sloping Land Conversion Policy illustrated. Moreover, more flexibility is needed to allow for regional differences in fiscal resources and needs. In some cases, the failure to take into account institutional realities in the design phase—and to make good use of local knowledge and institutions—can distort development agencies' program and project goals during implementation.

Poverty and Natural Resource Degradation: Irrigation Tanks in South India

R. Balasubramanian and C. Chandrasekaran

Introduction

Tanks are one of the oldest sources of irrigation in South India. Tanks are particularly important in Tamil Nadu, where they provide irrigation for about one third of the rice-growing area, thus playing a crucial role in the state's food security. Tank irrigation systems are less capital-intensive and have wider geographical distribution than large irrigation projects. They are also eco-friendly, serving as flood moderators during heavy rainfall and as drought mitigating mechanisms during long dry spells (Vasimalai et al., 1996). Tanks recharge groundwater, a major source of drinking water for numerous rural and urban communities. Fish reared in tanks provide nutritious and affordable food for rural people besides being a source of income to fisherfolk. Thus, prosperity levels and the size of villages in many semiarid regions are directly proportional to the size and performance of irrigation tanks (Someshwar, 1999).

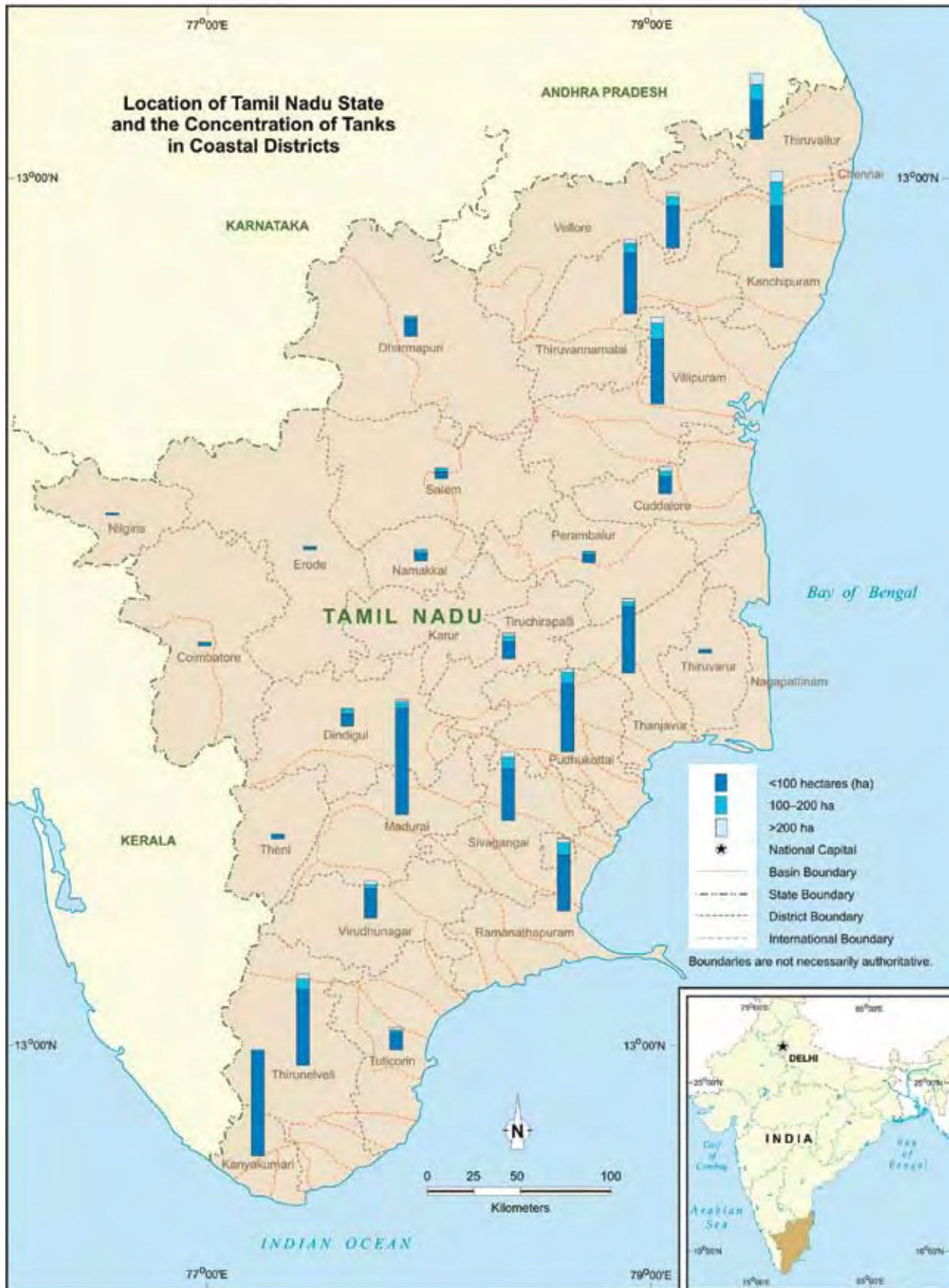
Despite these economic and ecological benefits, the performance of tanks has been in continuous

decline. The share of the area irrigated by tanks, compared to the total irrigated area in Tamil Nadu, has dwindled from about 1 million ha (about 40% of the total irrigated area in Tamil Nadu) in 1955 to about 0.6 million ha (less than 21%) in 2000. This decline reflects many problems besetting tank irrigation. The condition and performance of most of the tanks are poor due to inadequate operation and maintenance, disintegration of the traditional institutions responsible for managing tanks, heavy sedimentation, and private encroachments into feeder channels and water spread areas (Palanisami and Balasubramanian, 1998). Traditional institutions have come under tremendous pressure because of state and market interventions, political patronage, and political encouragement of encroachment (Nadkarni, 2000).

In response to resource degradation, people often develop collective and individual coping mechanisms (Scherr, 2000). In this context, collective coping strategies mainly take the form of efforts to revive and conserve the tanks. Individual coping strategies include permanent or temporary migration to seek nonagricultural opportunities, and the digging of private irrigation wells to make up for tank water shortages. Private coping strategies, such as migration and nonfarm employment, reduce investments in and labor for tank management (Bilsborrow, 1992; Reardon and Vosti, 1995). Meanwhile, private wells and nonfarm employment reduce the relative economic value of tanks in the village economy. Hence, the individual and collective coping strategies, together with user-group, resource, and household characteristics, determine the level of collective action applied to the conservation and management of tanks. Because the extent of collective action affects resource conditions and water availability, it has a direct bearing on agricultural productivity, poverty, health, and nutrition.

This case study is based on a larger study undertaken in the south Indian state of Tamil Nadu (Balasubramanian and Selvaraj, 2003), plus additional fieldwork to answer specific questions on the role of groundwater, dependence of farm and nonfarm households on tanks, and institutional challenges to the revival of tanks. This case study also analyzes the nexus between poverty, livelihood options, and tank management. Further, it challenges some of the existing notions regarding the factors leading to tank degradation, tank rehabilitation, and the handing over of tank management. The study also attempts to provide a modest agenda for future tank rehabilitation programs.

Map 2



Source: Government of Tamil Nadu.

Poverty, dependence on tanks, and tank institutions

Being small, tanks lend themselves to decentralized management and are especially important to marginal and small-scale farmers who largely depend on them. The dependence of the poor was analyzed based on the village- and household-level data collected from 30 tanks in two administrative blocks of Ramanathapuram District. Sample households are classified according to two income categories: households living below the poverty line (poor households) and households living above the poverty line (non-poor households). The study used the Government of India's poverty line of Indian rupees (Rs)18,000 (\$360 based on the prevailing exchange rate during 2000) per capita per year.

Farm and landless households in poorer regions are much more dependent on tanks than their counterparts in nonpoor regions (Table 9). Poor regions depend more heavily on tanks for agricultural crop production and noncrop activities, including domestic water use, livestock husbandry, and fuelwood collection. More than 90% of poor farm households depend solely on tank water for irrigation, while only

two thirds of the nonpoor households depend solely on tanks for water. Although livestock ownership was comparatively lower in poor regions, livestock-based income's share of total household income, and the dependence of poor farming and landless households on tanks for grazing and watering livestock, has been much higher than for nonpoor households. A similar observation could be made of household dependence on tanks for domestic water and fuelwood.

In poorer villages, the greater dependence on tanks is one plausible reason for people investing more money and labor in tank maintenance, as well as the presence of stronger institutions for tank management. However, the declining dependability of tanks due to uncertainties in water availability leads to the diversification of livelihoods away from tank-fed agriculture, resulting in reduced dependence on tanks and weakening of the related institutions.

Tank management: Provision and appropriation

Tank management problems fall into two distinct categories: provision and appropriation. Provision problems are encountered in bringing sufficient water to

Table 9: Dependence on Tanks of Farming and Landless Households

Item	Poorer regions		Nonpoor regions	
	Farming households	Landless households	Farming households	Landless households
Dependence on tanks for irrigation water (% of households)	92	0	67	0
Average agricultural income from tank command (Rs/yr/household)	13,000	4,960	18,500	6,120
Share of agricultural income in tank command in total household income (%)	28.63	30.75	19.64	24.43
Average number of livestock units per household	7.9	5.6	9.2	3.4
Share of income from livestock to total household income (%)	13.30	21.57	9.60	12.92
Average number of days of livestock grazing in tank per yr	78	93	48	56
Average number of days of livestock watering in tanks per yr	67	102	52	71
Average number of days of using tanks for domestic purposes per yr	62	68	37	45
Fuelwood collected from tanks in relation to total household fuelwood consumption (%)	21.20	24.65	18.30	17.40

% = percent; Rs = Indian rupees; yr = year.
Source: Authors' field survey.

the tank, and making it available for use at the outlet. This involves multiple tasks, such as conserving the catchments, maintaining supply channels, removing and preventing encroachment into tank water spread areas, desilting, and maintaining and repairing bunds and sluices. Appropriation problems relate to the sharing of benefits from tanks, such as water for agricultural and nonagricultural purposes, fish, trees, and grasses that grow in tanks and silt from the tank bed. However, as this case study will demonstrate, provision and appropriation are closely related since inequitable appropriation results in reduced support for provision.

The institutional landscape in tank-irrigated areas of Tamil Nadu varies from very weak and informal water management mechanisms to strong formal institutions. The weak and informal institutions do almost nothing to improve the performance of tanks, except for formulating a few ad hoc rules for sharing water. Farmers enforce and monitor these rules, or appoint common irrigators temporarily. At the other extreme, strong formal institutions in some places clearly specify and enforce management rules, water diversion from the upstream supply channel, cleaning of field channels below the tank outlet, and revenue mobilization from tank usufructs and its utilization. A wide array of institutional arrangements can be found between these two extremes.

However, evidence suggests that tank management has been decreasing in recent years. In about 20% of the tanks surveyed for this study, farmers reported that they have stopped the time-tested practice of appointing *neerkattis* (common irrigators), who irrigate the fields and are in charge of protecting tank boundaries. This has happened even for some of the tanks that were modernized recently under externally assisted tank rehabilitation projects.

Factors behind tank management decline

A review of previous work on tanks (Palanisami and Balasubramanian, 1998; Palanisami and Easter, 1991; Janakarajan, 1993a and 1993b; Umasankari, 1991; Sakthivadivel et al., 2004) and this study's own fieldwork enabled the identification of various factors and processes that result in tank degradation. These are shown in Figure 4. Based on this information, an econometric analysis was conducted separately for the State of Tamil Nadu and for Ramanathapuram District to generate empirical evidence regarding the tank degradation process. The results show that the number

of private wells in tank commands, the ratio of rural to total population (a proxy for encroachment), and rainfall were statistically significant in affecting tank degradation (Balasubramanian and Selvaraj, 2003). Fluctuation in rainfall, government control over tank management activities, livelihood diversification through off-farm employment, size of user group, and the presence or otherwise of traditional institutional arrangements are some of the other factors affecting tank maintenance.

- **Rainfall fluctuation.** As noted by Williams (1997) in the context of rangelands, long periods of low rainfall and severe droughts have accelerated the process of resource degradation, as people diversify their livelihood strategies away from tank-fed agriculture and neglect tanks.
- **State intervention and state neglect.** State intervention in tank management initiated during the later part of British rule in India led to the loss of community rights over tank usufructs, breakdown in traditional management systems, and neglect of tanks. The extent of poor people's dependence on tanks as a prime factor promoting their participation in tank maintenance, and the income-generating potential of tank usufructs, rarely has been recognized. This is evident from the gross underinvestment in tank maintenance by the local and state governments (Dhan Foundation, 2004). The Government always has depended on external agencies for tank rehabilitation. Such attitudes also can be found at the village level. Just as the Government expects external aid for tank rehabilitation, villagers turn to outside actors, such as the government and nongovernment organizations (NGOs), for tank maintenance.
- **Off-farm employment.** Large-scale migration and off-farm employment have altered dramatically the relative economic importance of tank-fed agriculture in people's livelihoods, social values, and power structures in village societies. This has destabilized the traditional village institutions, including those responsible for tank management (Janakarajan, 1993b). In most parts of Tamil Nadu, agriculture is becoming a less-preferred livelihood occupation—even more so in tank-irrigated areas because of the growing risks in tank-fed agriculture. As shown in Table 9, tank-based income of farming and landless households represents less than one third of the total household income in

poor and nonpoor regions. In most tank-fed areas, especially those without access to groundwater, a single rice crop is grown, with low yields and high risks. Groundwater availability and smaller landholdings limit the scope for increasing cropping intensity, yields, and diversification; hence, tank-fed farm income is hardly sufficient. A number of farmers in a recently modernized tank cascade in Ramanathapuram District reported that the rice supplied to them under drought relief is cheaper than the rice produced on their farms. Thus, diversification into nonfarm activities becomes inevitable, leading to neglect and further degradation of tanks.

- **Group size.** The econometric analysis also showed that tank size—a proxy for group size—has a negative influence on collective action. This is probably because larger tanks serve more beneficiaries, in many cases more than one village. Increasing heterogeneity discourages cooperation. Large tanks are also more likely to be divided along political and caste lines.
- **Existing institutions.** The presence of common irrigators represents the vestiges of traditional institutional arrangements (or prior institutional experience), and plays a strong role in sustaining cooperation among tank farmers.

PROVISION PROBLEMS REGARDING WATER DELIVERY AND STORAGE

The provision problem refers to bringing sufficient water to the tank, and making it available for use at the outlet through the maintenance of tank structures, feeder channels, etc. Participation of households in tank maintenance is decided at village meetings. Collective tank maintenance work was observed in only 18 of the 30 tanks for which detailed information was gathered. In the remaining 12 tanks, such activities were not undertaken during the survey years 1999–2000 and 2000–2001. The main challenge is the encroachment on tank components, such as feeder channels, water spread area, and catchments. To understand this, three related questions must be answered. Why does encroachment occur? Why do people not stop it? Why do they not contribute to repairing the damage?

In poor and nonpoor regions, the main reason for low levels of tank maintenance is the perception that it is the duty of the Government to invest in tank conservation and maintenance. The cost of rehabilitation is the overwhelming reason in poorer regions,

while the multivillage nature of tank problems and lack of cooperation from well owners were reportedly the prime reasons for meager maintenance efforts in nonpoor regions.

Why does encroachment occur?

- **Industrial development and urbanization.** Politically powerful individuals and/or groups with links to the Government and/or bureaucratic power structure have encroached on tanks for agricultural or nonagricultural purposes. Pollution of tank water is common in many tanks located near cities and industrial areas, such as tannery-intensive villages in northern Tamil Nadu. Government departments have shown the way by encroaching on and misusing tanks for urban purposes (Dhan Foundation, 2004).

Why do people not stop encroachment?

- **Encroachment by those in other jurisdictions.** In more than 90% of cases, encroachment is an intervillage problem. Thus, it is not amenable to being solved by local people without active support from the Government and the bureaucracy. Furthermore, because most of the tanks are in cascades, the hydrological boundaries do not coincide with the civil and revenue administrative jurisdiction. As such, village panchayats and local bureaucracies cannot resolve the encroachments.
- **Particular challenge facing small tanks.** Other things remaining constant, encroachment is a more serious problem in small tanks. Farmers are not only fewer, which limits their lobbying power, their poor economic status makes them vulnerable to local political and economic pressures.

Why do people not contribute to repairing the damage?

- **High cost of maintenance.** Even in the 18 tanks where some collective tank maintenance was evident, the contribution was grossly inadequate compared to the extent of rehabilitation required.
- **Nonpoor regions face greater problems.** The institutional landscape also shows remarkable differences between poor and nonpoor regions—with poorer regions having comparatively stronger institutional arrangements than nonpoor regions. Consequently, even households with a high degree of dependence on nonfarm activi-

ties in poorer regions have made a more substantial contribution to tank management than their counterparts in nonpoor regions. Encroachments were generally greater in nonpoor than in poorer regions. The level of encroachment was not significant in Ramanathapuram, probably due to poor urban development and low levels of land productivity (Mosse, 1997a).

- **Lack of cooperation from private well owners.** Detailed discussions with the villagers indicated that participation in tank maintenance activities is not based on strategic interaction among the farmers. Rather, it is based on a consensus regarding what has to be done and how much has to be spent on tanks. In some tanks, where many private wells are found, voluntary participation by well owners is relatively low. In a few tanks, well owners do not participate in collective action, although they take water from tanks. Those who do not own wells do not object to this because of their dependence on well owners during periods of tank water scarcity.

APPROPRIATION PROBLEMS REGARDING THE SHARING OF TANK BENEFITS

Private wells have upset long-standing rules on tank water access. In effect, wells within tank commands are used to privatize common-pool tank water because of the physical interdependence between tank storage and well-water recharge.

Private wells, agricultural yields, and employment. Existing property institutions regarding land and groundwater, the policy environment, and the hydrological conditions in most tank areas are highly conducive to the digging of private wells by rich farmers. The emergence of a groundwater market has mitigated, to a large degree, small-scale farmers' lack of access to groundwater. Private wells and groundwater markets help considerably in saving crops under water stress during critical growth stages, given the uncertainty in tank water supply (Palanisami and Flinn, 1989; Palanisami and Easter, 1991; Janakarajan, 1993a; Palanisami and Balasubramanian, 1998). Crop cultivation using wells during the non-tank season is a source of employment for the landless labor households. A comparative analysis of crop production and labor employment under different levels of access to groundwater can identify the role of groundwater in tank commands (Table 2). Cropping intensity, crop

yields, and the extent of labor employment correlate positively with the number of wells in the tank command area.

Private wells and tank management. The number of private wells has a positive impact on tank performance up to a certain threshold, and then its impact on tank performance becomes negative. In other words, the tanks and wells have a complementary relationship up to a limited number of wells. Beyond that number, the relationship becomes competitive and leads to tank degradation, as seen in Tamil Nadu and Ramanathapuram. This is possibly because the emergence of private wells in limited numbers contributes to agriculture by providing supplementary irrigation when tank water is scarce (Palanisami and Easter, 1991), thereby sustaining the farmers' interest in tank-fed agriculture and collective action in maintaining the tanks. Indeed, wells are highly dependent on tanks for recharging. However, if the number of private wells exceeds a certain threshold, economic differentiation among farm households sharpens and the dependence on private groundwater takes precedence over the collective interest in maintaining common-pool irrigation tanks. When private wells reach a sufficiently large number, competitive groundwater markets emerge in the tank commands. This reduces dependence on tanks even further, including among non-well owners since they become water buyers. The bottom line is that the impact of private wells and nonfarm employment on the conservation and management of tanks is a finely balanced issue that needs to be addressed carefully.

Electricity subsidies and weak regulations. Subsidized electricity for groundwater pumping, and the absence of institutional mechanisms to regulate the digging of private wells, has encouraged multiplication of the latter. Raising electricity prices has met with strong resistance from farmers, as well as opposition politicians. Some states (including Tamil Nadu) that raised prices have switched back to subsidies. The Government of Tamil Nadu recently introduced a law to regulate the digging of private wells, although it has not been implemented and there is no reason to believe it will be in the near future. Weak implementation also is likely to undermine the Tamil Nadu Farmers' Management of Irrigation Systems Act, which was introduced recently to hand over irrigation management to farmers.

Figure 4: Links Between Resource Degradation, Poverty, and Livelihood Options

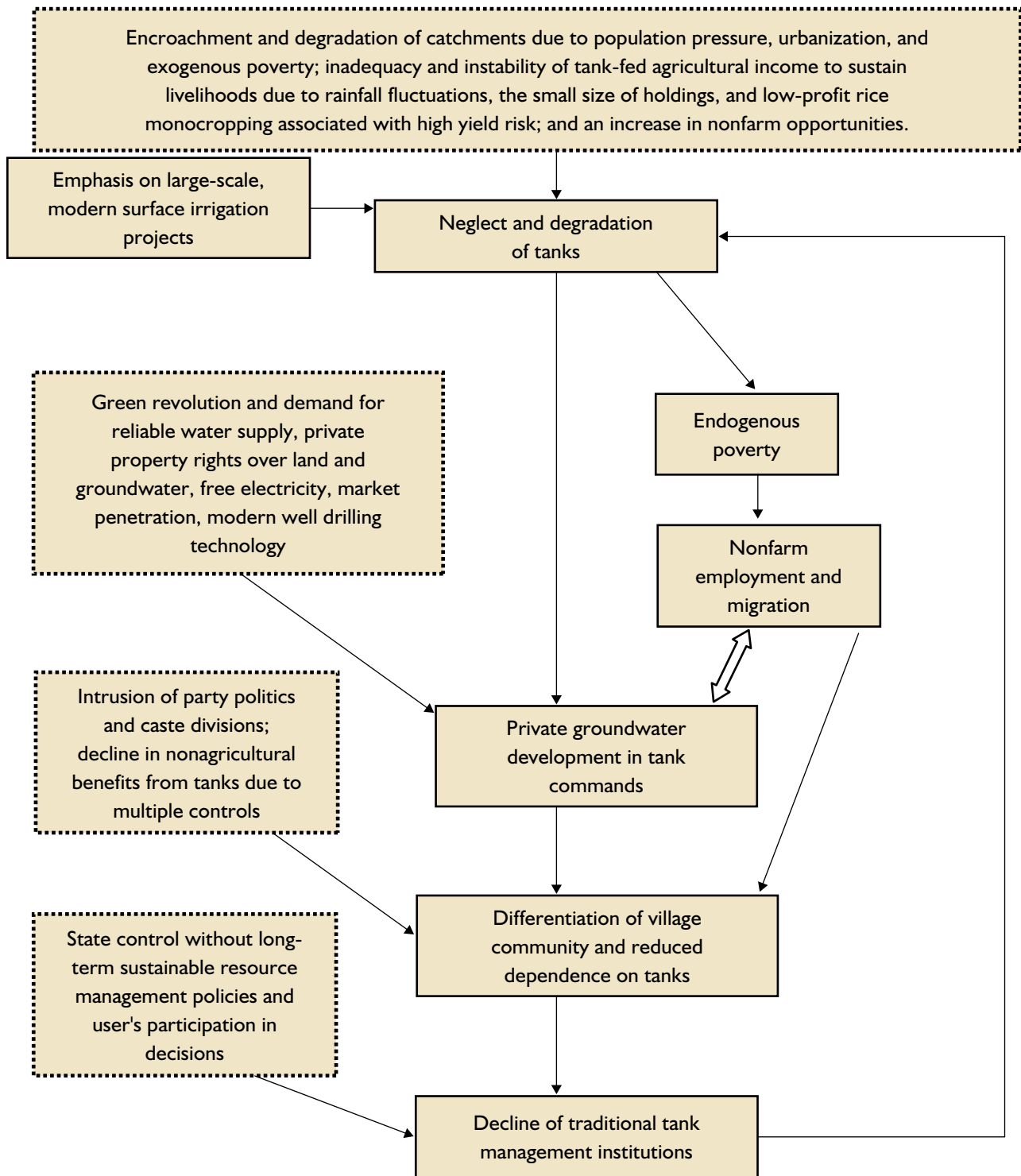


Table 10: Dependence on Tanks, Perception of Tank Problems, and Collective Action

Item	Share of tank-fed agriculture in total income of farm households in poor villages			Share of tank-fed agriculture in total income of farm households in nonpoor villages		
	< 33%	33–66%	>66%	< 33%	33–66%	>66%
Perception of tank problems	Poor water supply due to rainfall fluctuations and choking of supply channel	Poor water supply due to choking of supply channel and sedimentation in tanks	Sedimentation and poor condition of tank structures	Encroachment and poor water supply	Sedimentation and encroachment	Sedimentation and encroachment due to neglect of tanks
Ranking of reason for poor tank maintenance by village community	1. State's duty because tank rehabilitation and maintenance are costly	1. State's duty because tank rehabilitation is costly	1. State's duty because tank maintenance is a multivillage problem	1. State's duty because tank rehabilitation is a costly investment	1. Tank maintenance is a multivillage problem	1. Non-cooperation from well owners
	2. Nonfarm employment and reduced role of tanks in livelihoods	2. Low income and high risks in tank-fed agriculture	2. Increasing role of private wells	2. Tank management is a multivillage problem	2. Non-cooperation of well owners	2. Tank maintenance is a multivillage problem
Rice yield in tank command (kg/ha)	3,700	3,950	4,325	4,075	4,450	4,840
Wells (no.) per ha of command area	0.10	0.22	0.34	0.17	0.38	0.55
Percentage of migration and nonfarm employment among farm households	70.2	56.9	42.2	63.2	46.2	19.9
Institutional arrangements for tank and water management	Weak	Strong	Strong and systematic	Very weak	Weak	Weak
Contribution to tank management (Rs)	47.65	191.20	448.85	19.00	97.25	173.50
Encroachment (%)	10	15	23	36	27	14

ha = hectare; kg = kilogram; % = percent; Rs = Indian rupees.

Source: Authors' field survey.

Table 11: Private Wells, Nonfarm Employment, and Tank Performance

Item	Wells (no.)	Less than or equal to one well per 10 ha	Two to four wells per 10 ha	More than four wells per 10 ha
Average no. of wells per 10 ha	0	0.08	3.13	5.37
Percentage of remittance and nonagricultural income in relation to total household income	46.75	39.52	32.47	22.53
Percentage of households reporting migration and nonfarm activities in relation to total households	85.63	73.13	52.50	31.20
Cropping intensity (%)	74	98	127	143
Institutional arrangements for tank maintenance and water control	Weak	Strong	Strong	Weak
Rice yield in tank command area (kg/ha)	3,420	3,750	4,010	4,265
Agricultural labor use in tank command (no. of person-days per ha)	117	132	154	193
Percentage of tank-fed agricultural income to household total income	23.14	25.65	31.46	38.59

ha = hectare; kg = kilogram; no. = number; % = percent.
Source: Authors' field survey.

APPROPRIATION PROBLEMS REGARDING TANK FISHERY AND FORESTRY BENEFITS

Another important challenge is the multiple controls over various tank usufructs, such as tank fisheries and forestry. For example, while the tanks are under the control of the panchayat or the irrigation department of the state government, fisheries are controlled by the panchayats and the fishery department of the state government. The local panchayats and the revenue and forest departments of the state government have stakes in tank forestry. A complete lack of coordination among these departments not only results in underutilization of the productive potential of tanks (fisheries, forestry, silt, grasses), it also undermines the power to protect these usufructs from misuse. Researchers have reported the value of fish production/ha of command area to be in the range of Rs130 (Palanisami and Meinzen-Dick, 2001) to Rs200 (Palanisami et al., 1997), while official fishery production estimates put the value of fish production in tanks at Rs1,200–2,500/ha of command area. Such a huge gap between the official estimates and researchers' field-level estimates is due possibly to the gap between de jure fishing rights and de facto enjoyment of them. In more than three quarters of

the tanks where fishery production is active, although the de jure fishing rights are vested with the local or state government, farmers' associations reportedly take over government fishing rights through fake auctions by paying a bid amount of a few rupees to the Government and then re-auctioning these rights to private contractors for much higher amounts—sometimes hundreds of times higher than the actual bid amount paid. The difference between the amounts they pay and receive from private fishing contractors is credited to the village common funds for temple repairs and festivals.

Many studies and this study's fieldwork show that the multiple controls over tank usufructs, the tension between de jure and de facto rights, and the gross inadequacy of the government machinery to enforce and supervise the fishing rights (Government of Tamil Nadu, 1995) have resulted in the underutilization of the productive potential of the tanks. Moreover, whatever income is generated from tank usufructs is used for purposes other than tank maintenance in most of the tanks (Palanisami et al., 1997; Balasubramanian and Selvaraj, 2003). An important corollary of these observations is that multiple controls over tank usufructs coexist with no control—a typical case of state property degenerating into an

open access resource or private property, thus leading to underuse or misuse of tank usufructs.

Tank rehabilitation: A critique of past efforts and an agenda for the future

This section attempts to demonstrate the vicious cycle in tank degradation: tank degradation—poverty—private coping strategies—further degradation of tanks. Past efforts to revive tanks through externally assisted tank modernization projects have made little headway in reversing the process of tank degradation.

SOME FAILURES OF TANK MODERNIZATION EFFORTS

Many attempts at tank modernization have failed. Of the 39,000 tanks in Tamil Nadu, about 1,300 have been modernized with an outlay of about Rs5 billion (\$1 = Rs44) over a period of more than 20 years. External agencies funded about 75% of these modernization investments. Modernization works have been remarkable uniform, despite the vast differences in tank irrigation problems across different agro-climatic and socioeconomic localities in the state. In most cases, the institutions have become defunct and the modernized physical structures have been poorly maintained. Some possible causes for these failures include

- **Lack of a livelihoods perspective and multiple-use benefits of tanks.** The first major drawback of past tank modernization projects was the failure to view the tanks from the perspective of people's livelihoods. Tank rehabilitation was never linked to other resource conservation programs, such as watershed development, community wells, forestry, and wasteland development. Similarly, a link was never established with poverty reduction programs, such as micro-finance, food-for-work, and drought relief. The multiple-use potential of tanks rarely has been recognized and has been grossly underestimated, while the potential benefits from agriculture have been overestimated. Selsky and Creahan (1996) emphasize the role of secondary and tertiary stakeholders in the sustainable use of resource systems. However, the roles of secondary stakeholders, such as fisherfolk, agricultural labor households, pastoralists, and non-agricultural households, have been neglected completely in tank modernization. These stakeholders could have been included in the tank community to create a formidable alliance

against vested interests and encroachers, and to build a broader community of tank users.

- **Lack of involvement of farmers.** Modernization of physical structures, such as field channels and sluices, has been overemphasized. Meanwhile, very little has been done to ensure the active participation of farmers in decision making, removing and preventing encroachments, and handing over benefits from tank usufructs to the village community.
- **Lack of community wells for the poor.** Despite uncertainty in tank filling and the need for supplementary well-irrigation, few attempts have been made to provide poor farmers with access to groundwater through group or community wells.

These factors have led to the emergence of a different kind of vicious cycle in tanks: externally assisted rehabilitation of tank structures—inadequate attention to sustainable institutions and multiple uses of tanks—poor maintenance and degradation of tanks—further dependence on externally assisted rehabilitation.

TANK MANAGEMENT MIGHT NOT BE VIABLE IN ALL CASES

Rural households will not conserve a resource unless its usefulness is fully perceived and realized. As noted by Long (1989), resource users find themselves in complex and uncertain situations. Based on their social experience, they have to choose between different courses of action by weighing the costs and benefits of contributing and conforming to the existing resource management regime against those resulting from an array of different strategies (Edwards and Steins, 1998). In tanks, these strategies include the development of private groundwater extraction to supplement tank water; migration and nonfarm employment; and neglect of agriculture and tanks wherever the latter have become extremely undependable. Thus, it is unrealistic to attempt to revive tanks that have lost their importance in people's livelihoods for various reasons, such as poor water supply with limited scope for groundwater development, migration, and significant livelihood diversification away from agriculture. The Vallakulam tank cascade in Ramanathapuram District, which was modernized with European Community support, is a case in point. The institutions that were revived with support from a local NGO have become dysfunctional for the reasons mentioned above. In another village within the Villoor tank cascade in

Madurai District, a similar program was implemented. However, the story was different: political divisions spurred by legislative and panchayat elections undermined the institutional arrangements.

For some tanks, the physical and institutional structures have reached the point of no return. Several tanks in the poorer region in East Ramanathapuram District have unpredictable rainfall and saline aquifers, which have forced the farmers to seek nonagricultural coping strategies, such as the production of charcoal using local bushes, migration, and other nonfarm employment outside the villages. In these situations, bold initiatives should be taken to reduce reliance on tank-fed agriculture for income by providing alternative employment opportunities. Exploitation of nonagricultural benefits from tanks, such as tank-bed fishery and forestry, are other possible alternatives to manage the decline in tank performance.

TANK MANAGEMENT SUCCESSES

Several institutions have solved provision and appropriation problems successfully and effectively by, for example, (i) maintaining feeder channels and diverting water from rivers, (ii) appointing common irrigators for water distribution, and (iii) removing sedimentation from the water spread area of tanks.¹⁴ In a few tanks—such as Parambur in Pudukkottai District and Kedar in Villuppuram District—the tank institutions have put aside local political differences and devised clear rules and strategies to exploit and share tank usufructs. When tank water is scarce, some of the strategies followed in a few of the tanks include acreage restriction, rotational water supply, and prohibiting well owners from using tank water. A comparison of self-organized, traditional institutions with those modernized by the Government with European Community support suggests that locally evolved institutions are more effective and sustainable. This also has been reported in other parts of the world (Ostrom and Gardner, 1993).

AGENDA FOR FUTURE TANK REHABILITATION PROGRAMS

Selectivity. Future tank rehabilitation efforts should focus on the careful selection of tanks with location-specific priorities for improvements decided by the beneficiaries and continuous outside technical and financial support.

Manage groundwater. The increasing uncertainty in tank water supply and stagnating profitability from rice monocropping is fueling the neglect of tanks. Tanks alone cannot support successful crop production without additional irrigation from wells. The macro-level econometric analysis of tank degradation has established that wells promote collective action within a specific range. Beyond that point, however, wells have a negative impact on tank maintenance. Therefore, institutional intervention to regulate well-irrigation within tank commands is needed. The high cost of tube wells for the poor can be reduced by providing community wells or group wells linked to continuing microcredit programs. The success of group wells in river-pumping projects in other parts of the state is a model for the success of community wells in tank-fed areas.

Increase nonagricultural benefit from tanks. As crop production is highly uncertain due to huge variations in tank filling, alternative sources of income from tanks have to come mostly from fishing, trees, silt, grazing, and other minor uses. Intensive rice–fish production could be made possible by transferring fishing rights to the farmers and developing appropriate skills. Successful cropping and fish production are possible in years of water scarcity by following the proportionate acreage restriction strategy used in Parambur and Kedar tanks. Planting trees with different economic uses and gestation periods could provide livelihood security in drought years. Exploitation of the multiple-use potential of tanks is found to improve tank performance significantly (Palanisami and Meinzen-Dick, 2001). Handing over tank usufructs in exchange for a commitment from the beneficiaries to utilize the income for tank rehabilitation is essential.

Promote tank-based microcredit. Part of the income from tank usufructs needs to be saved through microcredit programs to protect livelihoods during drought years. Coherently implementing crop insurance and community wells through microcredit groups would reduce informational problems besetting rural credit and insurance markets.

Proactive state that promotes greater farmer involvement without complete handover. A departure from the top-down, bureaucratic, civil engi-

¹⁴A water spread area refers to the area over which water is stored in tanks. Naturally, the silt carried by water from the catchment is deposited here causing tank sedimentation problem.

neering perspective of tank maintenance and water distribution is needed. However, that does not mean a complete handover to the villagers without considering the range of uses of the resource, the diverse interests of users, and the capability of local institutions to take on additional responsibilities (Williams, 1997). As Mosse (1997b) states, “people do not demand a reduced state but a better, responsive state.” In addition to providing technical and financial aid, the State (Grafton, 2000; Rangan, 1997) should enforce property rights, resolve conflicts, and coordinate the multiple uses and multivillage users of tanks.

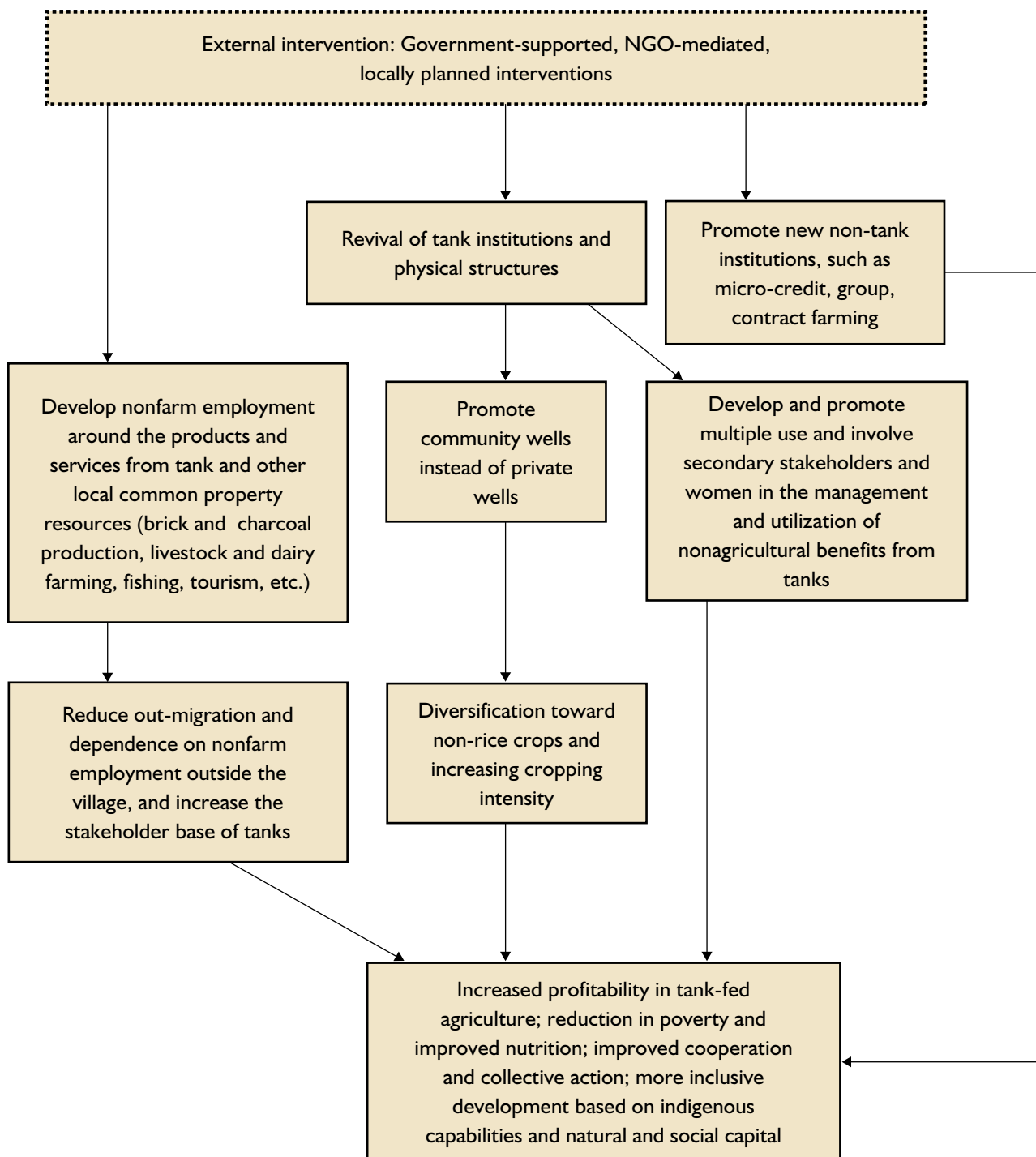
Table 12 summarizes the policy instruments discussed above for rehabilitating tanks and reviving institutions, as well as their possible impact on stakeholders. A plausible model for intervention is in Figure 5. Though not all policies or interventions could be implemented in all tanks, most of them hold promise for wider adoption. Implementation of some of the interventions—such as proportional acreage restriction during water scarcity, restricting well owners from taking tank water, and tradable water rights—might appear imaginative. However, they are not infeasible. The rudiments of these kinds of interventions have been applied in a few tanks.

Table 12: Political Economy of Possible Interventions

No.	Policy or intervention	Gainers	Losers
1.	Removal of encroachment involving secondary stakeholders (Pondicherry model)	Village community, including tank farmers	Upstream encroachers
2.	Regulating private wells	Small farmers	Large farmers with vested interest in groundwater exploitation, water sellers
3.	Turning over tank usufructs to tank users’ association, and linking it with microcredit programs	Village community	Government, local panchayats
4.	Promoting community wells and nonagricultural uses of tanks, and linking them with microcredit programs	Small and marginal farmers who are unable to afford private tube wells, and other poor and landless households	Water sellers in the short run; none in the long run
5.	Acreage restriction during years of water scarcity (Parambur, Kedar, and Kongudi tank models)	Small and marginal farmers	Well owners and large farmers
6.	No tank water supply to well owners without tradable permits over tank water (Kedar tank)	Non-well owners	Well owners
7.	Reduced tank water supply to well owners with tradable permits over tank water	Small farmers	None
8.	Government investment in physical structures, crop production technology, and participatory irrigation management	Tank community	None

Source: Tabulated based on authors’ work and review and synthesis of other studies on tank management.

Figure 5: From Vicious Cycle of Tank Degradation to Sustainable Tank Management



Community-Based Forest Management in Nepal: Reversing Environmental Degradation and Improving Livelihoods

Krishna Prasad Oli¹⁵ and Keshav Raj Kanel¹⁶

Introduction

Nepal is regarded as a pioneer in the development of progressive forest policy and legislation in South Asia. This focuses on the collaboration between the Government and local communities for community forestry (CF) and leasehold forestry (LF) programs. The twin objectives are (i) setting up common property systems of forest management to restore and rehabilitate degraded forests, and (ii) reducing poverty. The CF program has been implemented successfully for more than 2 decades, while the LF program has been working for slightly more than a decade.

CF consists mostly of preventive measures aimed at protecting forests from degradation and managing large plots of national forest that are handed over to a larger community whose members come from different socioeconomic backgrounds. The communities are mandated to prepare a long-term management plan, which is the basis for the work. They benefit directly from fuelwood, fodder, and litter. The income generated from the sale of surplus timber and other products is invested in community development activities. LF, which is aimed at redistributing assets to the poor, is carried out exclusively in degraded forest areas. Leasehold forests have 1–10 ha of land no farther than 3 km from the settlement, or half an hour walking distance. In this case, 2–10 poor households comprised the group, and the land is leased to them for a maximum of 40 years.

The purpose of this case study is to analyze the features of CF and LF systems in terms of reversing forest degradation, and their contribution to poverty reduction. In doing so, the study also revisits the theory of degradation and land-use change dynamics and their causes. The study analyzes (i) the role of different stakeholders in the implementation of CF and LF policy and legislation; (ii) evolving livelihood strategies of forest-dependent communities;

(iii) forest and protected area management in times of conflict; (iv) the positive and negative impacts of CF and LF policy; and (v) the legislation aimed at improving livelihoods and empowering women. The study is based on evidence from other study reports. Two local case studies from the mid-hills, one on CF and the other on LF, are also presented. This case study concludes with lessons learned, and second- and third-generation challenges for CF and LF.

Country background

Nepal is a mountainous country with much of the land under the Himalayan realm in the subtropical belt. Nearly 77% of the country's 147,181 km² is composed of rugged hills, mountains, and valleys, with elevations ranging from about 90 meters (m) to 8,848 m above sea level. The climate, therefore, is extremely variable, ranging from tropical to tundra. Nepal's population has grown from 8.5 million to 23.2 million over the last 5 decades, and continues to grow at 2.2% per year. The mountains and hills of Nepal are home to 52% of the population; the rest live in the Siwalik and Terai (plains) area.

The gross national income per capita is \$250. More than 81% of the economically active population lives in the rural areas and is engaged in farming. Farming is estimated to contribute about 40% of GDP. The National Planning Commission estimates that 42% of the population lives in poverty. A regional breakdown shows that poverty is concentrated mainly in the mountains (56%), compared to 41% in the mid-hills and 42% in the plain (Terai) areas. Furthermore, the disparities between rural and urban areas are considerable, with 44% of the rural population living in absolute poverty, compared to 23% in urban areas.

Extent of community and leasehold forestry

The CF and LF programs have succeeded because local communities use their innovative system of indigenous forest management through the new community-based institutions, such as user groups and sanctions. These indigenous systems have been operating in Nepal for centuries, and have been documented elsewhere (Messerschmidt, 1986; Gilmour

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and Fisher, 1991; Gilmour and Nurse, 1991). Since the establishment of the modern Nepal, a range of regulatory instruments and policies has been introduced to conserve and manage forest resources. Before the 1980s, commercial policy vested these rights in the hands of a few people, leading to indiscriminate extraction and deforestation. Moreover, the bureaucratic forest laws considered government officials as forest custodians, while local communities were viewed as encroachers rather than forest managers. This encouraged the depletion of forest resources.

After the preparation of the Master Plan for the Forestry Sector in the mid-1980s, progressive forest legislation and policies were put in place. The Forest Act (1993) and Forest Regulations (1995) were critical to the promotion of CF and LF in Nepal. By understanding customary mechanisms, and legitimizing them through statutory law, the Government transferred usufruct rights over forest resources to communities. As a result, more than 1 million ha of forestland, most of which were degraded, have been brought under successful CF and LF programs. CF is by far the larger program, covering about 1.1 million

ha, or 26% of the forest area. LF covers only 10,000 ha, or 0.2% of the forest area. More than 13,300 community forestry user groups (CFUGs) and more than 2,213 leasehold forestry user groups (LFUGs) are managing such forest areas, benefiting in excess of 7 million people—or roughly 1.5 million households.

The impact of community and leasehold forestry in improving livelihoods

Mountain people have adapted different livelihood strategies to cope with their harsh living environments. The most important of these is diversification of income through agriculture, livestock, and the sale of timber and NTFPs. Supplementary income from other sources, such as migration, small-scale tourism, and other aspects, is another important aspect of their livelihood strategies. Poor and vulnerable groups draw on various livelihood sources for their survival. Since the majority of the poor have landholdings that do not produce enough to feed them even for 3 months, their dependency on forest resources, such as fuelwood and NTFPs, is substantial. While women mem-

Table 13: Handover of Forests to Communities From 1988 to 2004

Year of CF handover to community	CFUGs	CF area handed over (ha)	Households
1988	1	27.00	53
1989	10	567.00	35
1990	42	1,972.57	1,115
1991	87	5,011.53	4,492
1992	349	20,844.55	12,973
1993	737	52,121.01	36,214
1994	1,225	88,763.23	80,944
1995	1,655	120,818.00	142,839
1996	1,763	156,899.46	178,670
1997	1,588	133,694.99	196,614
1998	1,442	135,767.01	177,366
1999	1,156	100,026.74	168,770
2000	1,067	90,713.67	135,406
2001	841	83,599.51	121,746
2002	592	50,667.12	93,827
2003	557	40,833.02	62,230
2004	430	32,449.04	49,109

CF = community forestry; CFUGs = community forestry user groups; ha = hectare.

Source: Government of Nepal, Department of Forests. 2004. Data on community forestry handover (unpublished).

bers of a poor household are engaged in household chores and in the agriculture sector, male members migrate or are engaged as wage laborers. A major part of their cash income (60%) comes from agriculture and off-farm activities, followed by small-sized businesses, cottage industries, and wage labor (Adhikari, 2003). Seasonal and annual out-migration varies from one zone to another. One estimate indicates that 40% migrate for seasonal work. Although generating income through migration has been a coping strategy, it sometimes creates a shortage of labor for local production and leads to poverty. Furthermore, mostly men migrate, increasing the workload of women with serious implications on their health and security.

CF and LF are good examples of decentralized governance of natural resources. The policy has provided the poor and others with the rights to organize, manage, and use the resource for their own benefit. However, decentralization alone is insufficient—and, in some situations, it has been seen as an interfering arm of the central Government. The CF and LF case studies show that rural households with capital assets, such as productive private lands and livestock, capture more benefits than poorer CFUG households. Even if CFUGs and LFUGs are allowed to sell the surplus forest products, the income generated might not be used to benefit mainly the poor households. Investments in local community development activities too often result in greater benefits for the rich.

IMPACT OF COMMUNITY FORESTRY ON IMPROVING LIVELIHOODS

The Forest Act (1993) and the Forest Regulations (1995) empowered CFUGs to sell and distribute forest products independently. The new role and responsibilities helped establish local-level institutions (CFUGs and LFUGs) to design rules, apply sanctions, collectively manage forests and funds, resolve conflicts, and monitor activities in the specified areas. The User Group Assembly—the highest decision-making body—prepares a constitution of the CFUG and forest operational plans. It also defines user rights and duties, and mobilizes CFUG funds for different activities.

The forest management strategy ensures the participation of local people in the management of forests, and allows them to procure forest goods and services for their benefit. Although the CF program reportedly has had a major impact on livelihoods, empirical evidence to substantiate this still is lacking at the national level. In an attempt to under-

stand the current situation, Kandel and Niraula (2004) analyzed the economic parameters collected from 1,788 selected CFUGs from 12 districts (1,541 from hills and mountains; 247 from Terai or Inner Terai and Siwalik areas) in two broad ecological zones (mid-hills and mountains, and Terai or Inner Terai and Siwalik). The value of forest products harvested, as well as the income and expenditure of CFUGs, was analyzed. Among the forest products, timber generates the highest percentage of income (69%), followed by fuelwood (19%), and grass fodder and bedding (10%). The communities use more than 79% of the forest products themselves, and a large amount of NTFPs are consumed in the form of medicines. Resin and other products are sold to outsiders. When the current user group forest product price records are considered, the annual income from Nepal's community forests totals Nepalese rupees (NRs)913.8 million (\$1 = NRs73). However, this is grossly undervalued. When the stumpage value (market price) was applied to these products, the income of Nepalese CFUGs totaled about NRs1.9 billion per year.

On the investment side, the CFUGs reinvest 28% of their income in forest protection and management, which is higher than the mandatory 25% stipulated in the Forest Regulations. The analysis showed that little is invested in capacity building (2%). Significantly, however, a high amount is spent on community development (36%). Pro-poor programs receive only 3%, while a large amount (more than 17%) is spent on miscellaneous activities—the gray area in CFUG management. Users contribute voluntary labor for various activities. They spend 42% in the management of CF resources, 19% on attending meetings and the Assembly, and 19% on harvesting forest products. In the Terai and Siwalik areas, only 21% of labor contributions are spent on protecting the forests, compared to 41% on product harvesting. Calculations taking into account the income of CFUGs, based on the user and stumpage prices and expenditures, show that CFUGs are investing NRs586/ha of community forest and receiving NRs1,865/ha/year. A single CF program of the Ministry of Forests and Soil Conservation contributes more than NRs1.9 billion, which was equivalent to the annual budget of the Ministry in 2004 and 60% more than the budget of the Department of Forests. The environmental services provided to the community and areas outside it have not been calculated, although this amount could be significant, as various valuation exercises

elsewhere in the world have shown. The CFUG system reportedly has improved significantly the aquifer water levels (Roy, 2002).

What is still unclear is the equitable use of resources among and between different groups—the rich, middle class, poor, ultra poor, and women. Poor user groups reportedly do not receive as many benefits from CF as the better off (Kanel, 2004). Several authors working in the field of CF recently have raised this issue (Malla, 2002). Heterogeneity among the groups, asymmetrical power relationships, and disparities in land resources, capital assets under private ownership, and human capital have hindered the equitable distribution of benefits from community resources. For example, Richards et al. (1999) found that household members with larger landholdings could benefit more than CF members with smaller holdings. Adhikari (2003) reviewed cases from South Asia and conducted a detailed study to examine this hypothesis in two selected districts in the mid-hills of Nepal, where CF has been operational for the last 2 decades. The study showed that poorer households in forest-dependent communities benefit much less from CF than the middle-income and rich households. The average poor household receives NRs7,756, while the rich households earn an average NRs24,466 annually from CF. Rich households received about 85% of income related to common property resources (CPRs), while the rest went to poor households. When considering gross CPR income as a percentage of household income, wealthier households were more dependent on CPRs than poorer households, which challenged the hypothesis that poor households rely more on CPRs.

Although poverty limits poor people's choices, evidence suggests that the poor are primarily responsible for resource degradation. Often, the rich have contributed much more to this process. Furthermore, when the net income from CF was considered as a percentage of a household's total income from the forest, poor households earned 5%; middle-income households, 8%; and better-off households, 4%. An econometric analysis showed that households with land and livestock assets gained most from CF. Moreover, the use of forest undergrowth, grass, forest litter, and timber—and the benefits from development activities arising from CF—all favor the rich. Because rich people have more assets and livestock, build bigger houses, have larger farms, and use more water for irrigation and leaf litter to fertilize their fields, they will draw more benefits from CF. In addition, CF

sanctions curtail the traditional resource-harvesting systems of poor households—e.g., making agricultural implements and charcoal; harvesting other forest resources; and in many situations, selling their share of CF areas. This has led to the skewed sharing of CF benefits.

Although the goal of the CF exercise is greater equity, legislative reforms followed by mass awareness are needed to address these issues. Another issue concerns the willingness of the community or the Government to transfer CF property rights to community members. Complete handover of CF resources to the CFUG might not solve the problem of equity because of elite capture.

IMPACT OF LEASEHOLD FORESTRY ON LIVELIHOODS

The most degraded lands unsuitable for CF are given to the poor—with a view to restoring and rehabilitating the land, while providing opportunities for the poor to increase their income. Development planners and external funding agencies adopted this as a strategy to simultaneously improve the lives of the poorest of the poor and reverse environmental degradation.

How has this plan fared? Has it impacted livelihoods? The Hill Leasehold Forestry and Forage Development Project carried out an impact study. In their evaluations, Ohler (2000) and Tamrakar and Kafley (2004) reported that the program has increased food security by 16%. Further, income and diversification of income sources are on a clear upward trend. Goats generate cash income for 53% of the households, while buffalo provide income for 20% of households. In older LF groups, earnings increase to 88% from goats, 41% from buffalo, and 16% from the sale of fodder from restored lands. The distance that women cover to fetch fodder leaves has been reduced to 2.5 hours per day, and disparities between male- and female-headed households have decreased. A remarkable shift in the sharing of decision making has been seen. Before the leasehold forests were formed, only 10% of the women could decide for themselves, compared to 25% now. However, this was not the case at the site for this study, as shown in the case study in Kavre (p. 64).

An average of 0.62 ha was handed over to the household, below the projected area of 1 ha of degraded land (FAO, Office of Evaluation, 2003). In the decade after LF began in 1993, the biggest achievement has been the formation of social capital. More than 2,213 groups have been formed and become involved in

income-generating activities. These groups have collected more than NRs3.8 million, which is dispersed as loans to members (ibid). Most group members now have savings in banks. Loans from the group's internal savings are used for household requirements. Further, the LF system has established a virtual moratorium on grazing in degraded lands, despite some conflicts over customary use rights. The LF committee also has provided lease certificates to women, who now feel empowered.

The LF program seems to have succeeded through its integrated and multidisciplinary approach toward restoring degraded areas. Poor lands are turning into productive lands, and stall-fed goats, buffaloes, medicinal plants, pineapple farming, and trees are providing benefits to poor men and women.

Women in community and leasehold forestry management

Persistent gender bias and the biological limitations resulting from childbearing and child care, however, have resulted in women having fewer opportunities than men in terms of asset ownership, employment, and education. Women perform most of the household activities, including collecting fuelwood, fodder, and leaf litter from forests and trees. Women also perform agricultural work on private lands. The handover of sections of national forests to local communities for management and sustainable use raised the role of women in forest management. This has been documented in the Master Plan for the Forestry Sector, which recommended that at least one third of the CFUG members be women. Women's empowerment has been raised continually in CF and LF debates.

The database of the Community Forestry Division of the Government shows 13,644 CFUGs, of which 690 are composed of women only. The latest survey indicates that about 25% of CFUG committee members in Nepal are women, and about 34,000 women are CFUG executive members. Their numbers are increasing as the CFUGs form new committees, so that at least half the CFUG executive members are women. CF guidelines were revised in 2000 to allow a male and a female member of each household to become members of a CFUG. Before the revision, only a male household member could be a CFUG member. This revision will promote women empowerment in CF.

To date, 2,213 LFUGs have been formed. Each group is composed of 5–10 poor households. Some

16,220 households have become members of these groups, receiving 9,798 ha of national forest lands. Because of their small size, LFUGs do not have an executive committee. However, women's decision-making capacity has improved substantially, according to reports comparing the decision-making characteristics of households before and after LFUG formation. Before the groups were formed, only 10% of the women could decide for themselves, while 30% made joint decisions and 60% depended on the decisions of a male household member. Five years later, 25% of women could decide for themselves, while 55% made joint decisions and 20% depended on a male household member. Less time spent collecting fuelwood has enabled women to get involved in additional productive activities, such as educating themselves and generating income. Lease certificates also are provided to women. If a male member is inactive, the lease certificate is transferred to his wife. In addition to enhancing asset ownership, including livestock ownership, this has increased confidence and inculcated a habit of saving. Asset ownership also has increased women's social security.

Forest degradation and land-use changes in community and leasehold forestry

An estimated 39% of land is categorized as forest and shrub land (Forestry Research and Survey Department, 1996). In the early 1960s and 1970s, several theories on degradation and deforestation emerged. Various authors (Eckholm, 1975 and 1976; World Bank, 1978) described it as the "Himalayan degradation" Theory. The World Bank predicted mass degradation of forests in Nepal by the turn of the century, which focused the world community's attention on the need to arrest environmental degradation in the Himalayas (Gilmour and Fisher, 1991). However, Ives and Messerli (1989) questioned these hypotheses after a comprehensive analysis of the Himalayan degradation theory. Earlier works had clearly undermined the vision and ingenuity of local people and community institutions in developing new ways of managing forests to mitigate the perceived scarcity. Since the early 1980s, research into the causes of mountain and hill degradation, and their relationship to poverty, has been undertaken (Gilmour and Fisher, 1991). New systems of resource management were developed and legitimized through policy and legislative reforms (Adhikari, 2003). These reforms required considerable efforts in understanding how

local people managed their forest resources. Several institutions, including the Forest Department of the Government, development partners, and researchers, were involved in designing these policy reforms (Messerschmidt and Rai, 1992).

The shift in land use from forest to arable agriculture in the hills and mountains was not a viable proposition. However, the fertile plains of the Terai had potential for this land-use conversion. Permanent habitation became possible in the Terai only after a malaria eradication program was carried out from the mid-1960s to the 1970s, and modern health and business services had gradually evolved. The Terai attracted waves of people—those migrating from the hills and mountains, repatriated from Myanmar, and displaced from the plains of northern India, as well as refugees from Bhutan. This resulted in large-scale deforestation and infrastructure development. Other incentives for migration to the Terai included the Government's policy of resettling people in the area, as well as opportunities for the illicit harvesting of forest resources, especially valuable hardwood. Thus, migration was a major cause of deforestation in the Terai.

Although downward migration is continuing, it is not clear whether forest degradation is a major problem in the hills and mountains of Nepal. Nevertheless, the myth of degradation continues. The existing scenario is explored below.

A nationwide study on land-use systems carried out by the Land Resource-Mapping Project (LRMP) found no significant change in forest cover in the hills and mountains between 1964 and 1978 (Government of Nepal, 1985). In fact, the project reported a slight increase in forest areas in the hills and mountains. In some cases, however, tree density declined (Nield, 1985), and tree crown cover dropped by 2.1% per year. Increased demand for fuelwood and timber to make agricultural implements and construct buildings in the satellite town centers, as well as infrastructure development, reduced crown density in the remaining forests.

Land-use changes long have been associated with the changing socioeconomic dynamics of growing human populations. Brown (1997) reported a 7% increase in forest cover in a mid-hill village. Similarly, Oli (2002a) observed a 9% increase in forest cover in the eastern mountains over 15 years. Fox (1993) found a considerable increase in forest cover in the Daraundi watershed in Gorkha District in the western hills. Due to increased awareness and the economic incen-

tives of forest management in CF and LF, deforestation reportedly declined in the Upper Pokhara Valley (Oli, 2002b). In Dhankuta District in the eastern hills, despite a 19% increase in the human population, land use was found to be stable between 1978 and 1990 (Virgo and Subba, 1994). A significant increase in mature forest in the Rupa watershed in the Pokhara Valley also was reported (Oli, 2002b). Branney and Yadav (1998) assessed the change in forest conditions, as well as the management of community forests, from 1994 to 1997 in four eastern hill districts. They found an overall improvement in the condition of community forests. Similarly, Jackson et al. (1998) studied land-use changes in two central hill districts, and compared forest conditions between 1978 and 1992. This study reported positive effects of CF on forest cover at lower altitudes. In another study of land-use change, Gautam et al. (2003) reported that connectivity between different patches of community forests was emerging due to forest regeneration. A livelihood forestry project carried out a baseline study among CF users in four eastern and three western hill districts. In the west, 93% of CF users felt that forest conditions were improving, while 72% of those in the east reported improvement (Livelihood and Forestry Program, 2003). Karna et al. (2004) analyzed data from seven forests in five locations to assess forest degradation and the conditions of community forests. Forest areas under community management had higher levels of protection, while forests under government control showed higher levels of harvest and lower levels of protection. This demonstrated that the density of forests under community custodianship has improved greatly, while pressure on national forests continues as a result of free access. This situation suggests that the management of national forests should be handed over to communities.

The majority of CF studies are limited to the hills and mountains. Rana (2004) analyzed remote sensing data to examine the forest conditions of the Terai Saptari District, and concluded that the condition of community forests was improving. Ohler (2000) reported changes in vegetative composition and high tree density in LF areas in the central hill districts. These works show that the implementation and practice of CF and LF has increased forest density and greenery, contributing directly to halting hill and mountain degradation. While data on land-use dynamics are available for specific sites in the country, data for the full range of CF and LF programs across the country has not been gathered since the publication

of LRMP results in 1985. Therefore, available data is insufficient to substantiate fully the claim that mountain and hill degradation is being reversed.

The Forest Resource Survey in 1964 estimated forest cover in Nepal at 47.7% (Sharma and Amatya, 1978). The National Planning Commission estimate was 37.7% in 1985. Between 1964 and 1979, 400,000 ha of forestland were converted to agricultural land in the Siwalik and Terai areas (Vinod, 1999). Furthermore, between 1978 and 1985 alone, 160,000 ha of forestland were converted to agricultural land. By 1992, an estimated 4 million ha of forest remained in the country. Today, an estimated 4.2 million ha (29% of the country) is covered by forest, and about 1.5 million ha of land (11%) is covered by shrubs and potentially could be restored to forest (Ministry of Population and Environment, 2003). Table 14 compares forestland changes since the publication of the LRMP report with the Forestry Research Survey data.

Overall forest cover in the country has increased by almost 4% (Table 13). In terms of physiographic regions, forest cover increased the most in high Himalayan (27.1%), middle hills (14.6%), and high mountains (7.7%). At the same time, forest area declined in the Siwalik and Terai regions due to illegal logging and the conversion of forestland for agriculture and infrastructure development.

Impact of community and leasehold forestry on biodiversity conservation

Conserving biodiversity, managing watersheds, and producing forest products for the local community are crucial for the sustainable development of CF

and LF in Nepal. Concerns have been expressed that earlier land degradation has altered biodiversity composition and communities, lowered forest and range conditions, destroyed riparian areas, reduced wildlife and wildlife habitat, and caused soil erosion. Loss of biodiversity is an inevitable result of these changes. Have CF and LF reversed these processes? Is biodiversity increasing in these restored areas? Has CF led to enhanced biodiversity? How is the altered ecosystem functioning?

Unfortunately, long-term research to evaluate the effects of CF and LF in the mid-hills (Oli, 2004a), mountains, Siwalik, and Terai is limited. Thus, answers to these questions are not readily available. However, research conducted by the International Forestry Resource Institute in two districts of the mid-hills from 1994 to 2000 (International Fund for Agriculture Development [IFARD], 2003) showed that the diversity of plant species in the LF increased by 57%—from 37 species in 1994 to 68 species in 2000. At another site, species diversity increased by 86%—from 70 species in 1995 to 130 in 2000. A substantial increase in tree saplings and tree species was recorded in the study sites. The regeneration of sal (*Shorea robusta*), sissoo (*Dalbergia sissoo*), and other native trees had caused the reduction of unpalatable understory. Oli (2004a) reported a 65–85% rise in plant species diversity over 10 years within the community forests of the eastern hills. The number of Avifauna, insects, reptiles, rodents, jackals, pangolins, and monkeys rose significantly. The increase in crown density and forest cover helped restore soil moisture in adjacent land, allowing farmers to interplant nutritious grass species along the edges. The authors of an LF case study in

Table 14: Forestland Change Dynamics in Nepal, 1985–1996

Geographic area	Total land area ('000 ha)	Forest and shrub lands 1985 ('000 ha)	% of total land	Forest and shrub lands 1996 ('000 ha)	Difference between periods ('000 ha)	Difference between periods (%)
High Himalayan	3,507.8	155.2	4.4	197.3	42.1	27.1
High Mountains	2,925.2	1,631.5	55.8	1,757.0	125.5	7.7
Middle hills	4,278.0	1,794.1	41.9	2,056.8	262.7	14.6
Siwaliks	1,889.9	1,444.7	76.4	1,329.6	(115.1)	(8.0)
Terai	2,117.2	591.3	27.9	487.3	(104.0)	(17.6)
Total	14,718.1	5,616.8	38.2	5,828.0	211.2	3.8

ha = hectare; % = percent.

Sources: Government of Nepal, 1985; Forestry Research and Survey Department, 1996.

Kavre (p. 64) observed similar trends. Sharma and Chettri (2003) reported that forest management is an instrument for biodiversity conservation, although sustainable harvest and equitable distribution are major challenges.

In the eastern hills, cardamom plantations initiated under alder forest canopy within CF and LF areas have stabilized the poor and unstable areas below 2,000 m, where landslides were common in the past. The perennial evergreen nature of the plant has restored the ecological stability of these areas. The crop is grown under alders, and both species bind the soil and protect the land from erosion. This ecologically stable farming system has improved many farm economies greatly, and farmers now have reasonable standards of living (Sharma and Chettri, 2003). Even a farmer producing 80 kg of cardamom reports earning more than NRs30,000, a considerable sum in these areas. Moreover, this system does not require much institutional support from government organizations and NGOs. At lower elevations in the area, land allocated for crop production also is being converted gradually to cardamom and alder plantations. The CF and LF areas in the larger landscape are a mosaic of contiguous, forested areas for migratory wildlife and are increasing the connectivity between protected areas (Oli, 2004b).

Stakeholders involved in community and leasehold forestry

Many stakeholders—local communities, local-level authorities, the Government, multilateral agencies, bilateral agencies, donors, and NGOs—have been involved in developing LF and CF. Previously, local officials governed highly formalized institutions called Jimwals or Talukdar. This system linked communal usage to ownership of land in the rural areas. Office holders administered CPRs, including the community-managed forest areas. Therefore, the concept of CF or common resource management already existed, and some say that the modern CF concept is merely “old wine in a new bottle” (Gilmour and Fisher, 1991). The evolution of development planning in the forestry sector started in the 1970s with the transition from the top-down approach to a more development-from-below approach to meet basic community needs.

The CF and LF programs were designed to increase the involvement of local people in the management of forests. Over time, communities

were empowered through exposure and training, and entrusted with usufruct rights. The role of the Forest Department gradually changed from policing to facilitating. Before the initiation of the CF and LF programs, the Government was responsible for managing the forests, while local people used them. The formulation of the 1993 Forest Act and the 1995 Forest Regulations resolved this asymmetry between management roles and responsibilities and forest usage. These laws and regulations clearly specify the roles, responsibilities, risks, and rewards of the Government (forest service officials), CFUGs, and LFUGs. Government officials became facilitators and extension agents, and the Government took on the role of monitoring forest use to protect them from being overharvested or converted to other land uses. The groups, meanwhile, took over responsibility for management and sustainable utilization.

The Federation of Community Forest Users of Nepal (FECOFUN) was formed 11 years ago to lobby for the promotion of CF in Nepal. FECOFUN has district and zonal units working for the benefit of CFUGs and community forests. About 70% of the CFUGs are members of this federation. FECOFUN participates in national CF debates and runs programs to empower CFUGs. Similarly, other federations, such as the Nepal Forest Users Group and the Himalayan Grassroot Women’s Natural Resources Management Association, were formed to cater to the various needs of CFUGs in Nepal. Support for the formation of the federations and networks came from bilateral funding agencies, such as the International Center for Integrated Mountain Development, the Ford Foundation, and the Swiss Agency for Development and Cooperation (SDC), in collaboration with the Government of Nepal. Some support was also provided for program implementation.

Several NGOs also are working on CF and LF. Their involvement and assistance has focused largely on social mobilization, improved governance, and income-generation activities. The Tenth Five-Year Plan (2003–2007) also includes a provision for involving NGOs and civil society in the promotion of CF and LF in Nepal. At the Fourth National Level Community Forestry Workshop, more than half of the 350 or more participants were from NGOs, civil society, and federations and individuals working for the promotion of CFUGs in Nepal.

During the initial phase of CF development, the Government of Australia provided technical and financial support for pilot CF models in two districts

adjoining the Kathmandu Valley. Subsequently, the World Bank provided loan assistance for the implementation of a CF program in the mid-hills. The success of these early programs fostered interest from other funding agencies. The Danish International Development Assistance is supporting CF programs in 38 hill districts, while the United Kingdom's Department for International Development is providing financial and technical assistance in 12 hill and mountain districts and three Terai districts. Similarly, the Government of the Netherlands (through SNV Netherlands Development Organisation) is supporting CF in eight Terai districts. The Government of Germany (through the German Agency for Technical Cooperation) is providing support in three Terai and inner Terai districts. The United States Agency for International Development is supporting CF programs in one hill and three Terai districts. SDC is supporting CF programs in three mountain and hill districts. The Government of Australia, which has been supporting CF programs since its inception, is still doing so in two mountain and hill districts. International NGOs, such as the World Wide Fund for Nature (WWF), IUCN, and the Cooperative for Assistance and Relief Everywhere, also are promoting CF, LF, conservation area, and protected area management in the country.

The work of these agencies has helped build local institutions and enhance the capacity of forest officials and users in the management and sustainable use of forest resources. In addition, members of expatriate staff working on CF projects have taken their experience of CF, LF, and buffer zone management from Nepal to other parts of the world, especially in matters of community involvement in conservation and forest management. Today, CF and LF are so well established in Nepal that they are self-sustaining without the support of these agencies, provided the Government remains responsive and accountable to user groups, and collaborative links with various agencies are maintained.

Second- and third-generation challenges and opportunities for community and leasehold forestry

The first phase of CF and LF focused on expanding forests in degraded and deforested areas with the active participation of local people. The majority of stakeholders agree that the first-generation objective of expanding greenery has been met reasonably. The social objective of promoting grassroots-level gover-

nance and livelihood promotion was somewhat ignored in the first CF phase. Therefore, second-generation issues now demand attention, especially amid reports that local elites are capturing most of the benefits from CF and monopolizing key CFUG executive positions.

The theme of the Fourth National Level Community Forestry Workshop was "Twenty-Five Years of Community Forestry: Contribution to Millennium Development Goals." The workshop identified good governance, livelihoods, and sustainable forest management as the three key second-generation issues that need to be resolved in the coming years. It also suggested that implementation of strategic reforms on these three issues could contribute directly to the attainment of the Millennium Development Goals (MDGs).

External funding agencies provide about 60% of the national CF programs' development budgets. The way the Government and funding agencies participate and form partnerships going forward will have implications for the performance and future of CF programs in Nepal. Iterative interactions of the three key second-generation CF reform issues will impact directly their contribution to the MDGs. However, challenges lie ahead in all three areas.

- **Governance.** The formulation and enforcement of rules to coordinate the activities of individuals within the CFUGs, as well as a facilitative role for the Government, are essential elements of effective and adaptive forest governance. The heterogeneity of individuals in terms of interests, asset ownership, and access to power make collective action challenging. Nepal's bureaucracy has changed over the last 5 decades, and especially since 1990. Previously, the main focus was on channeling goods and services from tenant farmers to the Government and, to a lesser extent, to the people. Now the flow is in the opposite direction. However, a change in attitudes and approaches has not accompanied the changed context. Moreover, Nepal is a multicultural society in which each caste and ethnic group has a strong tendency to favor its own. This means that minority members and women user group members might have less voice than their male counterparts. The extremely poor, unlike the less poor, might not be receiving any benefits at all. Dealing with such heterogeneous groups is a challenge. Political patronage and favoritism in decision making are other threats to the equitable sharing of benefits.

- **Livelihoods.** The purpose of development is to increase human freedom by expanding human capabilities for full and creative lives (United Nations Development Programme, 2004). This demands that people be the beneficiaries of development, as well as the agents of change that drive development. Equitable participation in decision making and in benefit sharing is the key to human development in community forests. Rapid assessment data taken from 12 districts, which were compiled and analyzed by the Community Forestry Division, show that substantial income can be generated from community forests. The challenge is to streamline those resources and the CFUG institutions to achieve livelihood improvements for the poor, the marginalized, and women. Again, the involvement of all the stakeholders in the process is essential to address this issue.
- **Sustainable forest management.** Community and leasehold forest conditions have improved by devolving authority to local CFUGs. The availability of macro-level data on changes in forest conditions can assist policy reform. CF programs and projects funded by external sources of assistance should generate policy-relevant information to fill the gap. Community forest users and foresters working in the field suggest that CF be managed passively.

To address the second-generation CF and LF issues, the Government is planning to create subgroups of poor households within CFUGs. The subgroups will be given part of the community forestland with the consensus of CFUG members. The groups will plant and promote high-value NTFPs, such as medicinal and aromatic plants, in these lands. The Government will provide the subgroups with initial technical and financial backstopping. The produce from the land will be sold in the market or processed locally. The subgroups' entrepreneurship and negotiation skills will be enhanced with support from the Government, bilateral projects, civil society, and CFUGs themselves. Assistance for marketing the products will also be sought. CFUG governance reforms will help the inclusion of the poor and women in the CFUG executive committee membership. Similarly, fund utilization guidelines will be formulated, in collaboration with CFUG, to ensure that at least 25% of the CFUGs' income is spent on pro-poor programs. However, although these constitute

a few strategies for reducing poverty and promoting greater equity, major implementation challenges lie ahead. Until the bargaining and negotiating capacity of the poor vis-à-vis the local elite is enhanced, CF and LF will continue to have limited scope in poverty reduction.

Forest and biodiversity conservation in times of conflict

Nepal has been facing a Maoist insurgency for the last 9 years. As of early 2005, the conflict had claimed more than 11,000 lives. Like other sectors, forest and biodiversity conservation in Nepal are threatened by the conflict. Although pro-people policies have helped forest and biodiversity conservation in many ways, violent conflicts threaten CF, LF, and protected areas (McNeely, 2004). This section examines the effect of the Maoist insurgency on the conservation of Nepal's forest and biodiversity resources.

HOW DO COMMUNITIES MANAGE FORESTRY RESOURCES IN TIMES OF CONFLICT?

The breakdown of law and order in the country as a result of the armed conflict has weakened the chances of lasting peace and diminished hope for sustainable development in Nepal. At the core of the local sustainable development efforts are community-based institutions—traditional institutions that functioned locally, mobilizing local resources and working toward community development. The spirit of voluntarism and philanthropy is nurtured carefully in these institutions. Many of them are still working to meet their goals of serving the community, albeit on a much subdued scale. Many others have stopped functioning.

Among the local institutions that have survived despite the conflict are the CF, LF, and buffer zone user groups. A sense of self-help, combined with the values of conservation and economic gain, has motivated their efforts. However, the prolonged conflict has challenged many of these values. Threats from the rebels and the evolution of a donor-driven NGO culture have influenced the core values that defined such local-level civil society and people's engagement. Despite these challenges, some local-level institutions have survived to provide a neutral cushion against the insurgents and the government army. Because of their resilience and continued presence at the local level during the conflict, urban-based civil society, NGOs, and others also have started to align themselves with, and work through, these institutions. In many places, these grassroots user-group

institutions are the only link between the people, the Government, nongovernment institutions, and the Maoists in forest and conservation area management. However, most of the funds accumulated by the user groups (including poor members' loans) have been diverted from their savings to community development work out of fear that rebels will ask the CFUGs and LFUGs for "donations," or that their funds will be looted.

With the conflict, employment and funding in the development sector reportedly have declined. Thus, many poverty reduction programs have become victims of the Maoist insurgency (Oli, 2004c). This has forced many NGOs to seek ways to continue working at the local level, including becoming more transparent regarding their financial commitments and expenditures, and developing alliances with CFUGs and LFUGs. Once this innovative NGO approach was understood, some government ministries also began to make their funds transparent in public places.

Today, local CFUGs, LFUGs, and buffer zone community user groups in and around protected areas are the main program implementation vehicles for natural resources management in Nepal. Maoists have forced NGOs to register with the Maoist "government" (*Jana satta*), an exercise that allows the rebels to track fund flows and charge taxes. Although many CFUGs and LFUGs expressed their reluctance to register with the Maoist regime, quite a few reportedly have made secret arrangements and secured permits from the rebels to continue working in the rural areas. The CFUGs' strategy is to keep the arrangements from becoming public. In addition, political factors have helped them to continue functioning. These factors include the use of user groups and their federations of CFUGs, LFUGs, and leasehold cooperatives, as well as their alliances for political motivation and bargaining. Also, the groups are organized into specialized organizations, and power-sharing arrangements are becoming more democratic and decentralized. With 36% of the CFUGs' income invested in community development, including school support, road construction, irrigation, and primary health care, the social justice system also is improving. Further, about 3% of CF income is spent on pro-poor programs, which reportedly are increasing (Kandel and Niraula, 2004).

CFUGs have emerged as impartial vehicles for conservation and development by adopting a neutral position vis-à-vis different parties, creating awareness regarding the management of resources, and establishing strong cooperation between different ele-

ments of society. Furthermore, CFUGs and LFUGs have continued working successfully during the conflict by taking action against corrupt CFUG and LFUG members, seeking diverse financial support, and maintaining good working relations with different opposing parties. However, the frequent abduction of rural people by the insurgents and the outflow of able-bodied men from their villages have made effective CF and LF management difficult. The army's occupation of CF areas to set up camps, barracks, or firing ranges, which increasingly has threatened the people's access to CF resources and livelihoods, has compounded the difficulties (*Kathmandu Post*, 2005).

FOREST CONSERVATION DURING THE CONFLICT

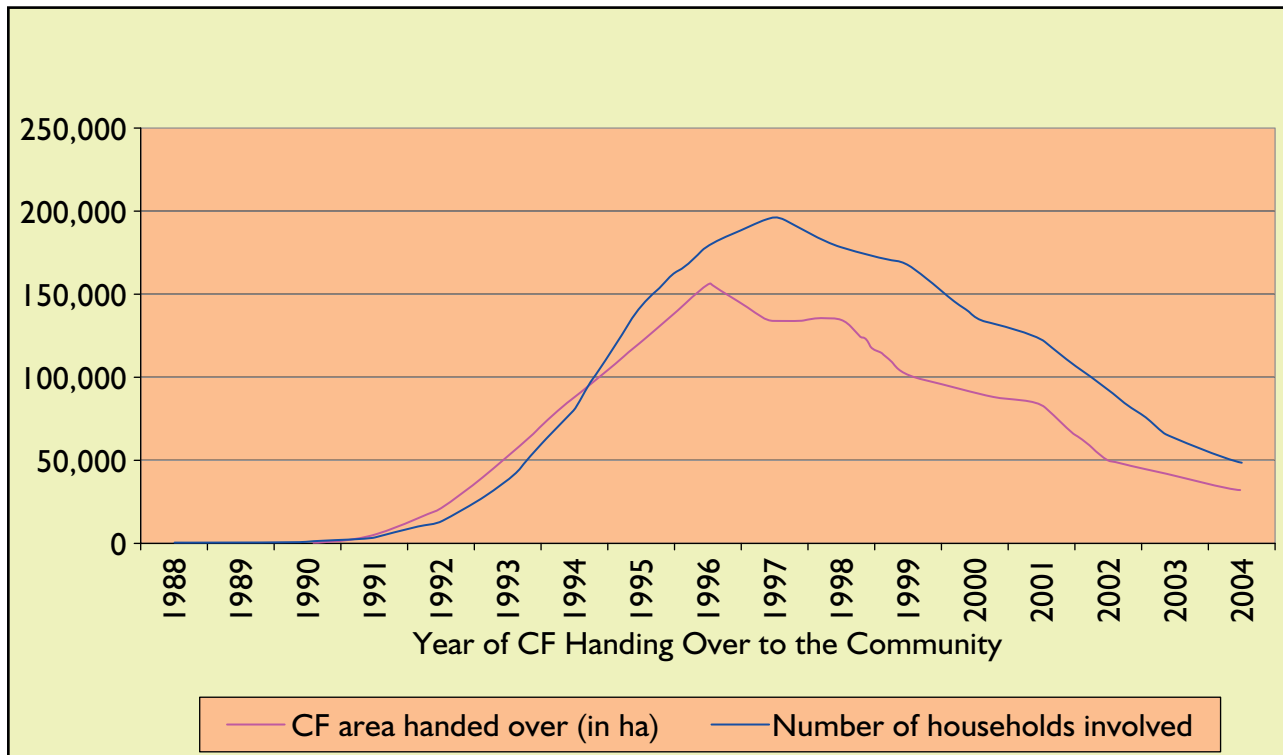
The Maoist insurgency has severely undermined the functioning of CF and LF by restricting the mobility of government officials in the field, and by destroying forestry sector infrastructure. The Forest Department has lost offices and range posts following rebel attacks (Figure 6). Community members and forest guards are afraid to enter forests because of the risk of attacks from security personnel and from the Maoists. In the absence of forest offices and forest guards, timber smuggling also has increased (*Kathmandu Post*, 2002).

Significant damage to government property also has affected the functioning of CF and LF, as well as the handover of CF and LF areas to communities (Figure 6). Under the law, government sanctions are required for the registration and monitoring of CF and LF. The preparation of operational forest plans requires a detailed assessment of the area to be handed over to the community, as well as technical inputs. Forest officials and community members do not want to risk their lives by entering insurgency-hit areas. Since 1996, the handover of CF and LF areas has slowed considerably, which coincides with the intensification of the conflict.

The intensity of the Maoist insurgency differs in each district (Map 3). Furthermore, not all impacts are negative, nor can all impacts be attributed to Maoists. The majority of negative impacts can be attributed to criminals seeking opportunities, while others originate out of need or from the lack of security. Most positive environmental impacts can be attributed to strong community groups, or the fear of violent consequences.

Timber poaching, which is not uniform throughout the country, is especially prevalent in accessible areas. Timber extraction in some CF areas in the Siwalik and Terai continues unabated in the absence

Figure 6: Community Forestry Handover Situation Before and During Conflict



CF = community forestry; ha = hectare.

Source: Department of Forests, Community Forestry Division, 2004.

of any security measures. In these areas, solidarity and social dynamics among community members—and with adjoining communities—are still prevalent. Furthermore, as Siwalik and Terai forests were used commercially for revenue generation and resettlement, indigenous institutions were not involved in their management. Third, India is a great market opportunity for timber and NTFPs. Thus, the management of Terai forests is a major challenge for communities and the Government, even during normal times. Areas that are patrolled by government security forces rarely fare much better because poachers know the whereabouts of the patrols. Furthermore, security forces usually will not venture far from their barracks, and they head back to their bases well before dark.

Maoist-controlled areas depend on local cadre leadership. In some areas, Maoists protect forests and hunt down poachers, depending on their needs and opportunities for the sale of forest products. For example, a group of Maoists evicted some 200 squatters by destroying their illegal dwellings in the Koshi Tappu Wildlife Reserve. Eyewitnesses reported that the Maoists beat the squatters and ruined their rice

fields by letting their cattle graze on them. The area is generally a safe haven for timber smugglers, although they often clash with Maoists (*Himalayan Times*, 2004). In other areas, rebels have taken over community forests and are using the profits from timber sales to finance their activities (*Kathmandu Post*, 2003c; *Himalayan Times*, 2003; *Nepali Times*, 2004).

The Maoist insurgency's greatest impact on the lives of forest-dependent communities is double taxation, i.e., being forced to pay taxes to the Government as well as to the insurgents. The impacts on NTFPs are not well-known because of the security situation. However, NTFP dealers have reported that insurgents have fixed the rate for the export of medicinal plants and cardamom normally at 10% of the market price.

High-value products are taxed differently. For example, yarsa gumba (*Cordyceps sinensis*)—an expensive medicinal herb that grows wild in the western highlands and is believed to be an aphrodisiac that cures impotency and increases vigor—is highly sought after on the international market. Its price in the local market is said to be NRs70,000–100,000 (\$900–1,300) per kg. However, it can fetch as much

as NRs200,000 (\$2,500) per kg in the international market (*Kathmandu Post*, 2003a; *Kantipur Online*, 2004). Maoists reportedly are benefiting from the large-scale smuggling of yarsa gumba out of Nepal to India and the PRC. Merchants transporting the medicinal herb pay the tax to the controlling force in a particular region, whether Maoist or the Government (*Kathmandu Post*, 2003a).

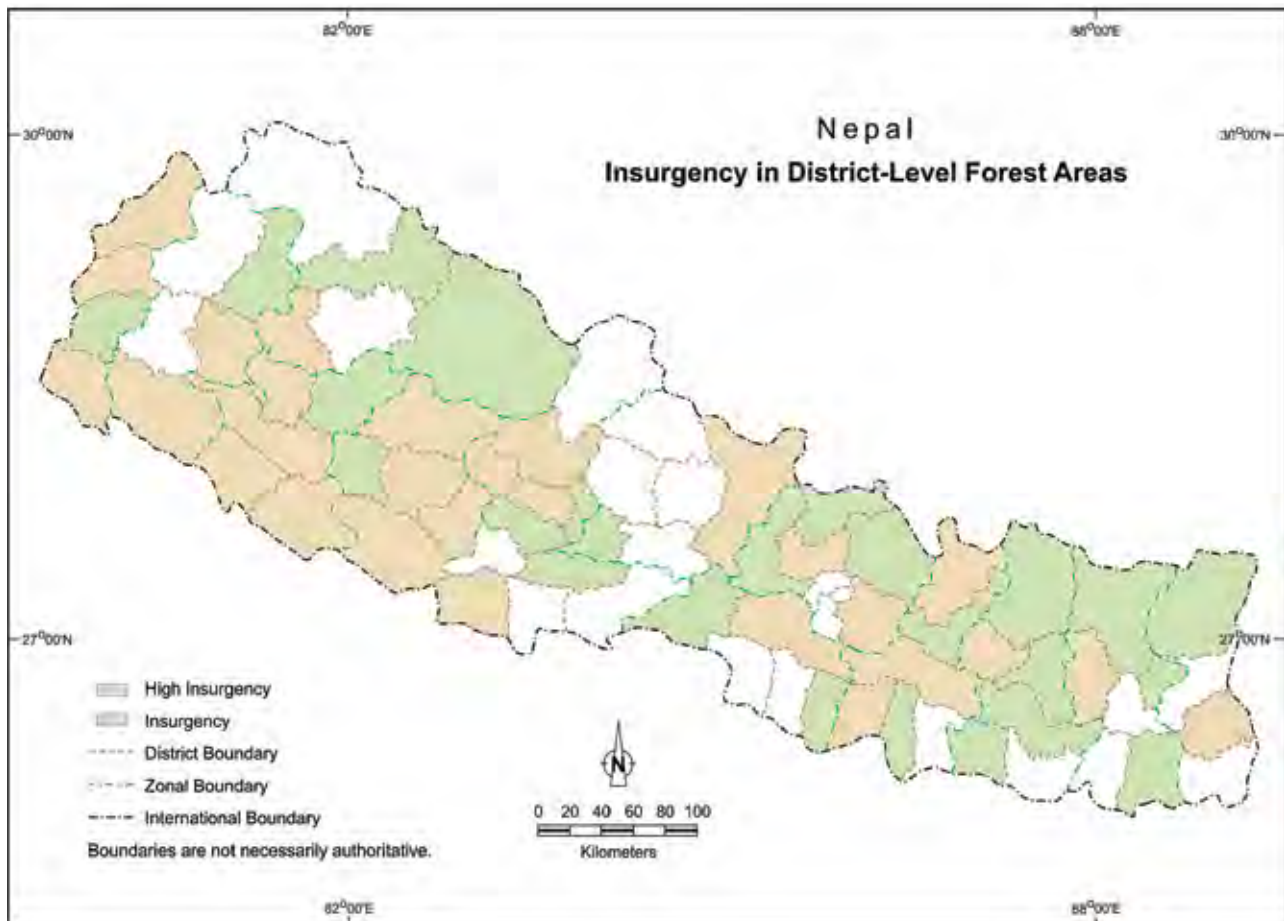
In some areas of Nepal, positive environmental impacts of the Maoist insurgency have been observed. The most visible impact has been the regeneration of forests and NTFPs in some mid-hill regions. Two such districts east of Kathmandu—Kavre and Sindhupalchok—have seen dramatic growth in forest cover over the past several years. Forest regeneration has been so successful that locals also are noticing a return of wildlife species (*Nepali Times*, 2004). The primary reason for forest regeneration in some mid-hill regions in Nepal is the out-migration. More than 200,000 people were displaced as of 2003, according to one estimate (Uprety, 2004). Men in many villages

have left out of fear of being recruited into the Maoist forces; others have left their villages out of fear of being targeted as collaborators by security forces.

The poachers' fear of entering forests is another reason behind forest rejuvenation and the return of wildlife in some districts. Maoists and security forces have been known to severely injure or kill poachers. Poaching also has decreased in some districts because security forces and Maoists have confiscated firearms from local populations. An additional rationale is that the increased insecurity has decreased the mobility of some rural people.

The positive environmental impacts observed in some regions of the country, however, are usually to the detriment of other areas. The out-migration from some mid-hill districts, for example, has placed additional environmental burden on other areas of the country. Depopulation of the hills has increased the pressure on forests in the Terai in the south and along Nepal's northern border with Tibet (*Nepali Times*, 2004). The scale of the migration has not been documented fully.

Map 3



Source: Habitat Himalaya, 2002.

PROTECTED AREAS IN TIMES OF CONFLICT

Murphy et al. (2004) reviewed the impact of the Maoist insurgency on conservation. A general feeling of lawlessness prevails in many areas of the country, which has created a free-for-all mentality regarding natural resources in some regions. The current state of Nepal's protected areas leaves many species at risk from poaching or overexploitation. In some regions, the working mechanisms that oversee sustainable resource use are absent; in others, protective measures have broken down completely. This potentially could erase—or at least set back—many conservation successes in Nepal.

The only reliable data on the poaching of significant species is for the Asian one-horned rhinoceros population. This is undoubtedly the result of decades of successful, high-profile conservation efforts for this flagship species. While records exist for a few other species from smuggling seizures, the data are scant. Poaching of one-horned rhinos increased significantly after a state of emergency was declared in November 2001. The reduction of Royal Nepal Army (RNA) units within the protected areas, and the ensuing attacks by Maoists on park offices and security forces, left rhino populations vulnerable to poachers. Nepal was home to 612 one-horned rhinos, according to a 2000 census. The Royal Chitwan National Park (RCNP) recorded the bulk of this endangered species with 529 at the time of the census. Others were reported in the Royal Bardia National Park (RBNP) and the Royal Suklaphanta Wildlife Reserve. Six rhinos were poached in the RCNP in 1998, according to the Wildlife Department Annual Report (*Kathmandu Post*, 2003b). Between April 2002 and March 2003, 23 one-horned rhinos and 8 rhinos were killed by poachers in RCNP. From April 2003 to March 2004, poachers took 17 one-horned rhinos in RCNP and RBNP. The decrease in poaching is credited to the arrest of 50 rhino poachers, as well as the strengthening of anti-poaching units within the rhino parks (*Kathmandu Post*, 2004).

The Maoists began their assault on protected areas by strategically striking and destroying outlying protected area guard posts and park offices. As these targets were remote and sparsely staffed, they were extremely vulnerable. The Maoists continued attacking outlying posts, commonly burning most to the ground. This pushed the RNA and park staff into

government-controlled district centers. Many protected areas are now unguarded and vulnerable to unchecked resource extraction and biodiversity loss. Protected areas can be categorized in two ways: those with army soldiers and those without. Maoists are believed to use the protected areas that are free of soldiers as training grounds. Two protected areas where Maoists have total control are the Dhorpatan Hunting Reserve and the Makalu-Barun National Park.¹⁷ The Dhorpatan Hunting Reserve is in midwestern Nepal, where the Maoist movement originated. Makalu-Barun is in northeastern Nepal, adjacent to Sagarmatha (Mount Everest) National Park. One major concern is that Maoist control could spill into Sagarmatha, a World Heritage site and arguably Nepal's most famous national park. Before Maoist attacks on protected area infrastructure, Nepal's parks had 112 guard posts positioned throughout the system. This number had decreased to 34 by 2002, a 70% reduction (Yonzon, 2004).

Officials are concerned about projects in the Annapurna Conservation Area after Maoist rebels waged numerous recent attacks on various offices. The King Mahendra Trust for Nature Conservation launched the Annapurna Conservation Area Project in 1986, the first and largest conservation area in Nepal. The project was initiated as an innovative approach to protected area management through the use of community user groups. In November 2002, Maoists attacked the main office, setting it ablaze (*Himalayan Times*, 2002). Demands for "donations" from park workers are reported to be frequent.¹⁸

Earlier, Maoist insurgents threatened the local community engaged in conservation. Since then, as part of a local-level conflict management strategy, more than 1,000 community members from these remote areas agreed to pursue conservation work for the benefit of the people. In doing so, they asked the insurgents not to hinder their activities and prevent the meager funds from flowing into their poor areas. All the same, it has become extremely difficult for the community to engage in conservation (*Kantipur Daily*, 2005).

Clearly, the Maoist insurgency's impact is not limited to the continuing forestry management programs; it also has impacted biodiversity conservation and development in general. The local-level elected

¹⁷ Personal interview with a World Commission on Protected Areas (WCPA) official, August 2004, whose identity is protected for security reason.

¹⁸ Personal interview with a WCPA official, August 2004, whose identity is protected for security reason. A "donation" is the term used to describe extortion by the Maoists. Though not widely admitted, this form of extortion is prevalent in Nepal.

Map 4



Source: Department of National Parks and Wildlife Conservation-Park People Program, 1999.

bodies have been dissolved, leaving behind crises over the ownership of projects and plans. The local-level user groups face blame from the Government if they collaborate with the insurgents on conservation or development. On the other hand, user groups working in collaboration with the Government face punishment from the insurgents.

To ease this situation, neutral institutions are important. IUCN and WWF have worked in the conservation sector for more than a decade. However, their approach toward conflict management, especially in conservation, seems to be to keep away from the warring factions rather than to help develop codes of conduct for biodiversity conservation during times of violent conflict. Instead of facing the challenges of mediation for biodiversity conservation, their strategies have been to support local-level NGOs or user groups as a conduit for their project implementation, and to continue monitoring them from the center. Yet IUCN and WWF, because of their international position, could raise awareness among all the parties

and develop strategies to boost the morale of park and conservation authorities during conflict. They also could forge alliances with conservation groups, federations, and journalists, thereby putting pressure on warring factions. In the absence of any support from mainstream conservation organizations, the fate of biodiversity conservation in times of conflict is in the hands of powerless community user groups.

Lessons for the future

Based on experiences gained through Nepal's CF and LF programs, some lessons on how to use improved forest management to contribute to poverty reduction in rural areas include

- The old theory of Himalayan degradation linked only population and resources. The review found that institutions mediate between population and resources. Therefore, institution building at the local level is essential—and more important than planting trees on degraded lands. Further,

though the population of the mid-hills has risen, the quality and area of forests have increased with reforms in the institutional setup governing the use of these resources.

- One of the roles of the Government is to enhance the capacity of decentralized, autonomous, and incentive-compatible institutions and organizations. This is a prerequisite for assigning resource management authority to them. The other roles of the Government are to facilitate collaborative partnerships with these institutions and organizations, and to continue to invest in infrastructure and services. The Government also must develop policies that favor CF and LF, ensuring that markets for the produce function better, and the risk and effects of market failures are minimized.
- Even if a decentralized system of forest management is set up and activated, the local elite might capture these decentralized units through proxy participation, low accountability, and lack of transparency and equity. To prevent this, disadvantaged groups need to be brought into all levels of the decision-making process. Consequently, the reform of local-level governance is also fundamental.
- The concept of user groups is related to more than forest resource management. User groups are also the platform and vehicle for undertaking different development activities defined and articulated by the local people. Their capacity, therefore, needs to be enhanced continually.
- National ownership of the aid process is increasing. NGOs and civil society groups that work directly through these local-level organizations and institutions can improve the life of the people and reduce the conflict.
- Because of their resilience, local-level institutions can act as a neutral forum for conservation, development, and peace building, and continue working in times of conflict.
- Transferring resource-use rights to women and the poor instills confidence in them and enhances their livelihood opportunities and security.
- Technical intervention to increase the productivity of the forest should be prioritized in areas where the institutions at the user-group level are robust. The first priority should be to strengthen the institution, followed by technical intervention. Only then can forests generate more livelihood opportunities for the poor, women, and disadvantaged groups. This also will help them

manage resources in a more sustainable and scientific way.

- Continuous monitoring should be carried out in a locally understandable manner to allow CFUGs and LFUGs to capitalize on their success and rectify their mistakes. Geographical information system techniques need to be used more extensively to support monitoring, evaluation, and planning.
- Compromise between needs-based and rights-based approaches to forest management is essential. Transferring ownership rights to needy people also will help users understand their rights.
- Alliance building and the roles of federations, journalists, and the media have to be understood to enable forestry to become a vehicle that contributes to poverty reduction.

Case study of Bhasme Pakaha and Alche Chour Tallo Pokhari leasehold forestry groups in Kavre District

In Rabiopi Village Development Committee (VDC) of Kavre District, in the mid-hills of Nepal, the local forest did not have a single standing tree left for fuelwood or fodder due to exploitation. Before the implementation of the LF model, harvesting of forest products was punishable by law. Although people were denied legal access for any activity, they continued to exploit the forest products indiscriminately. These areas were suffering the tragedy of the commons.

In collaboration with the Forest Department and the local community, the poor groups living close to the two degraded sites were identified, and a decision was made to hand over the degraded areas on lease to the poor community. The project began with the formation of community user groups from among the poorest households. Ten hectares of degraded land (one with an area of 4 ha; the other, 6 ha) were leased for 40 years to the two poor groups, which consisted of six and seven households, respectively. The committees designed their own management plan in consultation with technicians from the Forest Department. The representation of women in the committee was low. The first committee had one woman, who is the chairperson; the other had two women. Once the lease agreement had been executed with the Forest Department, the committee divided the land equally between the user-group households, and each household demarcated its area to reduce potential conflict.

The first LF group was established in 1994; the other, a year later. The authors of this report visited the sites and conducted a subjective assessment in consultation with user group members. The first LF group is now 12 years old, while the second is 11 years old. When the first LF group applied control and protection measures, pine seedlings appeared naturally within the first year. In the second site, which is near sal trees (*Shorea robusta*), sal forest seedlings began to appear. The forest users then planted mangoes, bamboo, and pineapples, as well as some fodder species.

After nearly a decade, users seem to be self-sufficient in terms of fuelwood, forest litter, and animal fodder. During this period, government agencies, particularly the forest and livestock departments, worked closely with the groups to provide technical know-how and inputs, such as seedlings, goats, and buffaloes. Both groups reported that 5 years into the LF project, 50% of their fuelwood requirements came from the forest. Now they are self-sufficient in fuelwood. Forest density has improved from virtually no trees to 2,400–4,000 trees/ha of leasehold forest area. Each household harvests 250–300 kg of fuelwood per year from the forest.

With training on livelihood options, user groups also have planted fodder trees on their farmland. Today, each farm in the project area has about 35 fodder trees. This, along with other farm by-products, is sufficient to meet local fuelwood needs. The trees in the LF are not ready for use as timber, although poles required for farm operations are harvested. The regeneration of forests close to the settlement helped reduce the time women spend collecting fuelwood, fodder, and leaf litter reportedly from 8 to 5 hours, saving about 3 hours per day. The women are investing this saved time in vegetable cultivation and animal care, significantly increasing household income. The sale of milk, goats, and vegetables generated a reported net off-farm income of more than NRs35,000 per year. The other important contribution of LF, according to users, is from leaf litter. The soil organic matter on farms has increased as a result of the use of forest litter and farmyard manure. Earthworm activity, which is a good soil organic matter indicator, was visible everywhere on the farms.

LF groups invest 30% of their income in community development, mainly to pay for the services of a schoolteacher, minor irrigation, and some religious and cultural activities. Another 40% is invested

in capacity building of user group members, 10% is reinvested in forest plantation, and 35% goes toward protecting the forest. This relatively large investment in protection was in response to the fear of encroachment by outsiders, a major issue.

The biodiversity status of the LF sites also was assessed during the field visit. A quadrat of 5 m² was prepared, and measurements were taken from five sites in each leasehold forest. Vegetation species and the number of trees within each quadrat were counted and converted into per hectare averages. Based on these measurements, plant density was found to have increased 66%, while species richness had increased 49%. Users reported a 30% increase in avifauna, and a 40% rise in the occurrence of transitory wildlife, including leopards, jackals, and hares. They also reported a 40% increase in reptiles, such as lizards, snakes, and pangolins. Further, users reported a 10% increase in various NTFPs.

Entrusting the community—especially the most marginalized sections of the community—with the management of degraded public lands has increased their sense of responsibility and ownership over the resources. Through their own organization of user committees, the poor have become the custodians of the LF area. They have invested time, effort, and resources in the restoration and rehabilitation of the land. The groups have undertaken forestry and planted horticultural crops and fodder grass, which has helped conserve biodiversity and increase household incomes. This contractual change—leasing degraded areas to the poorest sections of the community, and enhancing their capacity through the deployment of local NGOs—has helped to arrest land degradation, increase forest crown density, and improve soil structure.

While this is a success story, second- and third-generation problems are emerging. For example, what will be the status of the LF area when the 40-year lease expires? Will the lease then extend to the descendants of the current users, who have made huge investments to restore the degraded land and conserve biodiversity? What benefits will user group members have if they migrate out of the area? Will they be allowed to sell their share? Since land resources are finite, what alternative arrangements for their use will evolve in the future? What new forest-related management modalities for product processing and marketing could be developed to help these groups? These are just some of the emerging issues that need further attention.

Case study on Community Forestry: The Kafley Community Forest of Lalitpur District

Kafley Community Forest in Lalitpur District is about 18 kilometers east of Kathmandu. It is one of the 10 community forests of Lamatar VDC. These forests cover about 550 ha and are managed by 782 households. These lands were handed over 14 years ago to a CFUG, known as the Mul Ban, which managed the resources as a single community forest. Later, the community forest and the CFUG were split into 10, one of which was Kafley. This was created in 1993 as a separate community forest with its own constitution. The 550-ha forest is the watershed at the foothills.

Kafley Community Forest covers 94 ha. Its operational plan was revised in 2002, and 68 households now manage the forest. CFUG members of this forest reported that only 2 households were very poor, 50 were of middle income, and the remaining 16 were better off. CFUG members have elected 11 executive committee members, of which five are females (two from poor households). A closed canopy of pine (*Castanopsis* spp./*Schima* spp.) covers about 70% of the CF area. The remaining 30% comprises shrubs, bamboo, and ferns. The users protect the forest from grazing, encroachment, fires, and hunting, while managing the gullies. They voluntarily patrol the forest on rotation. The executive committee regulates the harvesting of forest products by season, as well as harvesting equipment.

LIVELIHOOD STRATEGIES

The two poorer households do not have any private agricultural land and are engaged in daily labor. The daily wage rate is NRs175 for males and NRs95 for females. The 50 middle-income households produce enough food on their own farms for about 8 months. Each of the better-off households sells food worth about NRs10,000–12,000. About 80% of people from middle- and higher-income households also are engaged in salaried jobs, although the proportion of females is less than 10%. Two males have gone to work in Malaysia. About 5% of households sell milk, and about 7% of households also are engaged in small-scale businesses or shops. Some households have started to grow vegetables (tomatoes, green peas, cauliflower, etc.) to generate income.

IMPROVEMENT IN FOREST CONDITIONS

The Government started a pine plantation in 1980 to improve the condition of the forest. However,

people showed little interest in conserving the forest. When this and other forests were handed over to the Mul Ban users committee about 16 years ago, the overused and degraded area was covered mainly with ferns and shrubs. However, after 2 years of collective management, the 550-ha forest was divided—first into seven community forests, and then into 10. The handing over of the forest to the users (now 68 households) heralded a process of forest regulation and rule. The users crafted the rules and regulations by consensus, and sanctioned rule breakers. The design and enforcement of operational rules by the users themselves, in addition to the continuous support from the District Forest Office (DFO) and exposure visits and training of the users, inspired the users to improve the condition of the forest and use it in a more sustainable way. Before the forest was handed over, it was degraded; now it is a high and dense forest. Except for the rocky and bushy area that accounts for 30% of the community forest, the forest has many poles and trees. The density of plants and trees has increased substantially. The latest forest inventory shows 7,088 regenerated plants, 141 poles, and 31 trees per ha of forest area. The forest is divided into five management blocks. The forest has no invasive species. Avifauna has increased; deer, rabbits, leopards, snakes, and other animals are present in great numbers. Medicinal and aromatic plants, including cardamom, also are plentiful. Last year, the user groups also planted 20 culms of bamboo.

The impact of these improvements on forest conditions is visible. Moreover, the water flow in streams has increased substantially, even during the critical season. The users used to collect fuelwood from Phulchauki, about 15 kilometers from their residence. Now, the fuelwood from the community forest is sufficient for all the households, and CFUG sells the surplus to outsiders. Even the number of trees on vacant private land (near the gullies and streams) has increased. The relationship with forest officials has improved significantly: the users do not need to obtain a permit from them to harvest the forest products. They follow the operational plan, which they prepared and endorsed in collaboration with DFO. The underlying factors leading to the improvement of forest conditions reportedly were (i) the facilitative forest policy of the Government, (ii) increased awareness of the users, (iii) support from the forest officials, (iv) devolution of forest control to users, (v) regulation of forest harvesting by the users,

- (vi) forest guarding and patrolling by the users, and
- (vii) provision of training to the users.

DECISION MAKING AND BENEFIT ACCRUAL

The users hold a General Assembly at least once a year. The users elect an executive committee, which is accountable to the users. The forest products are distributed among the users based on fiscal equivalence or equality. However, one of the poorer households received free timber (0.57 cm³). The users have decided to provide NRs8,000 to the children of *Dalits* (lower caste) to enable them to attend school. Similarly, 2 *ropanis* (equivalent to 0.1 ha) of the forest have been allocated to one poorer household to plant cardamom; the household can take 80% of the produce, while the remaining 20% accrues to the CFUG fund. With regard to the benefits women receive from the forests, users reported that their time spent fetching water, fuelwood, and leaf litter has decreased substantially. Further, the drudgery of carrying heavy loads over long distances also has declined because of the easy availability of water and forest products from the community forest. Women also have become more assertive, which is reflected in their participation in public forums and meetings. They use their saved time to grow green vegetables and attend ceremonies. However, many users said that the Dalits,

the poor, and women have not benefited as much from the training. The following reasons were cited: (i) the training sessions are attended mostly by the committee's chairperson and vice-chairperson, who do not share the skills and knowledge acquired; (ii) the incentive to attend the training is mainly for the daily subsistence allowance; and (iii) decision making is still the domain of the rich and the elite.

INCOME AND EXPENDITURE FROM THE COMMUNITY FOREST

The CF has maintained a record of the amount of products harvested from the forest for the fiscal year 2004–2005. The main forest products harvested are fuelwood, twigs, timber, grass, and leaf litter. The users have sold some of the surplus fuelwood (125 head-loads) to outsiders as well. CFUG also keeps track of the sources of funds generated and their utilization. The figures are publicly audited, and a copy of the audited report is shared with DFO. During the fiscal year 2004–2005, CFUG generated NRs145,067, part of which was spent on various activities, leaving a balance of NRs67,384 in its bank account. This money could be used toward a poverty reduction program. The users need a sensitization workshop to initiate programs to improve the livelihoods of the two poor families.

POVERTY, HEALTH, AND ECOSYSTEMS

SARS and Avian Influenza: Exploring the Role of Conservation and Veterinary Health in Addressing Zoonotic Diseases in Asia

Anne Hammill, Dina Giannikopoulos, and William Karesh¹⁹

Introduction

The growing threat of animal-borne, or zoonotic, diseases in the Asia and Pacific region was made devastatingly clear with the outbreaks of severe acute respiratory syndrome (SARS) in 2003 and avian influenza in 2004. The real (and potential) geographic reach of these outbreaks, as well as their socioeconomic impacts and associated response measures, highlighted the changing landscape of human health. The metaforces of globalization, urbanization, and population expansion that have shaped much of Asia's development trajectory also have undermined environmental sustainability and animal health. The convergence of these trends—along with more culturally determined factors, such as food preferences and traditional farming practices—has inextricably linked the health of wildlife, people, and domestic animals. Zoonotic pathogens are estimated to be three times more likely to become emerging infectious diseases, signaling an urgent need to broaden the scope of public health to consider carefully animal health and its environmental determinants (Enserink, 2000). This implies the need for greater cooperation between disciplines and sectors, particularly

between public health professionals, ecologists, and veterinary health specialists, to address a growing threat to human security in the Asia and Pacific region.

This case study examines the causes and impacts of, and responses to, two recent zoonotic disease outbreaks—avian influenza and SARS—in the Asia and Pacific region. In so doing, it aims to demonstrate the close connections between animal and human health, how these connections can lead to zoonotic disease outbreaks that disproportionately affect the poor, and why this calls for new and more integrated approaches to dealing with public health issues.

Background: the growing threat of zoonotic diseases

The World Health Organization (WHO) describes zoonotic diseases, or zoonoses, as “those diseases and infections [the agents of] which are naturally transmitted between vertebrate animals and man” (WHO/Food and Agriculture Organization [FAO], 1959). Such diseases are transmitted to humans in a variety of ways: (i) direct contact with infected animals; (ii) ingestion of contaminated food, water, or other organic matter (such as feces, urine, or saliva); (iii) inhalation; and (iv) through arthropod vectors, such as mosquitoes, fleas, and ticks (Lane and Anderson, 2001). Examples of zoonotic diseases (and their animal hosts) include bubonic plague (rodents), influenza (birds, horses, and pigs), West Nile fever (birds), Ebola (primates), and HIV/AIDS (primates). Of the 1,415 known pathogens,

¹⁹Research and preparation for this study was made possible in part through a research support grant from the International Development Research Centre (IDRC) in Canada for a project entitled, “Animal Health and Human Health—IUCN World Conservation Conference, Bangkok 2004.”

researchers estimate that 849 (60%) are zoonotic. Further, 73% of the 156 pathogens that are considered emerging reach human populations through animals (Enserink, 2000).²⁰

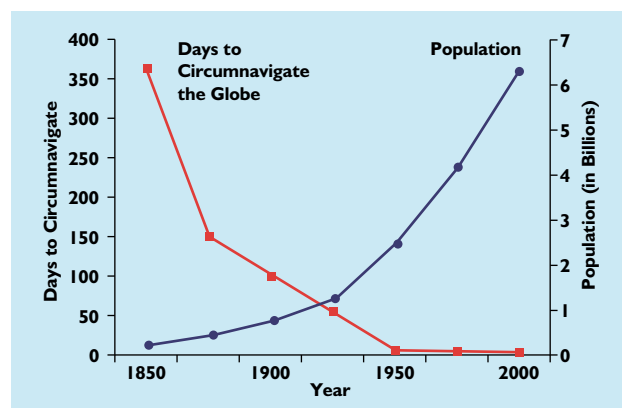
The increased risk of transmission of these zoonotic pathogens can be attributed to a number of factors largely related to the allied trends of expanding human populations (in terms of numbers and settlement patterns), and an unprecedented globalization of agriculture, trade, and human travel. These determinants include

- **Increased contact between humans and animals.** Rapidly-growing and more concentrated human and farm animal populations are bringing people and animals into closer contact, especially in regions, such as Southeast Asia (Trust for America’s Health, 2003). While population growth rates in Asia and the Pacific have declined rapidly, some 3.7 billion people—about 60% of the global population—still live in the region. Much of this growth is occurring in cities. The United Nations Human Settlements Programme reports that Asia’s share of the global urban population has risen from 9% in 1920 to 48% in 2000, and many Asian cities are doubling their population every 15–20 years (UN–HABITAT, 2003). This increase translates into more crowded conditions, facilitating animal–human transmission of pathogens, as well as human–human transmission.
- **Movement of people and farming into wildlife habitat.** The growing need to accommodate more people—and the associated demand for increased agricultural production—has encouraged settlement in areas where humans have never lived. This, coupled with new or changing agricultural practices in previously wild areas, can put humans in contact with zoonotic pathogens by increasing proximity and/or creating conditions that favor an increased population of the microbe or its host (Morse, 1995).
- **Changes in animal husbandry and feeding practices.** Linked to the expansion of farming is the role of intensifying livestock production systems. Animals usually are limited to confined spaces with the waste from the production

system, creating unhygienic conditions ideal for disease transmission. The increased use of rapid automated slaughter practices and industrial feedlots has been associated with *E. coli* outbreaks, while the practice of feeding animal protein to cattle to cut costs is believed to have resulted in Bovine Spongiform Encephalopathy or “mad cow” disease (Nierenberg and Garcés, 2004). Moreover, many industrial Animal farms are located beside or within rapidly-growing cities. This is especially the case in Asia, which has the fastest-developing livestock sector in the world, fueled by a steady increase in meat consumption in the region.

- **Increased movement of goods and people.** More efficient and far-reaching transportation networks and trading systems have facilitated the expansion of agriculture. In the past, disease outbreaks were more likely to be isolated geographically and, therefore, contained. The historical expansion of trade routes, colonialism, and the transportation revolution surpassed geographic boundaries and introduced infections to previously unaffected parts of the world. Cargo ships and especially air travel have allowed this to happen even more quickly. Pathogen reservoirs can travel across oceans in a matter of hours and infect unsuspecting hosts. When considered against the background of a rapidly-growing global population, the disease implications of increased mobility are clear (Figure 7).

Figure 7: Speed of Global Travel in Relation to World Population Growth



Source: Murphy and Nathanson, 1994.

²⁰ Emerging infectious diseases are defined as “diseases that have recently increased in incidence or geographic range, recently moved into new host populations, recently been discovered or are caused by newly-evolved pathogens” (Daszak et al., 2001).

- **Trade in exotic species.** Among the goods that are being moved around the world through expanded transport and trade networks are wild-life species. The \$6 billion global exotic pet trade, legal and illegal, has been implicated in the spread of zoonotic diseases, such as monkeypox in the United States (Karesh et al., 2005). In this instance, Gambian giant rats carrying the monkeypox virus had been exported to the United States from West or Central Africa. These were housed with pet prairie dogs and sold as exotic pets. One of the prairie dogs went on to bite and transmit the virus to a young child in Wisconsin, leading to an outbreak of the disease in the Midwestern states in 2003.
- **Food habits.** Cultural food preferences in different parts of the world also have played a role in disease transmission between animals and humans. In Africa, for example, the consumption of so-called bushmeat has been implicated in outbreaks of HIV/AIDS and Ebola (Karesh et al., 2005). In the case of SARS, the masked palm civet—a cat-sized animal considered a delicacy by the Chinese—is believed to have been involved in the transmission of the virus. Moreover, the live animal markets that sell and slaughter these and other animals to meet the demand for fresh meat are potential hotbeds of the disease.
- **Lack or breakdown of public health measures.** Lapses in health and sanitation measures, particularly in developing countries and the inner cities of developed countries, can create conditions allowing the emergence or reemergence of pathogens. These are typically associated with issues of water supply, waste disposal, vector control, and maintenance of immunization programs.

Other factors contributing to zoonoses include pathogen mutation and new forms of transmission, for example, xenotransplantation, or the transfer of organs or other tissues from animals to humans (Murphy, 2002).

These determinants can come together in a variety of circumstances to increase the threat of zoonotic disease outbreaks in communities, countries, and regions. The transboundary nature of these diseases—in terms of outbreaks and impacts—can complicate response measures, as they are more difficult to isolate and control. Further, the impacts of these diseases are costly in terms of human health (morbidity and mortality) and socioeconomics (loss of local

livelihoods, trade embargoes, tourism decline, etc.). The following two sections highlight the emergence and impacts of two recent zoonotic outbreaks in the Asia and Pacific region.

Avian influenza in South Asia

In 2004, Southeast Asia saw one of the most dramatic outbreaks of zoonotic diseases in recent history. Avian influenza—commonly known as bird flu—affected Cambodia, People’s Republic of China (PRC), Indonesia, Japan, Republic of Korea, Lao People’s Democratic Republic (Lao PDR), Malaysia, Thailand, and Viet Nam (CDC, 2004). These outbreaks resulted in the eradication of more than 120 million birds, and they were implicated in some human fatalities in Thailand and Viet Nam. The region continues to be at risk. A third wave of infection started in mid-December 2004, and cases were still being reported when this case study was being written. Cambodia and Indonesia confirmed their first human cases of the H5N1 virus strain in April and June 2005, respectively. Evidence suggests that the virus is now endemic in parts of Asia and is evolving in ways that favor the onset of a pandemic (WHO, 2005). Avian influenza poses significant risks to the region’s economic and public health, and is likely to hinder poverty reduction strategies if preventive measures against more outbreaks are not taken. National and international efforts to control the disease are necessary to ensure economic, social, and political stability in Asia.

AVIAN INFLUENZA: AN OVERVIEW

Avian influenza is an animal disease that affects birds primarily, with occasional occurrences in other animals. Caused by Type A strains of the influenza virus, it manifests itself in two forms: (i) low pathogenic avian influenza, with symptoms ranging from mild illness and fatigue to reduced egg production; and (ii) highly pathogenic avian influenza, such as H5N1, a contagious and fatal form of the disease that can be detected by sudden onset, rapid and severe illness, and death (WHO, 2004c). It is extremely contagious among bird populations, particularly domestic chickens and turkeys, which have less resistance to the disease than wild birds. The virus is spread directly to humans through contact with secretions from infected birds. Once in humans, the virus causes severe disease with high mortality rates.

Human-to-human transmission is rare, although cases of infection through close personal contact are still being investigated.

The disease, initially detected in Italy more than 100 years ago, now exists worldwide (WHO, 2004c). Avian influenza, which surfaced primarily in Europe and the Americas a number of times between 1959 and 2003, is new to most Asian countries (WHO, 2004b). The first Asian outbreak of the H5N1 strain of avian influenza occurred in 1997 in Hong Kong, China. It prompted immediate and drastic action that included the culling of Hong Kong, China's entire poultry population—roughly 1.5 million birds—in a matter of days. Concurrent with this outbreak, the first human cases were documented. Eighteen people suffered from severe respiratory symptoms, six of whom died (WHO, 2004c). The disease was catapulted into the international spotlight during the massive 2003–2004 outbreaks in Asia, which occurred in three waves (January–April 2004, July–October 2004, and December 2004–April 2005).

The possible causes for the emergence of outbreaks are varied, including contact between wild and domestic birds. Migratory waterfowl are considered natural hosts and reservoirs for low pathogenic strains of the virus, and might infect poultry through exposure at live markets or in nature (WHO, 2004c). The virus becomes highly pathogenic by genetic changes in domestic poultry. Domestic chickens are highly vulnerable to the disease, requiring the adoption of extreme measures upon detection of illness to prevent epidemics, including extermination of entire populations. Domestic ducks, commonly raised outdoors in Asia, are known to carry pathogenic strains, such as H5N1, and shed the virus in feces, often without ever showing signs of the disease. Domestic ducks can infect wild birds sharing the same ponds or wetlands. Live markets—with their highly concentrated bird populations and wide geographic range of producers converging there to trade—have been implicated as sources of epidemics. This is particularly true in Asia, where poultry production has increased significantly in recent years. Thailand alone accounted for nearly 7% of the global meat trade in 2003, having increased production by 32% and exports by 74% between 1999 and 2003 (Newcomb and Harrington, 2004).

Poultry production is an important financial resource for economies throughout Asia. As a result, bird populations are growing, and farms are becoming more concentrated to meet the burgeoning demand. This leaves poultry in these regions increasingly vul-

nerable to avian diseases, and is likely to make prevention of outbreaks difficult. As much as 80% of poultry is being raised on backyard farms or in small-scale production, which can make containing bird flu more difficult (WHO, 2004b). These operations are harder to monitor and regulate than large farms.

What is particularly troubling about avian influenza is its potential to spark a global human flu epidemic (WHO, 2004a). Researchers are concerned that the H5N1 virus will change its genetic composition through gene reassortment with human or other types of flu viruses, using humans or pigs as “mixing vessels” (WHO, 2004c). This can lead to the emergence of more virulent and easily transmittable forms of influenza, against which humans will have little resistance in the absence of a vaccine or natural immunity.

IMPACTS OF AVIAN INFLUENZA ON ASIA'S ECONOMY AND POOR POPULATION

The emergence of avian influenza in South Asia has had severe repercussions on national economies and individual livelihoods, especially among the poor. Examining the standard practices for dealing with bird flu outbreaks—mass culling—can provide some insights into the economic impact of the disease. Hong Kong, China's quick response to the infection in 1997—the destruction of its entire poultry population—was widely seen as effective in preventing a larger disaster (WHO, 2004b). This set a precedent for other affected regions. Thailand, perhaps the hardest hit, has culled approximately 36 million birds, or 25% of its domestic flocks (Newcomb and Harrington, 2004); many local areas have lost more than half their poultry. The World Bank estimates that Viet Nam might have lost 0.3–1.8% of its gross domestic product (GDP) in 2003 due to bird flu (FAO, 2004). Overall, economic estimates place the total costs in Southeast Asia between \$12 billion and \$14 billion (Newcomb and Harrington, 2004).

Many countries in affected regions became major exporters of poultry products in recent decades, and the impact of infection has led to the loss of export markets. Outbreaks “disrupt markets, affecting demand for poultry products and prices, and they may destabilize employment and income for those in commercial poultry production, processing or retailing” (FAO, 2004). The enormous scope of the impacts of this disease poses significant challenges to countries facing the growing threat of avian influenza. They must work to regain trading status

following an outbreak, and the mass culling of vulnerable bird populations is seen as a necessary measure to demonstrate response to the problem. This is also relevant to other economic sectors, such as tourism, where outbreaks can lead to drastic declines in foreign visitors.

The poor are disproportionately vulnerable to avian influenza in several ways. The International Livestock Research Institute reports that poultry is at the bottom of what is commonly referred to as the “livestock ladder,” meaning the poorest tend to raise poultry (Perry et al., 2002). The intensive exposure of these farmers to bird populations, coupled with unsafe land-use practices where livestock live in proximity to homes, creates a situation of heightened susceptibility to the spread of avian diseases. The lack of information, limited or no access to animal health resources, and little protection against disease outbreaks (e.g., monitoring, surveillance, and response capabilities) exacerbate the situation. When birds are destroyed, poultry farmers lose an important food and protein source, as well as a primary income source. In the case of bird flu in Asia, monetary compensation for culled poultry has been inadequate, especially for rural backyard farmers and small-scale producers. This can act as a disincentive for farmers to report infections.

The larger political and social consequences of bird flu outbreaks include compromised public confidence, which hinders the stability of a region, and increased pressure to target small-scale village and backyard poultry production (FAO, 2004)—a move that will hurt already impoverished communities. This makes vulnerable populations even more insecure in the face of growing disease threats.

Severe acute respiratory syndrome in the PRC

The SARS outbreaks of 2002–2003 created one of the biggest health concerns in recent memory. Crossing borders and disseminating across multiple global networks, SARS poses unique challenges that threaten health and economic security. It has had “major economic, social, and psychological impacts on the populations of the countries most affected by it” (ADB, 2003). Of the more than 8,000 cases reported worldwide, 750 resulted in death (Sampathkumar et al., 2003). As the site of the disease’s emergence and initial outbreak, the PRC bore the brunt of the resultant health emergency, serving as a valuable case study for building understanding of the links between animal health, human health, and poverty reduction.

SARS: AN OVERVIEW

SARS is a febrile respiratory illness caused by corona viruses. These are enveloped RNA viruses that can cause disease in humans and animals. Transmission occurs primarily through the spread of large droplets, although some evidence suggests links between airborne spread and surface contamination (Sampathkumar et al., 2003). SARS was detected first in the PRC in November 2002 when “a highly contagious atypical pneumonia first appeared in the Guangdong Province” (Sampathkumar et al., 2003). From there, a complicated chain of events led to the international spread of SARS, with airlines and hotels implicated as early conduits.

SARS has an incubation period of 2–10 days. Initial signs include flu-like symptoms, such as fever and headache. Patients exhibiting symptoms of the disease are classified into two categories (Sampathkumar et al., 2003):

- “Suspect cases, or persons with the onset of fever and lower respiratory tract symptoms within 10 days of either having traveled to an affected area or having come in contact with someone with SARS.”
- “Probable cases or suspect cases, who also have chest radiographic findings of pneumonia, acute respiratory distress syndrome (ARDS), or an unexplained respiratory illness resulting in death, with autopsy findings of ARDS without identifiable cause.”

The fatality rate of SARS is 3–12%, although this increases dramatically in patients over 60 years old (Sampathkumar et al., 2003). Currently, no specific treatment is available for SARS; infected persons are generally treated for pneumonia.

Much evidence suggests that SARS originated in animals and was subsequently transmitted to humans through contact with infected species. “SARS likely jumped from a domestic or wild animal host to humans in the context of intensifying human-induced pressures on wildlife populations and close interactions between humans, wildlife, and domestic animals” (Newcomb, 2003). Findings have pointed to live animal markets in Guangdong Province in the PRC as initial transmission points for SARS. Particular attention has been paid to the role of the masked palm civet sold in these markets. Similar genetic links were discovered between the SARS corona virus and other corona viruses in the masked palm civet and raccoon-dog, as well as in

some species of fruit-eating bats which are commonly sold in markets. These wildlife species, as may others are sold for consumption in live markets that are notorious for their cramped and unhygienic conditions, i.e., conditions ideal for viral transmission (Sampathkumar et al., 2003; Karesh et al., 2005). One researcher noted that among the earliest SARS patients, a disproportionate number were chefs and food handlers who have been suspected as being original point sources in the jump of SARS from animals to humans (Newcomb, 2003).

Acknowledging the significant threat that wild and exotic species posed to the health of people throughout the PRC, experts from the Food and Agriculture Organization of the United Nations (FAO), WHO, and the Government of the PRC subsequently recommended enhanced monitoring of the trade in live animals (Normile, 2003). In addition, the PRC authorities became more aggressive in stemming the sale of at least 54 animal species.

IMPACTS ON THE PRC'S ECONOMY AND POOR POPULATION

The initial impact of SARS on the PRC's economy stemmed "mostly from public perceptions and fear of the disease" (ADB, 2003). SARS outbreaks led to restricted movement of people, which affected the tourism and service industries through reduced consumer spending within the country. Airlines particularly suffered the consequences of reduced travel to the PRC, and reverberations also were felt in hotels, restaurants, and other related industries. Consumer confidence decreased in the PRC among potential tourists and large-scale financial investors alike. The Asian Development Bank (ADB) issued a report (ADB, 2003) that stated if SARS persists it "could dampen investor confidence, resulting in weaker investment and lower inflows of foreign capital." One estimate placed the 2003 economic cost of SARS in the PRC at a loss of 0.5–2% in GDP growth (Gill, 2003).

In addition to reducing demand for goods and services from the PRC, SARS has the potential to wreak economic havoc by creating supply shocks. Illness, fear, or precautionary measures can disrupt the workforce, affecting the manufacturing and services sectors. This can lead to a reduction in international trade, the foundation of the PRC's economy, with even larger consequences for the global economy (ADB, 2003).

The high costs of health care for infected persons also will affect the economic impacts of SARS in the PRC. Treatment of this disease, especially among poor populations, likely will put pressure on the Government and strain resources in the case of a large-scale epidemic. Costs for monitoring and surveillance of animal and human populations also will fall on the Government.

Poor populations were, and continue to be, more vulnerable to the impacts of SARS outbreaks than most other groups. The high cost of treatment disproportionately affects those who cannot afford health care, or are not employed in the PRC's services sector, particularly migrant workers and the rural poor (ADB, 2003). The less affluent probably will experience higher mortality rates. Rural areas are especially at risk of SARS due to the lack of effective monitoring, surveillance, prevention, and treatment systems, as well as inadequate to nonexistent health and social services. In addition, the risk is higher for rural and poor populations because they live closer to, and interact more intensely with, animals and the environment—both of which are natural reservoirs for disease.

Zoonotic diseases and poverty

The outbreaks of avian influenza and SARS demonstrated how zoonotic diseases disproportionately affect the poor who depend on animals to support their livelihoods. Wild and domesticated animals are a growing source of protein and income in developing countries (Perry et al., 2002). Although wild animals are often reservoirs for disease, many exotic species are eaten by poor people or captured and sold in live markets. In the absence of other safer forms of subsistence, such risky behavior offers a viable economic outlet for many people.

The FAO reports that "the most vulnerable groups, for whom animal diseases are particularly devastating, are poor livestock farmers and farming communities" (FAO, 2002). When animal diseases strike a poor community, the implications are severe and include (i) loss of livestock productivity or death, (ii) loss of farm productivity, (iii) high treatment costs, (iv) reduction or elimination of market opportunities, (v) disturbance of human health or death, and (vi) impairment of human welfare (FAO, 2002). The implications of avian influenza are significant in this respect because chickens are the most widely kept livestock in the world; the poorest segments of society depend most on these animals (Perry et al., 2002).

The International Livestock Research Institute (Perry et al., 2002) cites two factors that are important in understanding why the poor are more at risk:

- **More disease prevalence in the developing world.** The most significant factors explaining this include unrestricted movement of animals, which increases the probability of exposure to infection; climates and ecosystems that are susceptible to disease spread; and poor sanitation and living conditions, where people live in proximity to livestock and other animals.
- **Less disease control in the developing world.** Lack of funding for research in animal disease control in the developing world limits progress in this area. In addition, numerous financial, infrastructure, logistic, and educational restrictions “often do not permit the optimal delivery and adoption of known disease control measures” (Perry et al., 2002).

In fact, most developing countries already carry a heavy disease burden. Other more common infectious diseases (e.g., HIV/AIDS, malaria, diarrhea) and health-related issues (e.g., malnutrition, reproductive health) play a much larger role in the overall health picture in the Asia and Pacific region than emerging zoonotic diseases. To a certain degree, the threat of SARS and avian influenza has been overstated due to their high epidemic potential and the international media coverage that accompanied the recent outbreaks. However, for countries already saddled with an under-equipped and overwhelmed health care system, the impacts of emerging zoonotic diseases could be devastating.

Efforts to reduce poverty in developing countries, therefore, should emphasize eradicating infectious animal diseases or at least increasing the coping capacity of regions and populations at risk, and increasing monitoring and surveillance. This requires cooperation at the national and international levels, as well as interdisciplinary cooperation of specialists from multiple fields, including veterinary health, public health, and conservation, among others.

Environmental and veterinary health: Reducing the risk of zoonotic diseases

Given the socioeconomic impacts of zoonoses in the Asia and Pacific region, and the role of environmental change and animal health in their emergence, can sound environmental management help reduce the

risk of such diseases? Within this category of prevention and response measures, what is the potential role of animal or veterinary health?

Conservationists’ skilled knowledge of ecosystem functions and dynamics and how these are linked to human activities is essential to understanding the epidemiology of zoonotic diseases, as well as to the development of appropriate response measures. Similarly, the expertise of veterinary health specialists on how to handle and conduct surveillance programs for wildlife should be considered, as it can help prevent and control emerging zoonoses. Investments in wildlife health, as well as cooperation between animal and human health officials, ultimately can protect human populations. For example, when avian influenza first appeared, wild birds in Northeast and Southeast Asia initially were implicated in the transmission of the virus. Conservation biologists and veterinarians were the first to point out that this was unlikely, given the migratory routes and timing of wild birds, and instead identified domestic birds as the more likely culprits (Karesh and Cook, 2005). In Africa, when animal health workers detected Ebola, villagers were warned not to hunt or handle animals, which minimized the risks of disease transmission and the potential for an outbreak (Karesh and Cook, 2005).

However, the involvement of conservationists or veterinary health specialists is less about developing a list of targeted “conservation” or “animal health” interventions, and more about incorporating their knowledge and experience into mainstream public health decision making. Such an approach clearly calls for more cooperation across disciplines, ministries, and sectors. Despite fundamental differences in their objectives, the integration of these different disciplines and approaches could lead to more effective measures to address the emerging threat of zoonotic diseases. Conservation and animal health input might limit the wholesale eradication of species and its potentially devastating economic impacts, using such a measure only as a last resort.

Yet this approach will require overcoming political, institutional, and policy challenges that already impede sustainable responses to human health threats. These include

- **Slow and/or reactive response to disease outbreaks.** The fear of negative economic and political ramifications can hinder the identification of—and response to—disease outbreaks.

- **Lax or nonexistent enforcement of laws, treaties, and conventions.** The failure or unwillingness to enforce regulations related to biosafety, environmental protection, animal trade (i.e., the Convention on International Trade in Endangered Species of Wild Flora and Fauna), and property rights can undermine efforts to develop sound disease prevention and control measures.
- **Lack of infrastructure and resources to cope with outbreaks.** Many developing countries—where the threat of zoonoses is the greatest—lack human resources and skills, technology and equipment for detection and treatment, and medical infrastructure. Even at the government and international agency levels, resources are limited. For example, the World Animal Health Organization’s resources for considering wildlife-related diseases consist of a volunteer committee of six people that meets only 3 days a year.

At this time, no international agency is responsible for—or capable of—monitoring and preventing the countless diseases that cross borders and species (Karesh and Cook, 2005). Regulations and restrictions continue to prevent collaboration between countries and agencies. WHO can become involved in a country only if officially invited, “leaving it helpless to intervene in countries with governments that either do not know about or do not want to reveal the presence of a disease within their borders” (Karesh and Cook, 2005). Similarly, the World Animal Health Organization can accept information on wildlife diseases in a country only if such information is submitted by a national agricultural authority, and few of these monitor wildlife diseases.

To promote interdisciplinary cooperation in the fight against zoonotic diseases, human, animal, and wildlife health specialists met with practitioners in conservation biology, law, and public policy in September 2004 to draft the Manhattan Principles on One World, One Health. This document lays out priorities for action in tackling emerging zoonotic diseases in a holistic, interdisciplinary manner (Box 1).

Recommendations

Several important lessons emerging from the preceding analysis can be formulated into a series of recommendations for governments, policy makers, and organizations concerned with the emergence of zoonotic diseases in the Asia and Pacific region.

The outbreaks of the avian influenza in South Asia and of SARS in the PRC demonstrated how human vulnerability to animal diseases is increasing globally. For this reason, focusing on the nature and intensity of human exposure to domestic and wild animal populations is important. Further, interactions between animals, and between humans and animals favor the risk of disease transmission and should be reduced. Measures for achieving this might include

- **Regulating live animal markets.** This can include shifting the responsibility and cost of outbreak prevention to animal traders by requiring them to buy disease outbreak insurance on all animal imports.
- **Reducing risky cultural practices.** Appropriate public education campaigns can help reduce the consumption of exotic animals and other risky cultural practices.
- **Stemming the illegal trade in wildlife.** This can be achieved by enforcing existing laws and treaties, and investing in further enforcement resources.
- **Improving sanitation and living conditions in rural areas.** Maximizing potential bilateral and multilateral aid can be one means of improving rural conditions.
- **Identifying conservation practices to reduce the potential for disease transfer.** Further research and collaboration between disciplines can lower the risk of disease transfer from wild to domestic populations.

Moreover, the growing potential for disease spread due to globalization and breakthroughs in communication and travel necessitates other measures:

- Strengthen international cooperation to respond to outbreaks;
- Strengthen monitoring and surveillance networks that examine human and animal populations;
- Facilitate communication between detection and response networks;
- Facilitate cooperation across fields and disciplines, particularly veterinary health, public health, conservation, epidemiology, and wildlife studies;
- Increase the generation of field-based wildlife data through better surveillance of wild animal populations;
- Strengthen the public health capacities of vulnerable communities to treat infected animals and people; and

Box 1: The Manhattan Principles on One World, One Health

We urge the world's leaders, civil society, the global health community and institutions of science to

1. Recognize the essential link between human, domestic animal and wildlife health and the threat disease poses to people, their food supplies and economies, and the biodiversity essential to maintaining the healthy environments and functioning ecosystems we all require.
2. Recognize that decisions regarding land and water use have real implications for health. Alterations in the resilience of ecosystems and shifts in patterns of disease emergence and spread manifest themselves when we fail to recognize this relationship.
3. Include wildlife health science as an essential component of global disease prevention, surveillance, monitoring, control, and mitigation.
4. Recognize that human health programs can greatly contribute to conservation efforts.
5. Devise adaptive, holistic and forward-looking approaches to the prevention, surveillance, monitoring, control, and mitigation of emerging and resurging diseases that take the complex interconnections among species into full account.
6. Seek opportunities to fully integrate biodiversity conservation perspectives and human needs (including those related to domestic animal health) when developing solutions to infectious disease threats.
7. Reduce the demand for and better regulate the international live wildlife and bushmeat trade not only to protect wildlife populations but also to lessen the risks of disease movement, cross-species transmission, and the development of novel pathogen-host relationships. The costs of this worldwide trade in terms of impacts on public health, agriculture, and conservation are enormous, and the global community must address this trade as the real threat it is to global socioeconomic security.
8. Restrict the mass culling of free-ranging wildlife species for disease control to situations where there is a multidisciplinary, international scientific consensus that a wildlife population poses an urgent, significant threat to human health, food security or wildlife health more broadly.
9. Increase investment in the global human and animal health infrastructure commensurate with the serious nature of emerging and resurging disease threats to people, domestic animals, and wildlife. Enhanced capacity for global human and animal health surveillance and for clear, timely information-sharing (that takes language barriers into account) can only help improve coordination of responses among governmental and nongovernmental agencies, public and animal health institutions, vaccine / pharmaceutical manufacturers, and other stakeholders.
10. Form collaborative relationships among governments, local people, and the private and public (i.e., non-profit) sectors to meet the challenges of global health and biodiversity conservation.
11. Provide adequate resources and support for global wildlife health surveillance networks that exchange disease information with the public health and agricultural animal health communities as part of early warning systems for the emergence and resurgence of disease threats.
12. Invest in educating and raising awareness among the world's people and in influencing the policy process to increase recognition that we must better understand the relationships between health and ecosystem integrity to succeed in improving prospects for a healthier planet.

Source: One World, One Health. 2004. <http://www.oneworldonehealth.org/>.

- Overcome institutional and legal barriers to effective and efficient cooperation across disciplines and levels of governance.

Animal disease threatens the economic, social, and political stability of all populations, particularly in vulnerable regions throughout the developing world. For this reason, additional measures to bolster adaptation and coping strategies for those communities most at risk should be taken. These include developing more equitable health care infrastructure, preventive strategies that protect livelihoods (e.g., the use of vaccines instead of culling), and poverty reduction strategies that stress improving education, nutrition, and public health.

Deforestation and the Nipah Virus in Malaysia

Kaw Bing Chua, Beng Hooi Chua, and Chen Woon Wang²¹

Introduction

In late 1998, a novel paramyxovirus emerged in Malaysia, killing domestic pigs and humans and causing substantial economic loss to the local pig industry. Pteropid fruit bats have since been identified as a natural reservoir host of this virus, which was named the Nipah virus.

Over the last 2 decades, deforestation for pulpwood and industrial plantations has reduced substantially the forest habitat of these bats in Southeast Asia, including peninsular Malaysia. In 1997–1998, slash-and-burn deforestation in Kalimantan and Sumatra produced a severe haze that blanketed much of Southeast Asia in the months directly preceding the Nipah virus outbreak. The forest fire was exacerbated by a drought, which was driven by the severe 1997–1998 El Niño Southern Oscillation (ENSO) event.

This case study presents data suggesting that this series of events led to an acute reduction in the availability of flowering and fruiting forest trees for foraging by fruit bats. This culminated in the unprecedented encroachment of fruit bats into cultivated fruit orchards in 1997–1998. These anthropogenic events, in conjunction with the location of

piggeries within orchards and the design of pigsties, allowed the transmission of a novel paramyxovirus from its reservoir host to domestic pigs and, ultimately, to humans.

Lessons learned from this study contribute to the body of knowledge aimed at better understanding the links between seemingly discrete events. Such information can contribute to efforts to address similar events in the future.

Impacts of the Nipah virus outbreak

The outbreak of the Nipah virus was a tragic event for the people of Malaysia, especially those in the pig farming industry. Although the start of the outbreak was officially recorded as September 1998 in Ampang village, Kinta District, in northern peninsular Malaysia (Center for Disease Control and Prevention, 1999b), the virus most likely had contaminated the swine population as early as 1997 (Chua et al., 2002). This was substantiated with the later discovery of six encephalitis patients admitted to Ipoh General Hospital in 1997, whose stored sera were found to carry the anti-Nipah virus IgG (Chua, 2003). Respiratory illness and encephalitis in pigs in the same district preceded the outbreak of febrile encephalitis in humans (Mohd Nor, 2000).

By February 1999, similar diseases in pigs and humans were recognized in the central and southern parts of peninsular Malaysia. These were associated with the southern movement of domestic pigs from Kinta District. A month later, a cluster of 11 cases of respiratory illness and encephalitis, with one death, were reported among abattoir workers in Singapore, who handled pigs coming from the outbreak regions in Malaysia (Paton et al., 1999). The Nipah virus isolated from the cerebrospinal fluid of an encephalitic patient from Sungai Nipah village was identified as the etiological agent responsible for the outbreak (Chua et al., 1999; Chua et al., 2000). The outbreak in Singapore ended after the importation of pigs from Malaysia was prohibited. The outbreak in Malaysia, on the other hand, ceased with the culling of more than 1 million pigs and the destruction of nearly half the pig farms in peninsular Malaysia. By May 1999, 265 cases of encephalitis associated with the outbreak—resulting

²¹We are thankful to the Meteorological Services of Singapore for their kind permission to use the NOAA/AVHRR-14 satellite image, the Meteorological Services of Malaysia for the rainfall data and the Alam Sekitar Malaysia Sdn Bhd for their kind permission to use the air quality data regarding peninsular Malaysia. We are grateful to the Wildlife Department of Malaysia for use of the map of peninsular Malaysia to demonstrate the land area of primary forest cover, and to the Forest Research Institute of Malaysia for the figures on the annual primary forested areas of peninsular Malaysia. Finally, we are thankful to Professor Looi Lai Meng, editor of the Malaysian Journal of Pathology, for her kind permission to reproduce a major portion of the paper that was already published in the stated journal.

in 105 deaths—were recorded in Malaysia (Centers for Disease Control and Prevention, 1999a).

Hosts of the virus

As in investigations on other emerging zoonotic diseases, the priorities for future prevention and control have involved identifying the natural reservoirs of the etiological agents and analyzing the underlying causal factors for the emergence. The Nipah virus has a close sequence homology and serological cross-reactivity with the Hendra virus, a lethal paramyxovirus found in humans and domestic horses that emerged from fruit bat reservoirs in Australia (Murray et al., 1995). In an initial survey of 14 species, neutralizing antibodies of the Nipah virus were detected in Malayan flying foxes (*Pteropus vampyrus*) and Island flying foxes (*Pteropus hypomelanus*), although the Nipah virus was not isolated (Yob et al., 2001). Subsequent work isolated the Nipah virus from two pooled urine samples of *P. hypomelanus* and a swab sample of partially eaten jambu air (*Eugenia aquea*) fruit (Chua et al., 2002). Therefore, *P. hypomelanus* and *P. vampyrus* (otherwise known as fruit bats) probably serve as the natural reservoir hosts of the Nipah virus.

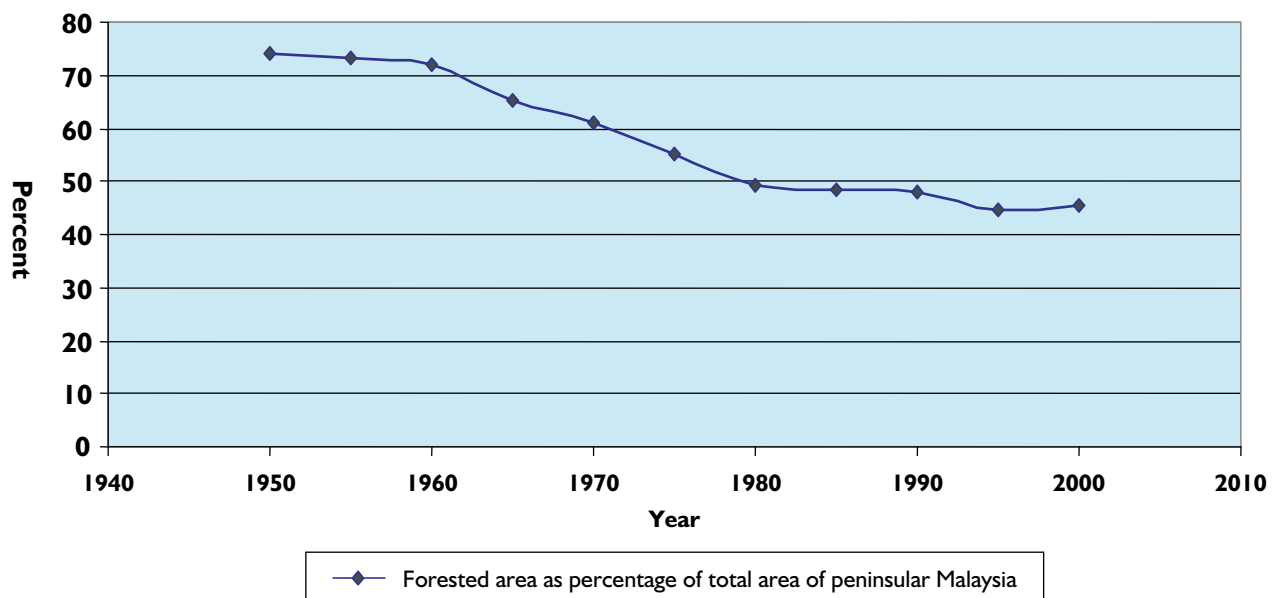
Impacts of deforestation and haze on fruit trees

Over the last 2 decades, anthropogenic fire-mediated deforestation has become one of the greatest threats

to tropical rainforests in the Amazon (Fernside, 1990; Setzer and Pereira, 1991), Africa (Isichei et al., 1995), and Southeast Asia (Malingreau et al., 1985). Fire is used for large-scale land clearing (e.g., for pulpwood and industrial crop plantations), as well as by small-scale farmers to clear land and burn agricultural waste (Malingreau et al., 1985; Schweithelm, 1998). Tropical deforestation by fire occurs on an immense scale in Southeast Asia. In 1982–1983, an estimated 3.5 million hectares (ha) of rainforests were burned in East Kalimantan due to the coincidence of drought and poor land-use management (Malingreau et al., 1985). A similar area was burned in Borneo and Sumatra in 1994 (Tang et al., 1996; Nichol, 1997). In 1950, before independence from British rule in 1957, more than 70% of peninsular Malaysia was covered with primary forests. By 1997, barely 45% of the area was covered with primary forests (Figure 8). Furthermore, most of the remaining primary forest was in the highlands that might not be such suitable habitats for Pteropid fruit bats. The impact of deforestation on wildlife habitat is clear (Chua et al., 2002; Setzer and Pereira, 1991). The extent of these anthropogenic changes affecting the food supply of highly mobile tropical forest species, such as fruit bats, is not known. However, the food supply could have been reduced to a critical level.

In the months of August, September, and October 1997, fires in Kalimantan and Sumatra destroyed approximately 5 million ha of tropical rainforests (Schweithelm and Glover, 1999). With the prevailing northwest winds, these fires created the most

Figure 8: Percentage of Forested Area in Peninsular Malaysia, 1950–2000



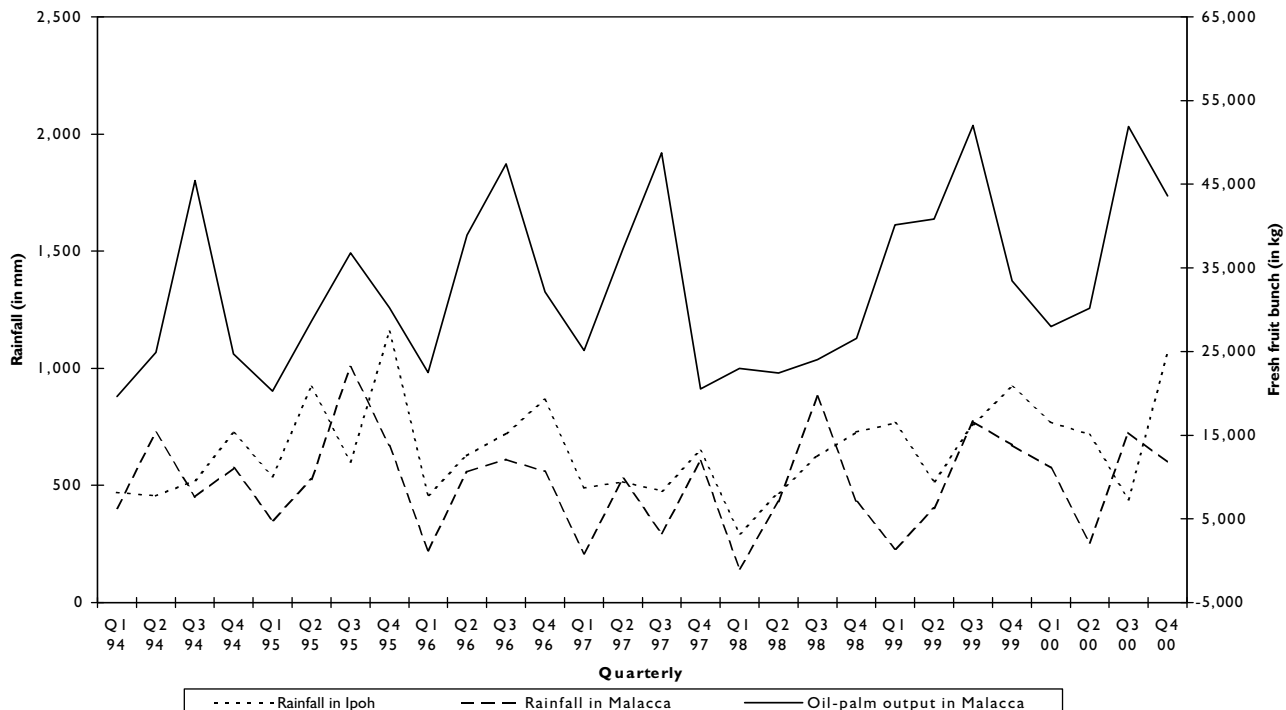
severe haze ever known in this part of Southeast Asia. The haze was particularly severe in the southern part of peninsular Malaysia (Malacca). Ipoh, the site of the initial Nipah virus disease outbreak, was less affected. Sulfate and organic carbon particles in the haze can obliterate 73–92% of total light (Ferman et al., 1981; Wolff et al., 1986), significantly affecting ecosystem functions, particularly in tropical rainforests (Barrie et al., 1981; Rosen et al., 1981; Fan et al., 1990; Davies and Unam, 1999). Hygroscopic particles in the haze grow in size with increasing relative humidity (Cass, 1979; Nochumson, 1982). In tropical rainforests, photosynthetic photon flux density generally limits photosynthesis. Tang et al. (1996) reported reduced photosynthesis by forest trees during a 1994 haze event in Malaysia despite the presence of higher levels of carbon dioxide, and demonstrated that the reduction of photosynthetic photon flux density within the forest was much greater than in open land.

The effect of the 1997–1998 haze on flowering and fruiting in tropical rainforest is not fully known. However, the haze substantially reduced the flowering and fruiting of orchard fruit trees in southern peninsular Malaysia. Orchard farmers in the states of Malacca and Johore reported severe crop failure in oral histories. Limited studies revealed a 10% reduction in rice yields following the 1997–1998 haze—

even in the northeastern part of peninsular Malaysia (Trengganu), which was less affected by the haze—and a delayed reduction in oil-palm crops in Tawau, Sabah (East Malaysia) (Mohamed Shahwahid and Othman, 1999). Figure 9 shows the quarterly output of oil-palm crops in terms of fresh fruit bunches of a 10-acre oil-palm smallholding of uniform age in Malacca State entering its peak plateau phase of production from 1994 onwards (Hartley, 1977a). The 1997–1998 haze, with the concomitant drought, caused a severe reduction in fresh fruit bunch outputs in oil-palm crops. Furthermore, the decrease in oil-palm crop output, which was delayed by about 6 months, suggests that the primary impact is failure to flower (oil-palm fruits take 6 months to mature) (Hartley, 1977b).

Figure 9 also shows the quarterly rainfall data in two representative areas in peninsular Malaysia from 1994 to 2000, one in the north (Ipoh, site of the Nipah virus initial outbreak) and another in the south (Malacca). Both experienced a decrease in rainfall corresponding to the severe ENSO event; however, the southern part of peninsular Malaysia was affected more severely. Therefore, the 1997–1998 ENSO-related drought exacerbated the anthropogenic fires in Indonesia which, subsequently, might have aggravated the haze-related flowering and fruiting failure of forest trees.

Figure 9: Quarterly Rainfall Data and Oil-Palm Crop Output in Relation to Rainfall in Malacca, 1994–2000



Links between deforestation, fruit bats, and pig farming

This case study suggests that the loss of foraging habitat, in conjunction with increasing deforestation, compelled the fruit bats to migrate into cultivated orchards. The study supports this hypothesis through observations gleaned from examining the sites corresponding to the index cases of the Nipah virus. An example is a partially demolished pigsty in the midst of durian (*Durio zibethinus*) and rambutan (*Nephelium lappaceum*) orchards in Ampang village (approximately 8 km from Ipoh City) within the Kinta District in the northern part of peninsular Malaysia. More than 20 ha of these orchards surround the pig farming area where the index cases of human encephalitis (Chua et al., 1999) and pig diseases (Mohd Nor et al., 2000) due to the Nipah virus were reported. Oral histories of local hunters and orchard farmers confirmed that *P. vampyrus*—one of two fruit bat species in which the Nipah virus was identified serologically—is normally absent from this area. However, a colony of *P. vampyrus* roosted in the forest in 1997 and 1998, about 20 km from Ampang, and regularly visited the orchards surrounding piggeries to forage on durian flower nectar. At the piggeries associated with the human index case of the Nipah virus disease, pigsties were purposely constructed with low concrete walls around the pig enclosure that extended beyond the roof's edge to allow rainwater runoff to collect inside the enclosure for bathing the pigs. Partially eaten fruits found within pigsties suggest a mechanism for direct transmission of the Nipah virus from infected fruit bats to pigs.

This study proposes that encroachment of the Nipah virus-infected fruit bats throughout 1997 and early 1998 led to the initial transmission of the virus to pigs and the subsequent outbreak in humans in late 1998. This analysis provides another example of complex, anthropogenic environmental changes driving the emergence of zoonotic disease from wildlife reservoirs (Jones et al., 1998; Daszak et al., 2000). It suggests that the Nipah virus joined the increasing number of emerging pathogens driven by ENSO events (Epstein, 1999). The increasing severity of these events should

be an impetus for us to better understand the phenomenon, as well as effectively predict and strategically combat the emergence of future zoonotic diseases.

Aquatic Resources, Food Security, and Nutrition in the Lao People's Democratic Republic: A Case Study from Attapeu Province

Richard Friend,²² Eric Meusch,²³ Simon Funge-Smith,²⁴ and Jintana Yhoung-Aree²⁵

Introduction

The growing interest in the potential of wild food resources to address food security and poverty reduction in the Lao PDR generates numerous opportunities for designing the most appropriate poverty-focused interventions. While considerable work has already been done on the role of nontimber forest products (NTFPs) in rural livelihoods in the Lao PDR, the importance of aquatic resources has received relatively little attention.²⁶ In many ways, the aquatic resources that are important in food security remain largely invisible. This is particularly important in the Lao PDR, where rice security is considered a key development strategy for reducing poverty and is an indicator of poverty and vulnerability. However, local livelihoods depend on a range of other resources besides rice, including aquatic resources.

The relationship between rice and aquatic resources is important. Increased rice production is one of the Lao PDR's national priorities for reducing poverty and ensuring food security. Intensification of rice production through development of irrigation systems, conversion of wetland areas, and the use of high-yielding varieties and supplementary inputs potentially could have negative impacts on wild aquatic resource production. While improved rice production is clearly needed, continuous viability of the wild aquatic resources found in rice fields, floodplains, and adjoining wetlands is equally important. Increased rice production would not necessarily offset the loss of these resources, which could have

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²⁶Aquatic resources as used here include fish, amphibians, some reptiles, various invertebrates (prawns, crabs, snails, insects), as well as numerous varieties of wild aquatic plants.

a greater negative impact on poorer people. Further, the management of these aquatic resources offers considerable opportunities to improve food security and nutrition.

This case study is based largely on a participatory assessment of the nutritional value of aquatic resources in rural livelihoods, undertaken as a joint initiative of IUCN, FAO, and the Lao Aquatic Resource Research Centre in Attapeu Province (Meusch et al., 2003).²⁷

A multidisciplinary team conducted the assessment during two missions in three villages in Attapeu: Tamoyot in Sanamsai District, Saisi in Saisetha District, and Gayeu in Samakisai District. The study applied a range of participatory methods to identify aquatic resource species and habitats, and to open the discussion with local people about the role of these resources in diversified livelihoods and their contribution to household food security. In addition, the study applied more quantitative methods, including an anthropometric assessment and a food frequency survey, to examine nutritional issues.

The main objective of the study was to gain a better understanding of how people living in rice production areas use aquatic resources and to evaluate the nutritional importance of these resources. The study was motivated by a concern that the production and value of aquatic resources often are not recognized fully, which results in missed opportunities for improving rural livelihoods through the wise management of aquatic resources. This case study, and the original report on which it is based, is intended to contribute to a broad discussion on appropriate food security strategies for the Lao PDR.

Invisible resources

Living aquatic resources often are overlooked in development planning. Yet evidence of the importance of fisheries and aquatic resources in the livelihoods of the Lao people can be found in many forms: the ubiquitous *padek* (fermented fish paste) that accompanies most meals; the wide variety of fish traps that can be found in markets or as decorations; and the many people who can be seen fishing or foraging in the canals, streams, floodplains, and rice fields throughout the country. Much of the aquatic

resources consumed in rural areas also can be seen in the markets of Vientiane, the capital. In addition to the wide range of fish species, frogs, insects, crabs, mollusks, and shrimps, as well as a host of aquatic plants, can be found. Despite the diversity of aquatic resources, their importance in local livelihoods—and their potential to reduce poverty and promote national development—often has been overlooked.

The lack of information on aquatic resources has been recognized as an important constraint in the Lao PDR and the Mekong region as a whole (Souvannaphanh et al., 2003). An FAO review (Coates, 2002) pointed out that current information on fisheries and aquatic resources in the Mekong region is seriously limited. The review found that traditional methods of assessing the production of aquatic resources have had limited success, and improved approaches to collecting and analyzing data are needed urgently. Although estimates of production and consumption of aquatic resources have been revised regularly over the last 10 years, a sense persists that their true value is underestimated.

Obtaining reliable information on aquatic resources has been a persistent problem for development planners and policy makers. The nature of these resources, and the ways they are harvested, pose significant challenges to information gathering. A wide range of aquatic resources is targeted regularly in rural areas from a wide range of habitats. Often, aquatic resource production is highly seasonal and varies greatly from one year to the next. This diversity and variability is not captured easily in normal assessment approaches. Thus, considerable investments would be required to improve these information systems (Souvannaphanh et al., 2003).

To assess the significance of aquatic resources, they should be considered in the context of a wider portfolio of livelihood strategies. Although most rural people regard themselves as rice farmers, rural households are engaged in an array of activities—all of which contribute to household livelihood strategies and well-being. In Attapeu, these activities include rice farming, raising livestock, gardening, and various household and domestic activities. This diversity of activities is essential for coping with the seasonality of agricultural production and availability of other resources.

²⁷The study was carried out with joint funding from IUCN Water and Nature Initiative and FAO Regional Office for Asia and the Pacific during the preparation of the UNDP-Global Environment Facility/IUCN/MRC Mekong Wetlands Biodiversity Conservation and Sustainable Use Program, which uses Attapeu Province as the Lao PDR demonstration site. The assessment has been used to inform the development of program activities in Attapeu.

Few rural people in Attapeu consider themselves fisherfolk, even though many fish or harvest aquatic resources. This is a common perception among rural people, who rate land owning and farming as their primary occupation. In addition, a significant proportion of time is spent making and repairing fishing gear and processing catches. Women and children are involved actively in these activities. The vast majority of the aquatic resources harvested are consumed within the household, with only a small proportion of higher-value species and specimens reaching the market. Thus, their economic value is not apparent immediately and becomes difficult to calculate.

Discussion and summary of main findings

The full range of the assessment's findings is presented in the original report. This case study will concentrate on the implications for biodiversity, nutrition, and food security. The following summary of the three villages of Attapeu Province where the study was carried out is taken from the main report.

Tamoyot Village. Tamoyot in Sanamxai District is a small village of 28 households, with a population of 158. Most of the people are of the Su ethnic minority, one of the many Mon Khmer groups that make up the Upland Lao or Lao Theung people. Tamoyot, about 13 km from the district town of Sanamsai, is fairly remote. The people of Tamoyot are relatively poor, earning their living from growing upland rice and foraging in the forests and wetlands. Food shortages are common, and many households produce only enough rice to last a few months. Most households rely heavily on fishing and foraging in local streams and swamps to support their livelihoods. While wetland rice production has been promoted, the people are reluctant to shift from their traditional upland cultivation.

Saisi Village. Saisi Village in Xaisetha District is on the banks of the Se Kamon River. The village has a long history, and currently consists of 200 households with a population of 1,062. The villagers, who are ethnic Lao, make a living producing wetland rice, growing vegetables, and fishing in the Se Kamon River. Because the village is easily accessible to provincial and district towns, villagers can easily access markets for buying and selling. Although most of the families produce enough rice for consumption, some produce a surplus for sale. However, since many families still suffer from rice shortages during certain months, they also rely on alternative sources.

Gayeu Village. Gayeu Village in Samakhisai District is near the provincial town on the main road to Sekong Province and Pakse town in Champasak Province. Gayeu is at the foot of a mountain, on the plain between the mountain and the Se Kong River. The villagers of Gayeu are primarily of the Oyi ethnic minority, a subgroup of Lao Theung. The village consists of 78 households, with a population of 428. The villagers, who have a history of producing wetland rice, have a highly developed system of terraced rice fields that extend to the foot of the mountain. Although the village's rice-growing land is considered productive, many households still experience food shortages. Thus, they supplement their livelihoods by fishing in a nearby oxbow lake and the Se Kong River. The people have developed unique systems of trap ponds in their rice fields.

The assessment illustrates that a wide range of food sources contributes to food security, and livelihood strategies involve the management of many resources. The study also aimed to compare the relative importance of aquatic resources and other food sources for villagers of different wealth. Villagers developed their own definitions and indicators of wealth and poverty within the village, and identified households that fit into their different wealth categories. While the criteria applied differed among the three villages, the common factors in determining wealth and poverty included food security, food availability, livestock ownership, type of house, and available labor within the household.

Although livelihood activities remain largely the same in different wealth groups, their relative importance is markedly different, as indicated in Table 15. Most significantly, men and women from better-off households attached relatively little importance to fishing and did not include the collection of aquatic animals on their list of priority activities. In contrast, men and women from worse-off families considered both activities priorities, with greater importance attached to the collection of aquatic animals.

Again, collecting aquatic animals and fishing are of great importance to poorer people.

Although rural people have difficulty calculating their own aquatic resource production, they consistently identify a wide range of species that they consume regularly. In Attapeu, local people identified an array of aquatic resource biodiversity, with aquatic animals largely referring to fish, eels, frogs, freshwater shrimp, snakes, snails, and turtles. The availability of

Table 15: Priority of Activities According to Wealth Category and Gender

Men from better-off households	Women from better-off households
Rice production	Rice production
Preparing food	Collecting firewood
Clearing and/or preparing fields	Carrying water
Raising livestock	Raising livestock
Collecting firewood	Preparing food
Carrying water	Milling rice
Fishing	Fishing
Cutting lumber	Gardening
Men from worse-off families	Women from worse-off families
Rice production	Preparing food
Preparing food	Collecting aquatic animals
Raising livestock	Raising livestock
Collecting aquatic animals	Fishing
Fishing	Gardening
Gardening	Rice production
Clearing and/or preparing fields	Child care

Source: Meusch et al., 2003, p. 10.

these resources differs among the three villages, with 61 species reported in Tamoyot Village and 102 species identified in Saisi Village.

Other aquatic animals, including several species of crabs, shrimp, frogs, shellfish, turtles, and various types of insects, were reported. In some cases, these animals (especially frogs, shrimp, and crabs) are as important to household consumption as fish.

Many aquatic habitats also are exploited in Attapeu. As each habitat supports particular aquatic organisms, the local people target them in specific ways. The main categories of aquatic environments are rivers and perennial streams, perennial ponds, marshes and oxbow lakes, seasonal ponds and streams, and rice fields.

The rivers and perennial streams provide important habitats for a wide range of fish and aquatic animals. The nature of these environments means that harvesting the aquatic resources often requires a relatively high degree of specialization, with additional investments in gear (including boats) and labor. Those unable to make these investments are restricted to less-intensive fishing along the edges of the rivers. Other aquatic environments are more

accessible and require less-specialized gear and investment. These are particularly important to poorer people, especially when the environments are common property resources. By definition, poorer people have less access to private lands.

Summary of aquatic environments

RIVERS AND PERENNIAL STREAMS

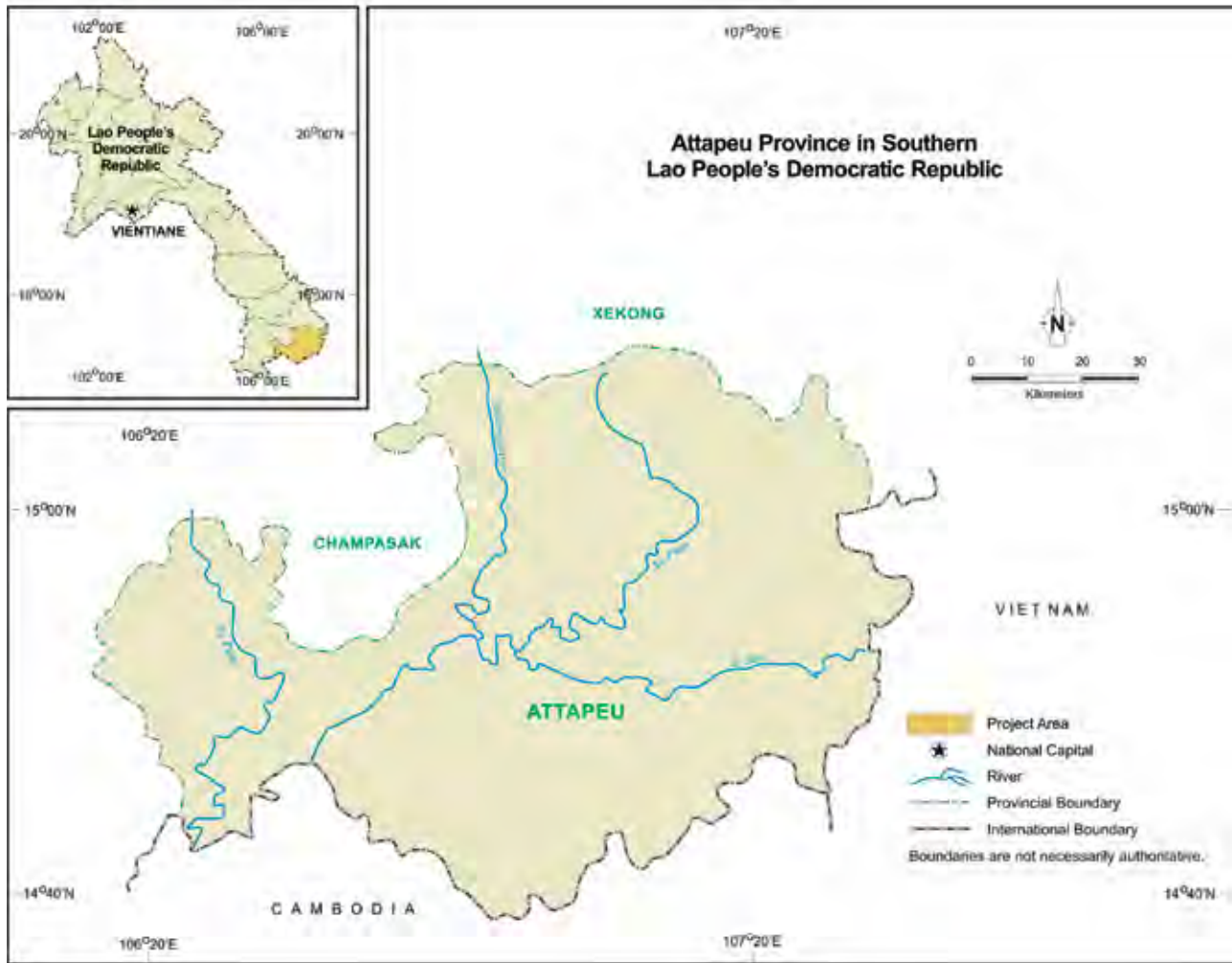
Rivers and perennial streams—key features in the lowlands of Attapeu—are important sources of fish and other aquatic produce. They are characterized by large amounts of water and sustain a range of aquatic organisms throughout the year. Between the rainy and dry seasons, the volume and flow of water fluctuate greatly. Being permanent, they are a dry-season refuge to a wide array of fish and other aquatic animals, and provide key habitats for a number of strictly riverine species.

Fishing in rivers requires some specialization. Variability in the water level, the changing nature of the environment caused by the fluctuation in water flows, and the seasonal activities of fish—some of which are migratory—based on the annual cycle of the river require specific knowledge and equipment. Boats, specialized nets, and other gear are required to fish in the rivers and large streams successfully. Much of the simpler, cheaper, and more common household gear have limited application in the river. This means that successfully accessing riverine aquatic resources requires financial investments in gear and some skills. Households that lack the means to purchase boats and equipment and to pay for the labor (typically strong males) needed to operate the specialized gear are limited to accessing resources along the edges of the rivers with smaller gear during periods when the water level is low. They also might assist others during peak fishing periods. While those who fish in the river are subject to seasonal scarcity of fish, they are able to fish to some extent throughout the year.

PERENNIAL PONDS, MARSHES, AND OXBOWS

Perennial ponds, marshes, and oxbows, which are fairly common in the lowland floodplains of Attapeu, have an important function in receiving excess water during the rainy season and holding it throughout the dry season. These water bodies are usually shallow and vary greatly in size over the course of the year—expanding during the rainy season and receding during the dry season. In many cases, they act as

Map 5



water stores (similar to the Cambodian Great Lake), receiving water directly from a rising river or stream during the rainy season, and draining back into the river or stream as the water level drops.

These water bodies also are refuges for fish and other aquatic organisms during the dry season. The

key species found in these water bodies are mainly floodplain fish rather than those found in rivers and streams, with the notable exception of riverine fish that remain trapped when the water recedes following flooding. Because the water is relatively fertile and shallow in areas, many types of aquatic

Table 16: Number of Aquatic Species Reported

Aquatic species	Tamoyot village	Saisi village	Gayeu village
Finfish	61	102	95
Crustaceans	3	6	6
Mollusks	4	7	6
Amphibians	8	14	6
Reptiles	8	10	5
Insects	–	7	7
Aquatic plants	19	16	31

Source: Meusch et al., 2003, p. 22.

plants and nonfish organisms, including mollusks, crustaceans, amphibians, and reptiles, are typically abundant.

Fishing in these perennial water bodies is typically less specialized and requires less investment than river fishing. When the water recedes and seasonal water bodies have dried or been harvested, people exploit the permanent water bodies using various types of gear. Since these water bodies are generally shallow (or have shallow areas), they are easy to access and conducive to the use of small-scale household gear and foraging activities, such as collecting aquatic plants and animals by hand. These areas are often particularly important to poorer people.

RICE FIELDS, SEASONAL PONDS, AND SEASONAL STREAMS

These types of water bodies are an important and often overlooked source of aquatic resources. They are found in lowlands where seasonal rains inundate vast areas for much of the year, typically from June to October. Fish from perennial water bodies migrate out to take advantage of these newly created water bodies for feeding and reproduction. They migrate through seasonal streams that drain the plains into the rivers. Fish use these streams for dispersal at the beginning of the rainy season and return at the end of the rainy season. Rice fields and seasonal ponds play a similar role in local hydrology, holding water higher in the watershed for longer periods than otherwise would be possible. Water harvesting²⁸ in rice fields and man-made seasonal ponds extends the productive phase of the aquatic environment (in the case of rice fields, at least long enough to produce a crop of rice).

Several species of fish and aquatic animals have evolved to take advantage of these temporary aquatic environments. At the beginning of the rainy season, they quickly disperse and reproduce (or in some cases reproduce and disperse) to fill the empty ecological niches that rapidly form in the newly inundated areas. Soon after the rains begin, the newly developed systems are populated with organisms that have been dormant or relatively inactive in permanent water bodies during the dry season.

Much household fishing is focused on these temporary water bodies. This activity is highly seasonal, taking place from the beginning of the rainy season

(June) until the water bodies dry up in the early to mid-dry season (November to January). Fish are harvested mostly using simple, inexpensive gear—a process that requires few specialized skills. Thus, poorer people are able to access this source. Fishing focuses on migration paths to and from water bodies and can be especially productive at the end of the temporary aquatic phase when fish move out of the floodplain back to permanent water bodies.

Harvesting aquatic resources and managing water and wetland habitats are important components of diversified livelihood strategies. As such, considerable time is dedicated to these activities. This level of diversification is an essential feature of livelihood strategies because the seasonal nature of rice and other crop production requires local people to adopt multiple strategies.

Maintaining food diversity and security

Diet and nutrition are key factors affecting health, food security, and poverty in the Lao PDR. An understanding of diet and nutrition is particularly important for vulnerable groups, such as poorer households and those with special needs, including pregnant and lactating women and children under 5 years old.

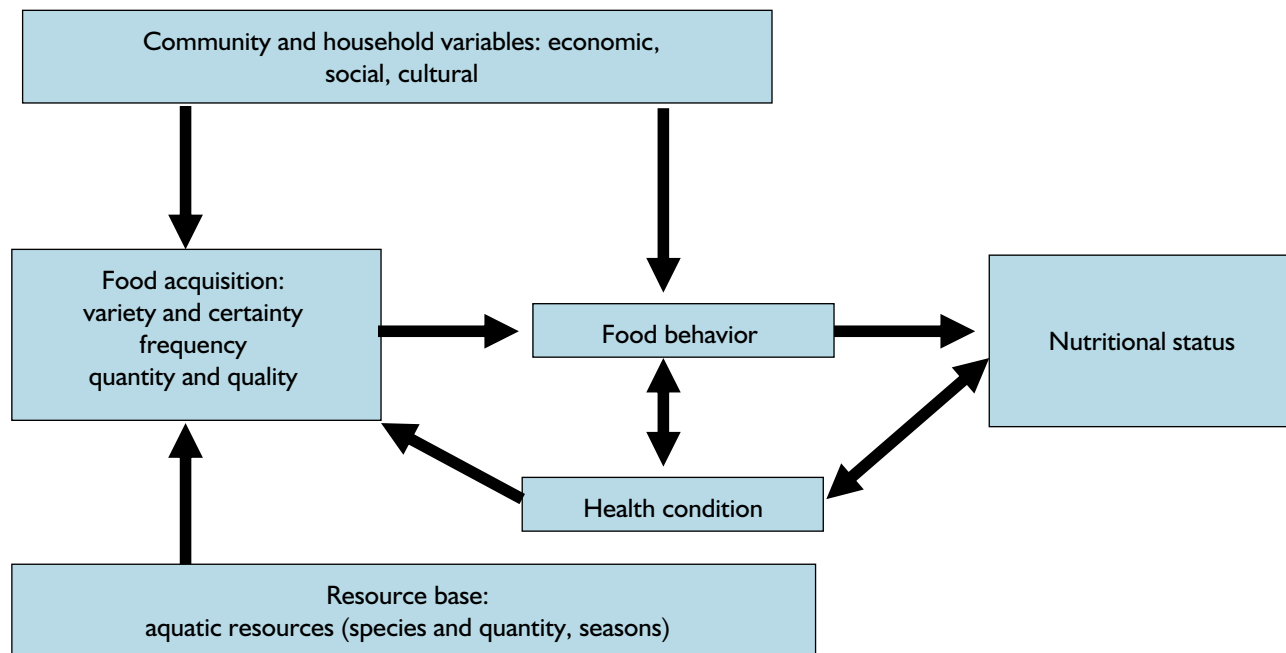
Nutritional status is the result of the interaction of a number of interrelated variables, as shown in Figure 10. This conceptual framework was used as the basis for understanding the link between health and nutrition and aquatic resources. In this framework, food is acquired from the aquatic resource base, which is expressed in terms of variety, certainty, frequency, quantity, and quality of acquisition.

Community and household variables, including family economics, social structure and organization, markets, and cultural beliefs, influence the acquisition and use of food (food behavior). The interaction between food acquisition and food behavior under the influence of community and household variables ultimately affects nutritional status. Underlying this interaction is the important aspect of health: poor health can limit an individual's food acquisition, consumption, and efficiency of assimilation or use. These will influence nutritional status.

Diets in most households are deficient in terms of quantity and quality. Local diets consist mainly of rice supplemented with insufficient amounts of

²⁸Water harvesting refers to collecting water during the wet season and trying to prolong its availability into the dry season for productive use (for crops or aquatic animal production), typically by using water-harvesting structures, such as small ponds and rice fields.

Figure 10: Linking Aquatic Resources to Nutritional Status



animal protein and lacking important micronutrients, such as iron, iodine, and vitamin A. This contributes to poor health and low productivity, which are significant threats to women and children. The level of health and nutrition is lower among women than men. Weak nutritional status and dietary habits are important factors in determining the health of pregnant women and infants. Starting life with poor nutrition undermines health throughout a person's life.

The report also highlighted dietary practices that might contribute to the poor nutritional status of many local people. For example, the widespread practices of not feeding colostrum to newborn babies because it is believed not to be ripe, as well as feeding rice to newborn babies, might have nutritional and health impacts with permanent implications.

Managing food diversity

Food security is not only about the availability of food; it also encompasses variety and quality. The availability of rice and aquatic resources is important in determining food security and nutritional well-being. Aquatic animals are the main source of animal protein in protein-poor diets since viable alternatives are not available. Indeed, aquatic resources constitute the main coping strategy for dealing with rice shortages, whereas coping strategies for dealing with shortages of aquatic resources do not exist. Any degradation of

these resources, therefore, is likely to have significant additional impacts on the fragile health and nutritional status of local people. Poorer people are likely to feel these impacts most severely.

Although degradation of aquatic resources is difficult to verify, the people of Attapeu commonly expressed the view that these resources are declining. Explanations for this included pressure from population growth; more widespread use of modern, efficient gear; increased market penetration; growing demand for aquatic resources; and environmental degradation. The increase in fishing was given more weight than environmental degradation.

Managing human fishing and aquatic environments is essential. Aquatic resource production depends on a number of factors. Maintaining habitats that are important for breeding, spawning, migration, and dry-season refuges is critical to ensuring the viability of aquatic resources.

This has implications for local land-use planning and agricultural development strategies. Increasing rice production by converting ponds, marshes, and other floodplain resources, as well as the management of rice fields, might have impacts on wild aquatic resources.

While the discussion regarding aquatic resources and fisheries tends to focus on the potential threats of degradation, the potential for improving rural livelihoods through the wise management of aquatic

environments and resources is considerable. Local experience in managing these resources is substantial. However, few development initiatives have tried to harness this experience. Protecting important breeding and spawning grounds and dry-season refuges might prevent degradation as well as increase production.

Implications

The study in Attapeu illustrates the fundamental importance of adopting a range of livelihood activities and resources. While aquatic resources play an important role, their full significance is easily overlooked. Weighing this significance requires an understanding of wider household livelihood strategies. However, as obtaining information on aquatic resource production and values is notoriously difficult, a combination of approaches is required. Local participatory approaches are most appropriate for monitoring and assessment and for supporting consultation on suitable management. Because of the complexity, diversity, and seasonality of aquatic resources, regular monitoring requires extensive participation of local resource users.

Reliable information to measure the economic value of aquatic resources is also lacking. This type of information is essential for policy makers and development planners in assessing different development options (Souvannaphanh et al., 2003). Where economic valuation techniques have been applied, the full value of economic resources becomes apparent. Gauging the economic and nutritional value of aquatic resources, combined with an economic assessment of the viability of alternative food sources, would provide important evidence about their full value and contribute to the evaluation of development options.

The Lao PDR and the Mekong region have some experience managing critical aquatic environments—including dry-season refuges, rice fields, and breeding and spawning grounds—to ensure the sustainability of stocks. For example, farmers traditionally set aside small water bodies in or adjacent to their rice fields.

This practice provides local habitats that help maintain stocks of aquatic resources during the dry season, which then repopulate during the flood season. Opportunities for testing these initiatives in Attapeu should be pursued.

When addressing nutrition and health, it is equally important to consider dietary habits, child rearing practices, and the preparation and storage of foods. Thus, supporting an integrated approach that combines managing aquatic resources with education and access to adequate health care services is critical. Improvements in nutrition are likely to have dramatic impacts on the rural people in Attapeu.

The integrated management of aquatic resources has significant institutional implications. Responsibilities lie with different government agencies: food security largely falls under the Ministry of Agriculture and Forestry; health and nutrition is under the Ministry of Public Health; and to complicate matters further, water management, irrigation, and agriculture are under different departments. Even within the fisheries sector, wild aquatic resources—other than commercial fisheries and aquaculture—receive little recognition. Applying an integrated approach to aquatic resource management for poverty reduction requires a level of cross-sectoral coordination that has been realized rarely.

Finally, aquatic resources and rice clearly are fundamental to food security, nutrition, and health. As the main animal protein source in protein-poor diets, aquatic resources are vital to maintaining the people's health and well-being. They tend to be managed as common property and are particularly important to poorer people who have less access to land and less capital to invest in improved rice production. Management of water resources and aquatic environments, therefore, is essential. Moreover, while increasing rice production is important and necessary, those efforts should not harm wild aquatic resources. The potential for improving food security and health through sustainable management of aquatic resources and improving rice production should be explored.

POVERTY AND BIODIVERSITY

Improving Poverty Reduction and Conservation Outcomes in the Grassland Ecosystem of Mongolia

Peter Zahler, Damien O. Joly, Linda Krueger, Steven A. Osofsky, and Shiilegdamba Enkhtuvshin

Introduction

Mongolia is home to the world's last and largest example of an essentially intact temperate grassland ecosystem. Only 1% of Mongolia is considered arable land, while about 34% of Mongolia's people depend directly on livestock production (most as traditional nomadic pastoralists) and an additional 26% indirectly do so. The annual per capita gross domestic product (GDP) is approximately \$600, with 40% of the country's 2.7 million people living at or below the poverty line. Poverty reduction must integrate the unique economic and environmental needs of the people who inhabit the steppe (temperate grassland ecosystem) and depend on its resources for their survival.

Mongolia's unique grassland ecosystem and poverty reduction

Mongolia's extensive grazing system functions over large areas, typically thousands to tens of thousands of square kilometers. The nomadic movements of pastoralists and wildlife in search of scarce resources cover areas larger than even the largest protected areas and communal management units. Thus, a substantial percentage of the human and wildlife populations depend directly on a fragile natural resource base. Past and present transhumant pastoralism is a direct and historically successful result of coping with this delicate balance. Unfortunately, traditional livelihoods are imperiled by overgrazing, particularly around *soum* (county) centers; a wide range of animal diseases, including some that

are zoonotic (i.e., transmissible to humans); and limited access to water for livestock. The ability to foster a multiuse landscape that allows traditional nomadic pastoralists to preserve their livelihoods without destroying the natural resource base on which they depend will determine, in part, the success of a conservation and development strategy for the steppe.

The Mongolian countryside provides significant natural resources that buffer poor rural populations from the worst effects of low cash incomes. In the Eastern Steppe, wild game and fish account for 13% of the average annual household protein consumption, according to household surveys. Market sales of game meat and furs also provide supplementary cash income, with sales totaling approximately \$180,000 per year (observed at just three provincial town markets) (Scharf and Enkhbold, 2002). The Siberian marmot, hunted for both meat and fur, is the most economically important species. However, trade in Mongolian gazelle, gray wolf, and red and corsac fox also contributes a significant part of the mix. Many of the skins and higher-value animal products, such as those used in traditional medicines, are exported to the provinces of the People's Republic of China (PRC) bordering the Inner Mongolia Autonomous Region.

However, available evidence suggests that wildlife populations are decreasing dramatically largely due to overexploitation. For example, the range of the Mongolian gazelle is now only about 25–30% of that observed in the 1950s, and the population is thought to be in serious decline (Lhagvasuren and Milner-Gulland, 1997; Zahler et al., 2004a). The same applies to Siberian marmot populations (Reading et al., 1998). A further decrease in wildlife will likely jeopardize food security and increase poverty in Mongolia by limiting opportunities for subsistence hunting. At the same time, this disruption of wildlife populations threatens the stability of the last relatively intact grassland in Eurasia.

Institutional context

Rural communities in Mongolia are suffering the consequences of the rapid national change from a centralized to a market economy. The closure of state factories in rural areas, which has meant a loss of jobs, appears to have set in motion a vicious cycle. More poor people have been driven back to the land, increasing pressure on natural resources and further limiting the economic viability of rural livelihoods. The quality of suitable rangeland for livestock has been compromised in many areas. These factors have combined with the limited rural business opportunities, in general, and the inexperience of the relative newcomers in livestock husbandry and in marketing local products to further complicate the challenge of promoting economic growth based on dwindling natural resources.

More than a decade after the dissolution of state-owned grazing regimes and the adoption of the 1994 land law, herding systems remain in flux. How changing land tenure systems will interact with increasingly prevalent market forces is unclear. However, with many absentee herd owners and the trend toward land privatization, sedentarization, and the subdivision of formerly communal rangelands are likely outcomes. As livestock production becomes more sedentary, stocking rates rise (increasing the potential for rangeland degradation), disease interactions intensify among livestock and between livestock and wildlife, and the movements of livestock and wildlife are restricted to the detriment of both.

High unemployment and poverty are primary concerns of local governments. Young people (15–35 years old) make up 50–60% of the population in the region. Many are unable to attend school, and more than half are unemployed. Meanwhile, without the state-run factories to purchase wool, hide, bones, and other products, herders are finding that they cannot sell some of their products. Lacking business acumen and investment resources, herders are unable to capitalize small-scale enterprises and transport systems to replace the defunct centralized system. They also lack knowledge to effectively negotiate prices for their products, and no government help is available to improve their marketing skills.

Mongolia's national economic needs, as well as strong external demand (most notably from the PRC), are driving oil, coal, gas, mineral, and wildlife exploitation in the region. While these resources could serve development and poverty reduction goals, there is also

the risk that they will be depleted by distant commercial interests with little benefit accruing to local populations. Development efforts in Mongolia must take into consideration the systemic links between poverty, disease, environmental degradation, and unsustainable use of resources. The development of a comprehensive conservation and natural resource management plan to preserve the integrity of the Eastern Steppe, its wildlife, and the unique traditional nomadic culture of its people is overdue.

Three of the most critical components of the Mongolian economy that have direct connections with biodiversity conservation are livestock, development (including the transport and mining sectors), and wildlife consumption and trade. These drivers are investigated in this case study through specific examples that highlight how Mongolia's economy and natural resource base are tightly linked—and why conservation, development, and economic production must be considered as interdependent.

The livestock–wildlife–human health interface

With 2.7 million people and 33 million domestic animals, Mongolia is, indeed, a “land of livestock.” More than half of Mongolia's population depends directly or indirectly on livestock production, which constitutes 30% of GDP. Therefore, the successful management of animal husbandry in the face of societal and economic changes is fundamental to Mongolia's future development, as well as the preservation of its traditional nomadic cultures. A persistent and growing concern is the threat of diseases: those that can pass between wild and domesticated animals, and those that move from animals to people (zoonoses).

Livestock production and wildlife conservation often are linked wherever domestic and wild animals come into contact. Several factors make this link particularly strong in Mongolia. The country's aridity and latitude result in highly variable intra- and inter-annual climate and resource availability. Pastoralists and wildlife respond to this variability by moving opportunistically across long distances to track ephemeral resources, often sharing the same pastures. Livestock and wild grazers have similar requirements that often lead them to the same resources and into physical contact. In some cases, they come into conflict with each other.

A wide range of animal diseases exist in Mongolia, including bovine tuberculosis, brucellosis, foot-and-mouth disease (FMD), Johne's disease, plague, and several parasites that are transmissible among wildlife, humans, and their livestock (Erbright et al., 2003; Lee et al., 1999; Zoljargal et al., 2001). These diseases might harm the health and productivity of humans, livestock, and wildlife, impairing economic development and ecological sustainability. The livelihoods of the rural poor are most severely impacted by disease—human and animal.

Continuing outbreaks of FMD illustrate the complexity of wildlife–livestock–human interactions in Mongolia. FMD is a highly contagious viral disease of ruminants that causes vesiculation of oral mucosa and skin of the feet (Thomson et al., 2001). After the 1970s, FMD had not been reported in Mongolia until an outbreak in domestic cattle and sheep during the winter of 2000–2001. A serological survey of FMD in Mongolian gazelles, which are sympatric with livestock throughout their range, found no evidence of exposure in 1998–1999 (Deem et al., 2001). However, after FMD appeared in livestock in 2001, a second serological survey found extensive FMD exposure in gazelles (Nyamsuren et al., 2006). FMD reappeared in livestock in Mongolia in 2002 and 2004. Whether gazelles can transmit FMD back to livestock is unknown, although livestock appear to be able to spread the virus to gazelles.

The presence of FMD has dramatic consequences for poverty reduction and conservation efforts in Mongolia. When a herd becomes infected with FMD, it significantly reduces livestock production. Moreover, market access is extremely limited for FMD-infected countries since live animals cannot be traded between FMD-infected and FMD-free countries, and the export of livestock products is heavily restricted (James and Rushton, 2002). During the last outbreaks in Mongolia, the Government imposed strict quarantines in affected areas, thus disrupting the traditional nomadic lifestyle of herders. Other FMD-control measures, including culling of affected animals and vaccination, cause further economic hardship. FMD threatens gazelles directly by causing catastrophic mortality (Sokolov and Lushchekina, 1997). The disease also has indirect impacts by triggering drastic, if misplaced, calls for “control” measures, such as culling and the disruption of gazelle migrations that are necessary for gazelle survival during the winter (Leimgruber et al., 2001).

Institutional responses required to tackle livestock–wildlife–human disease challenges

The intersection between government policies and land-use practices that affect disease transmission among people, livestock, and wildlife should be further examined. No one within the Government of Mongolia is responsible for integrating the policies and programs related to disease surveillance and livestock management with efforts focused on wildlife. (Mongolia is certainly not unique in this regard.) Relationships between livestock and wildlife are particularly intense. Improvements in the health of domestic animals likely will improve prospects for healthier wild animals and vice versa: this will ideally lead directly to healthier local people. It is essential to directly monitor community, livestock, and wildlife health parameters, such as the prevalence of zoonotic and animal diseases (e.g., FMD) in susceptible species over time and space; the number of disease outbreaks and types (i.e., by determining the causative pathogen) per year in wildlife under observation; and the incidence of marmot-related plague in hunters.

Stakeholder activism to improve conservation and reduce poverty: experiences from the Millennium Road and the Onggi River Movement

Development projects in Mongolia often have focused on regional growth with little consideration for environmental impacts, local communities, or poverty reduction. Inadequate environmental impact assessments (EIAs), combined with a lack of monitoring, repeatedly have led to environmental problems that directly and negatively affect local communities. This can result in increased poverty rather than improved economies. Two examples, a road and a mine, illustrate this point. The benefits in these cases often have been more likely to accrue to government officials and foreign interests than the local populace. The Millennium Road and Onggi River Movement (ORM) examples presented in this section highlight the need for greater stakeholder involvement in the planning process. They also underscore the need to incorporate stakeholder concerns regarding potential negative effects on the environment and on local economic structures.

THE MILLENNIUM ROAD

The people of the Eastern Steppe critically need transport networks. Much of the country is served by

dirt tracks, meaning hours or even days are required to transport goods to and from the countryside. Paved roads are practically nonexistent, and those that do exist are expensive to maintain due to the severe Mongolian climate and the long distances that must be covered to serve small numbers of people. For more than a decade, the PRC and Mongolia have been pursuing ways to improve regional economic cooperation and cross-border relations. Bilateral discussions, held since the early 1990s, produced trade and economic cooperation agreements at the subregional level between the local governments. However, these accords lacked adequate public notice and comment. A prime example is the Millennium Road project, which was initiated to ease transportation costs and increase herders' access to markets.

In the Eastern Steppe region of Mongolia, the Millennium Road was planned as a simple straight line running between the east and the west. Little attention was paid to the ramifications of the road's straight-line route on market access for rural people, or the potential environmental consequences of this route through the relatively pristine Eastern Steppe region and across the migratory paths of several hundred thousand Mongolian gazelles.

A bridge extending from the Millennium Road through the Nomrog Strictly Protected Area (SPA) also was planned. However, this plan directly contravened Mongolian law. Local government initiatives drove the proposed location of the Nomrog Bridge without adequate public consultation or stakeholder participation. A recent survey found that (i) about 71.4% of residents of the town of Sumber were opposed to the Nomrog Bridge; (ii) about 52.4% thought they would not benefit from this bridge; (iii) about 76.2% estimated that its adverse impact would be significant; (iv) about 76.2% strongly opposed degazetting (removing protected status) of part of the Nomrog SPA; and (v) about 80.9% designated the existing bridge near the city of Sumber as a more favorable cross-border route.

Although one argument made in favor of the bridge was economic, the location was inappropriate for large-scale commercial use, and a more suitable commercial link would be farther north. The proposed bridge over the Nomrog River was more remote compared to the existing bridge near Sumber—the most populated center in the vicinity—and its remoteness and construction would not bring economic benefits to the inhabitants of Sumber. Instead, cross-border trade would benefit the PRC much more than Mongolia.

The Nomrog SPA hosts a number of IUCN Red Book (rare or endangered) species that could be threatened further as a result of development plans. The proposed bridge and road infrastructure almost certainly would lead to a huge increase in poaching from the PRC side—where Mongolian gazelles have been almost annihilated—due to easier access. The infrastructure and transport plans would fragment the habitat of the gazelle population and limit their ability to migrate, contributing to a decline in their numbers. Migration is a critical aspect of gazelle behavior in the harsh winters and during spring, when the animals often must travel long distances to find adequate grazing, escape deep snows, or find safe locations to give birth.

Another argument in favor of the road and bridge was the potential increase in economic benefits from tourism. However, Nomrog SPA does not have the legal mandate or capacity to accommodate an increase in the number of tourists without compromising the level and standard of environmental protection.

The Government of Mongolia considered a border-crossing access bridge over the Nomrog River, the successful result of years of bilateral dialogue between Mongolia and the PRC that was now threatened by opposition. Not only were local communities not asked to contribute to the technical assessment process, some individuals who were invited to share their viewpoints were actually denied permission to do so by the Dornod *aimag* (province) government. At least one individual was threatened with the loss of her job if she attended the public meeting. A Choibalsan-based biology teacher—who made a public statement against the construction of the Nomrog River Bridge at the Eastern Steppe Biodiversity Project–World Wide Fund for Nature (WWF) National Forum on Protected Areas in Mongolia (November 2002)—was intimidated by her school district officials, who received telephone calls from the Dornod aimag government. These retributive actions are a violation of basic political rights and have reinforced the view that the development of civil society in Mongolia is not assured yet.

However, local stakeholder inputs finally may have been incorporated into plans for the road, which is still being built. The resulting alternative route presents a simple, elegant solution that could improve herders' access to local markets and facilitate the transport of market goods—a critical need for poverty reduction—without threatening the steppe ecosystem upon which the vast majority of people on the Eastern Steppe depend directly. The alternative route in the

east includes the economic hub town of Choibalsan, ensuring this center would not be doomed to economic neglect. Furthermore, the alternative route would avoid the gazelles' migration path and, thus, would be more compatible with gazelle life cycles than the original planned route. Using geographic information systems, the Wildlife Conservation Society found that the alternative route would serve 26–50 times more people than the officially proposed route and would require 205 kilometers (km) less road to be built. The alternative route, thus, offers a win-win solution that makes environmental and economic sense.

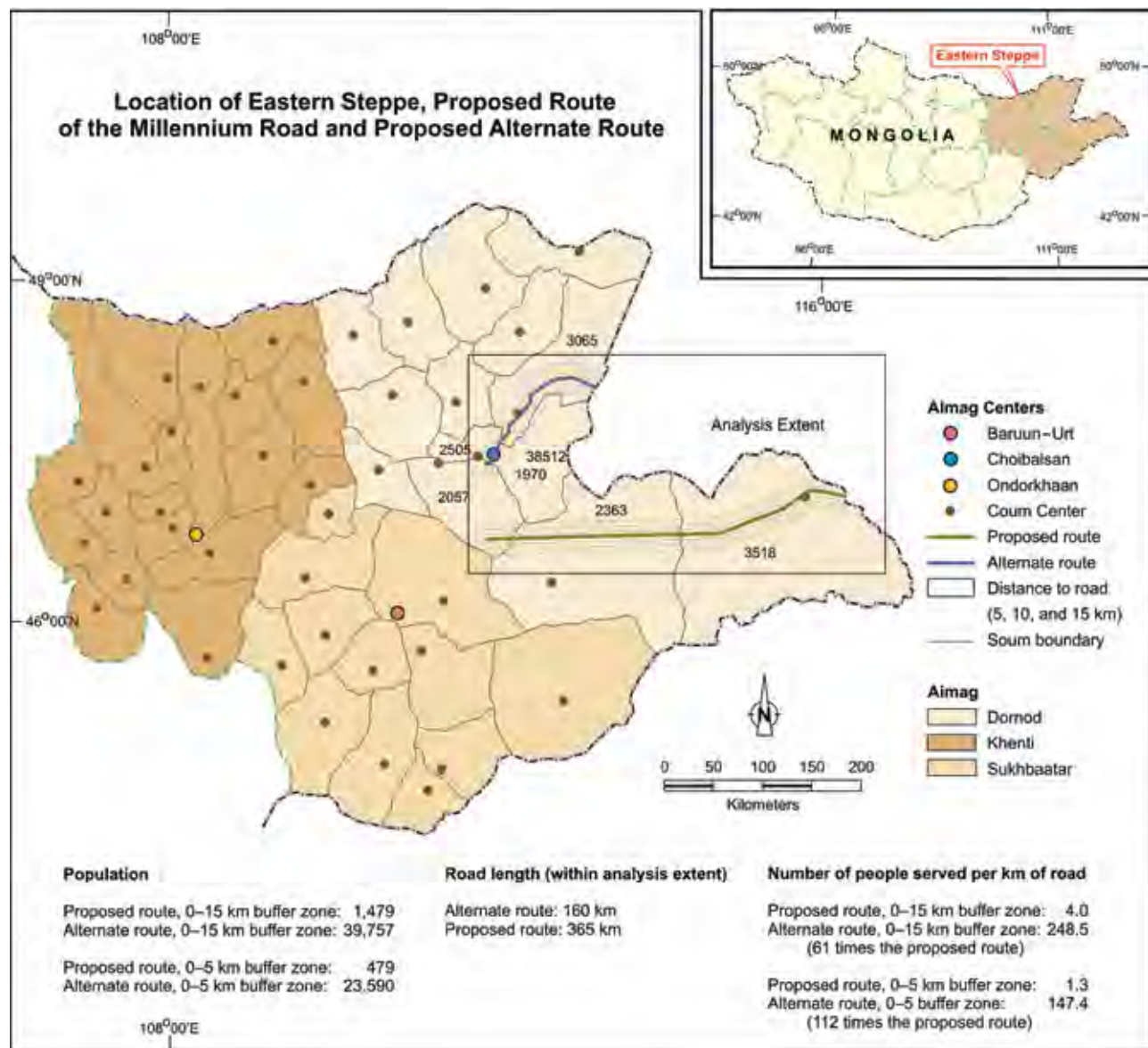
The Nomrog Bridge situation remains unresolved, however. Despite international and local outcry, as well

as a pullout by international funding agencies, a recent agreement between local Mongolian and PRC officials has resurrected the bridge plan—this time with funding from the PRC. Yet, if the residents of the Eastern Steppe are to receive real ecotourism benefits, PRC ecotourists need to be channeled into Dornod population centers. To ensure this happens, the river road from Kholonbuir Prefecture should use the existing bridge over the Khalghol River near Sumber as the international border point and gateway for PRC tourists.

THE ONGGI RIVER MOVEMENT

Mining has become one of the largest and fastest-growing industries in Mongolia. It constitutes more

Map 6



Source: Wildlife Conservation Society.

than 8.6% of GDP and 56% of exports. Mongolian mineral resources include gold, platinum, uranium, copper, zinc, oil, and natural gas. Mining is the fastest opportunity for Mongolia to acquire foreign exchange and lift itself out of poverty. While Mongolia has significant geological potential for such export earnings, current trade in raw minerals does not maximize the benefits for Mongolia, and more consideration needs to be given to increasing local value added in trade. Current trends raise concerns that local populations will receive few benefits, while bearing many of the deleterious effects on health and the environment, including sediment loading, heavy metal poisoning, water extraction, and morphological changes that have resulted in the drying of a number of water courses.

Placer mining—the most common method of extracting gold deposits—has exacerbated river pollution greatly through increased loading of sediment particles and nutrients at numerous sites in Mongolia. Officially, 28 river basins in eight aimags are “heavily polluted,” and some parts of the rivers are “damaged irreversibly.” Recently, hard rock gold mining practices—which use highly toxic agents such as cyanide and mercury that persist in the environment for long periods—have increased rapidly. Chemical spills might wipe out biodiversity within the immediate river ecosystems and have significant impacts on areas, animals, plants, and humans downstream.

In addition to the serious pollution caused by mining activities, water extraction and morphological changes to rivers associated with these activities can have dramatic repercussions. In some locations across Mongolia, they have caused the drying of several small rivers and severe water shortages for local people and livestock.

During the last decade, gold has been exploited in easily accessible areas. However, mining activities recently have expanded into pristine and protected areas. Although these protected areas are unique and offer invaluable opportunities for environmental protection and biodiversity conservation, pressure is growing to degazette many of them. The Ministry of Nature and Environment recently produced proposals to degazette more than 10% of Mongolia’s protected areas to allow the mining sector greater access.

With Mongolia’s weak regulatory structure and lax taxation laws, exploitation of mineral resources largely benefits the country’s wealthiest citizens and foreign nationals affiliated with mining corporations. Local people generally are left with low-paying jobs and a degraded quality of life caused by pollution and

loss of traditional sustainable jobs. The EIA process, including decision making and contract awarding, is inadequate, as are the quality and enforcement of EIA findings. Mining development will continue to be unchecked unless these EIA processes and procedures are amended to be clear, transparent, accountable to public scrutiny, and accompanied by strong compliance and enforcement provisions.

On the headwaters of the Onggi River, mining has silted streambeds, lowered water tables, and polluted entire watersheds with a variety of hazardous chemicals (including mercury). Downstream ecosystems and local communities have been seriously damaged as a result. In a response unprecedented for Mongolia, local communities along this river created one of the country’s first locally driven environmental nongovernment organizations (NGOs). Local stakeholders, who found their health and livelihoods at risk from the uncontrolled development of upstream mining, created the ORM.

ORM consists of 3,000 rural citizens (many of them nomadic herder families) who support restoration of the Onggi River. They have temporarily halted the operations of three gold mines polluting the river and the associated Red Lake. In a Mongolian first, ORM has filed court cases against the companies involved, which has been a key factor in raising national awareness about this and other environmental matters. ORM’s community-driven efforts can be replicated in other locations across Mongolia as a catalyst for change. Further, these efforts can demonstrate how local communities, the private sector, and government agencies can work together to maintain and even improve local livelihoods and environmental conditions.

Unsustainable wildlife hunting and trade

Wildlife species provide numerous economic benefits to local people in Mongolia, including serving as a source of protein and income from the trade of meat, fur, and animal parts used in medicinal markets. For poor people, the availability of wildlife can be crucial to economic and even physical survival. Wildlife provides food and reduces the need to slaughter livestock for consumption, so that instead livestock can provide benefits, such as milk and wool for personal use and for trading against other essential products and items, as well as serve as a combination of savings, wealth, and insurance. When wildlife becomes scarce, the impact is most dramatic on the poor and marginalized rural people.

Mongolia's transition in the early 1990s from a relatively strong, Soviet-dominated economy with strict controls over hunting and trade to a struggling free market economy has resulted in a dramatic increase in illegal hunting and trade. A range of wildlife species have declined rapidly due to a faltering economy, increased reliance on trade with the PRC, porous borders, and little funding or will for law enforcement (Wingard and Zahler, 2006). Much of this hunting is for local trade or consumption, although illegal international trade threatens some species in Mongolia. Evidence suggests that this threat is growing and spreading to new species. Three examples illustrate the unsustainable illegal hunting and trade pressure in Mongolia (Zahler et al., 2004b).

The Mongolian saiga antelope (*Saiga tatarica mongolica*) is a distinct subspecies found in the southwestern part of the country. The population of Mongolia's subspecies of saiga antelope has declined catastrophically from more than 5,000 to less than 800 (an 85% drop) in the last 5 years. The lucrative Chinese medicinal market for saiga horn is driving this collapse. Hunting is focused on the horned males, which has skewed sex ratios and exacerbated the population decline (Milner-Gulland et al., 2003). The saigas' breeding system has been disrupted, undermining its ability to recover from population declines. The extremely low numbers of saiga remaining in Mongolia make them especially susceptible to stochastic events, such as icy winters, that could cause mass mortality and potentially drive the subspecies to extinction. Circumstantial evidence suggests that middle-class people—those with vehicles and money for fuel—are the primary actors in the illegal trade of saiga horns.

Mongolia's red deer (*Cervus elaphus sibiricus*) were once common throughout much of the country. Unfortunately, the number of red deer also has declined catastrophically across Mongolia. A 1986 government assessment estimated the population size at approximately 130,000 in an area of 115,000 square kilometers (km²). The most recent population assessment in 2004 showed that only 8,000–10,000 red deer inhabit 15 aimags of Mongolia—a 92% decline in just 18 years. While habitat loss might play a small role, illegal poaching is the primary reason for this dramatic decline. Much of the poaching and subsequent trade is directed toward the international medicinal market, including harvesting for antlers (\$60–100 per kilogram), male genital organs (\$70–80), fetuses (\$20–50), and females' tails (\$50–80).

Mongolia is home to the world's largest mountain sheep, the argali (*Ovis ammon*). Foreign hunters seek these animals because of their impressive size and long, spiraling horns. Argali are declining in Mongolia, primarily due to an increase in poaching for horns and meat (for export to the PRC), predation by domestic guard dogs, and competition with domestic livestock. Government figures estimated 50,000 argali in Mongolia in 1975 and 60,000 in 1985. By 2001, only an estimated 13,000–15,000 remained—a 75% decline in just 16 years. Despite being listed as a threatened species in Mongolia and internationally, argali trophy hunting remains legal in Mongolia. The number of licenses has been increasing, reaching 80 in 2004. Trophy hunting is a lucrative business, with companies offering hunts for \$25,000–50,000. Although laws exist for the return of revenues to local governments for conservation initiatives, they are not followed. As a result, this program is surrounded by controversy as manifested by growing local opposition, accusations of corruption in the media, and a US lawsuit.

Illegal and unsustainable hunting has become the major threat to wildlife in the past decade in Mongolia. Despite adequate available habitat, some wildlife species are being driven rapidly to the brink of extinction. The recent increase in poaching in Mongolia stems from a combination of strong demand for wildlife products in Asian markets; large numbers of unemployed people struggling to make a living; and poor enforcement or lack of implementation of existing laws and policies on resource use, wildlife trade, and redistribution of trophy hunting revenues.

Institutional responses to address the hunting and trade challenge

Successfully addressing the unsustainable hunting problem will require a blend of programs: (i) social development to provide alternative livelihoods for poachers; (ii) better regulation of commercial and trophy hunting, including openness and transparency, external review, and oversight; (iii) improved use of legal disincentives and incentives; (iv) reform and vast improvement of law enforcement; and (v) creation of some form of national wildlife agency. However, such responses also should be linked to a social development plan that provides alternatives for poor people who turn to illegal practices to survive.

Local people—who depend directly and indirectly on Mongolia's wildlife resources—will be critical to the success of any wildlife management or

conservation program. Recognizing this need, the Government has begun to formulate policies and laws that simultaneously enable communities to engage in conservation and have a stake in Mongolia's resource base. For the moment, proposals have remained focused on forestry, although this could be expanded to include other resources. Unfortunately, only a few Mongolian legal specialists are involved in efforts to promote sustainable community-based natural resource management, and no institution at the national level is fully committed to the concept yet. Mongolia's communities currently have the right to form local organizations and gain access to resources. The development of local organizations, such as herder cooperatives for resource management, including local management of hunting, might be the best hope for Mongolia's wildlife crisis.

Conclusions

The broad scale of human impacts on nature in Mongolia has begun to jeopardize the life support systems on which the poorest disproportionately depend, threatening to eliminate future, more sustainable options for natural resource management. Wildlife, water, and rangeland for livestock—all critical inputs to the rural economy—are under pressure in many parts of Mongolia today.

All development, poverty reduction, or conservation efforts in Mongolia also must consider transboundary effects and other pressures on natural resources that originate outside the country. The influence of the PRC, which has a population nearly 500 times that of Mongolia and is one of the fastest-growing economies in the world, threatens to overwhelm Mongolia's efforts to determine its own future. External demand should be perceived and channeled as a positive force to generate foreign exchange earnings and investment, and business development in Mongolia. Whether most effects to date have been positive remains unclear, however. Many decisions apparently have been made in view of short-term gains rather than long-term environmental sustainability and local needs. Mongolian national agencies, working with the support of international development agencies, lenders, and local stakeholders, should consider carefully how to optimize the flow of benefits to create long-term economic opportunities for the Mongolian population. International processes also must be secured to enable the transboundary management of migra-

tory wildlife populations (e.g., gazelles) to ensure that hunters across the border do not exploit and, thus, potentially negate improved Mongolian wildlife policies.

Biodiversity conservation alone cannot reduce poverty in Mongolia. However, poverty reduction efforts that do not adequately consider conservation and sustainable natural resource use will not be successful in the long term. Mongolia's unique environmental conditions, historic culture of nomadic pastoralism, low human population, and high poverty rates make the country a distinctive test for linking poverty reduction and conservation on an ecosystem scale. Domestic political will, coupled with strong international donor support for holistic approaches, can allow Mongolia to achieve the economic modernization it needs and raise living standards, while protecting the natural resource base that remains the backbone of traditional Mongolian culture and livelihoods.

Poverty Reduction, Forests, and Conservation in Viet Nam: Understanding the Trade-offs

William D. Sunderlin and Huynh Thu Ba

Summary

This case study assesses the possibilities of improving rural livelihood while reversing the loss of forest resources in Viet Nam. A review of the literature yields a mixed answer. As in many other developing countries, livelihood in Viet Nam has been improved in part through the massive conversion of forests to other uses. Why then should a reversal of the loss of forests be expected to improve livelihood? The answer is that the continuation of some forest conversions, combined with forest protection and restoration, can contribute to the maintenance and improvement of livelihood. One of the great challenges that policy makers face is knowing how to distinguish between these two uses of resources, and how to manage them optimally.

Introduction

Viet Nam has made great strides toward eliminating poverty in the last 20 years. In the mid-1980s, seven of 10 Vietnamese lived in poverty. Ten years later, this proportion had been halved (World Bank in Viet Nam, 2000). From 1993 to 2002, poverty in Viet Nam decreased from 58% to 29% (ADB et al., 2003).

One of the Government's highest priorities is to follow through on this achievement and, thereby, eliminate remaining poverty.

In the last half century, Viet Nam, like many developing countries, has rapidly lost its forest cover across the country. The forested areas in Viet Nam were estimated to be 181,500 km², or 55% of the total land area of 330,000 km², in the late 1960s. By the late 1980s, forests covered only 56,680 km², or 17% of the total (Collins et al., 1991; De Koninck, 1999). With the loss of two thirds of its forest cover during this period, Viet Nam experienced the most rapid deforestation among Southeast Asian countries (De Koninck, 1999). Vo Quy (1996) estimates that said forest cover declined from 43% in 1943 to 20% in 1993. ADB estimates that Viet Nam's natural forest cover decreased, on the average, by 185,000 hectares (ha) per year from 1976–1990 (ADB, 2000). In the late 1990s, the Government announced it would halt deforestation and restore the forest cover in many areas of the country. This plan is called the Five-Million Hectare Reforestation Project.

Is Viet Nam's poverty reduction program compatible with its Five-Million Hectare Reforestation Project? This is an important question because, arguably, the loss of forest cover has been linked to an increase in per capita resource use and well-being. Would a sudden turn toward arresting deforestation and restoring forest covers threaten to undo some of the livelihood improvements?

These questions are best addressed against the backdrop of recent literature on forest transitions and the environmental Kuznets curve²⁹ related to forests, which suggests the compatibility between livelihood improvements and forest conservation is ultimately a developmental issue. In response to this literature, this study asks three questions regarding Viet Nam:

- (i) Is it best to wait for economic advancement to eliminate poverty and deforestation?
- (ii) Might forces other than economic development act in the defense of remaining forests?
- (iii) Can existing forests support poverty elimination?

The following three sections discuss (i) the theories on the relationship between poverty reduction and deforestation (forest transitions and the

environmental Kuznets curve); (ii) the relationship between poverty and deforestation in Viet Nam; and (iii) the potential compatibility between protecting and improving livelihood, and protecting and restoring the forest cover in Viet Nam (i.e., an exploration of the aforementioned three questions). The final section provides a summary and a conclusion.

Theories on poverty reduction and deforestation

Worldwide, forests have been disappearing rapidly in net terms. In the last 8,000 years, the earth's forest cover has declined from 6.2 billion ha to 3.3 billion ha,³⁰ and much of this loss has happened in the last 30 years (Bryant et al., 1997). From 1990 to 1997, approximately 6 million ha of humid tropical forests were lost each year, and about 2.3 million ha of forests were degraded (Achard et al., 2002). Forest cover loss generates deep concern for various reasons. Forests support the livelihood of millions of forest-dependent people, play a crucial role in the earth's carbon cycle, and encompass the highest species diversity and endemism among all terrestrial ecosystems. In addition, the genetic library of forests supports important functions, such as the improvement of agricultural crops through the introduction of germplasm of wild relatives found in forests, the introduction of new food, and the supply of medicinal plants and pharmaceuticals (Myers, 1997).

However, deforestation is not entirely bad. In fact, the conversion of forests to other land uses arguably has been instrumental in improving living standards worldwide for hundreds of years. The development of agriculture was a key factor in enabling a quantum leap in the ability of humans to exploit natural resources. The transition from hunting and gathering to swidden agriculture (sometimes called "shifting agriculture" or "slash-and-burn") and then to sedentary agriculture resulted in more than a five-fold increase in per capita appropriation of energy. Sedentary agriculture supports a much larger human population than was possible with previous modes of natural resource use. Moreover, the development of agriculture laid the foundation for the establishment of industry and urbanization, and through these, even higher per capita appropriation of energy and natural

²⁹The environmental Kuznets curve concept says that environmental deterioration displays an inverted U-shaped pattern over time. It is low prior to economic development, increases in the course of economic development, and then decreases when per capita income reaches a "turning point."

³⁰This is converted from Bryant et al. (1997, pp. 1 and 9): 62 million square kilometers (km²) to 33 million km².

resources. Agriculture has been developed mostly at the expense of forest covers. From 1700 until 1980, 19% of the world's forests disappeared, while the area occupied for agricultural purposes increased four-and-a-half times (Richards, 1990). It is no accident that, on the average, the worldwide decline in forest cover has been concurrent with extraordinary increases in human welfare.

Does this mean that continued improvement of living standards and continued increases in human population will lead to the disappearance of all forests? Apparently not. Countries that have a high standard of living paradoxically also tend to be countries where forest covers have stabilized and, in some cases, are increasing.

The reasons that forest cover stabilization and restoration tend to happen in countries with high per capita income vary. They include (i) a reduction of the relative share of agriculture in the economy, and associated rural–urban migration; (ii) agricultural mechanization; (iii) a decrease in agricultural prices, making agriculture on marginal lands less attractive; and (iv) a shift from the use of fuelwood to commercial fossil fuels and from wood to nonwood construction materials.

Literature on the environmental Kuznets curve hypothesizes that at a certain level of per capita income in developing countries (called the “turning point”), environmentally favorable outcomes usually begin to occur. A subset of this literature is concerned specifically with forest cover stabilization and restoration once the turning point has been reached (see, for example, Patel et al., 1995; Madhusudan et al., 2001; Culas and Dutta, 2002). The so-called forest transitions literature documents historical country case studies where forest cover stabilization and restoration have been achieved.³¹

Livelihood improvement and deforestation in Viet Nam

In Viet Nam, as in many other countries, the gradual increase in per capita income and natural resource use generally occurs with a decline in the country's area of natural forest. This is true in general terms, though recent history demonstrates an apparent lack of concurrence. The period after 1950 was one of economic stagnation, low per capita income, and massive

poverty in the early 1980s. Over this same period, forests were disappearing at an increasingly rapid pace. The great strides in reversing massive poverty began in 1986. Deforestation appears to have peaked in the early 1990s, though this is mere speculation.

In Viet Nam, the argument that improved living standards are related to the disappearance of forest covers is largely conjectural. It can be explained first by looking at the reasons for the improved living standards after 1986, and then at the reasons for rapid deforestation.

What were the keys to success in Viet Nam's poverty-reduction policies? The policy shift began in 1986 when Viet Nam converted from a centrally-planned economy to a market economy, abandoning its socialist industrialization model in favor of agriculture-led growth. Beginning in 1988, through its *Doi Moi* (renovation) policies, the Government abolished compulsory grain-purchase quotas, instituted free trade at market prices, ended collectivized agriculture, and distributed farmlands to individual households (Irvin, 1995; Dollar and Litvack, 1998). The reforms increased the relative prices of rice and other agricultural products, provided considerable incentives for rural producers with land and agricultural knowledge, and increased per capita rice production to historical highs for Viet Nam by 1988 (Dollar and Litvack, 1998). In the early phase of *Doi Moi*, the reduction in poverty resulted from the distribution of land to agricultural households and the provision of economic incentives to increase farm production (ADB et al., 2003). Moreover, the diversification of on-farm activities can explain most of the dramatic improvement in living standards from 1993–1998 (World Bank in Viet Nam, 2000).

Explanations on the causes of deforestation in Viet Nam vary considerably, though they tend to give agricultural expansion a prominent place. An ADB report states that the leading causes of deforestation in Viet Nam have been a population-driven demand for forest products and agricultural land, as well as the logging of large tracts of forest by State Forestry Enterprises (ADB, 2000). The author of *Deforestation in Viet Nam* found that the fundamental causes of rapid deforestation have been “demographic growth; economic growth; increasing demand for food and export crops; and increasing demand for forest products—primarily wood for the pulp and paper industry—for

³¹ For case studies on Denmark, France, Italy, and Switzerland, see Fairbairn and Needle, 1995; Mather et al., 1998; Mather et al., 1999; and Mather and Fairbairn, 2000.

construction and for fuel” (De Koninck, 1999, p. 15). He identifies four “instrumental factors” in Viet Nam’s deforestation: excessive reliance on swidden agriculture by some ethnic minorities, agricultural expansion, logging, and collection of forest products for subsistence needs (De Koninck, 1999, pp. 15–16). Lang (2001) sees three main causes: the second Indochina War, postwar resettlement and migration, and logging. De Koninck and Lang state that ethnic minorities have been wrongly accused of playing a primary role in the deforestation of Viet Nam (De Koninck, 1999; Lang, 2001).

In the 1990s, Viet Nam’s innovative rural development policies led to the dynamic growth of the agricultural sector, with the growing of perennial crops on forest lands (e.g., coffee, tea, rubber, and cashew nuts). This substantially improved the incomes and welfare of the rural population (ADB, 2001). Exports of agricultural crops almost doubled from 1988–1991, and accounted for more than half the value of Viet Nam’s exports (Fforde and Sénéque, 1995). From 1990–1999, Viet Nam’s cropland area grew at 3.4% per year, reaching 12.3 million ha (Economist Intelligence Unit, 2001). How much of this agricultural expansion took place at the expense of forest covers is unclear though.

In summary, deforestation in Viet Nam after World War II was associated with a rapidly growing population of rural producers, though not necessarily improved standards of living. Beginning with Doi Moi in 1986, policies favoring considerable increases in agricultural investment were instituted. This, in turn, intensified the clearing of forest lands in favor of farmlands. However, at least two important exceptions to this association between improving living standards and deforestation can be found.

First, deforestation can lead to a decline, rather than an improvement, in the standard of living in many instances. One important instance is the massive logging of areas where forest-dependent people (often ethnic minorities) are deprived of their main source of subsistence. In the 1950s, when the war against the French had begun, the Government of Viet Nam restricted local people from exploiting timber and nontimber forest products (NTFPs) to ensure forest resources could be used to support the war effort. Ethnic minorities reportedly suffered as a consequence of this prohibition (Nguyen Van Dang, 2001). Another important negative effect of deforestation is swidden cultivation under conditions of excessive population density, leading to shortened fallow periods, overuse

of soils, declining agricultural yields, and poverty. This phenomenon has been widely evident in Viet Nam (see, for example, Jamieson et al., 1998).

Second, an assumption that conversion to sedentary agriculture is the only explanation for the reduction in poverty would be wrong. Poverty reduction is a multisectoral and multidimensional process, and the contribution of the forest sector is just one part.

Nevertheless, the core of this study’s argument should be emphasized—that the conversion of forest lands to agricultural land has been one key factor in Viet Nam’s ability to feed a growing population and to raise the average per capita use of resources and standards of living.

Livelihood improvement and forest conservation in Viet Nam

The information presented in the previous sections yields three important sets of questions. The first question is: If forest conversion has been an important factor in the improved standards of living in Viet Nam, and if the ultimate trajectory of this change (based on the experience in rich countries) is the slowing of deforestation and, ultimately, reforestation, why worry about forest conservation and biodiversity? Will these problems not take care of themselves in the course of economic development?

For several reasons, the forest environmental Kuznets curve and the forest transition phenomenon cannot be relied upon to avoid undesirable losses of high-value forests, rare species, and environmental services. First, the recognized turning point at which reforestation begins is an annual per capita income of \$4,000–6,000 (Wunder, 2003). Viet Nam is still far below this threshold, and will not reach it for at least 10–20 years. Second, in countries where reforestation has occurred, many of the “new forests” are monoculture plantations, which do not restore much of the original biodiversity. The challenge of restoring biodiversity is generally greater in the tropical forests of developing countries, where biodiversity, on the average, tends to be higher than in temperate forests. Third, the consequences of allowing deforestation to proceed unabated are greater now than when the European forest transitions occurred, in part because of the key role of tropical forests in the global carbon cycle. Fourth, the forest transition involves trading one kind of environmental problem for another that might be more serious. Deforestation is often controlled at the cost of high per capita consumption of

hydrocarbon fuels (oil, coal, etc.), which is directly related to the greenhouse effect and global warming.

The second important question is: If the remaining natural forest cover and forest biodiversity in Viet Nam are timely and satisfactorily “saved” by the environmental Kuznets curve and forest transition, what forces will act in defense of these vital resources before they are lost?

The answer has two parts. First, forests in the remote and hilly regions of Viet Nam are unlikely to be destroyed, precisely because of their remoteness. Some forests will never be exploited (or exploited heavily) because they are on inaccessible terrain that would be too expensive to log (except by using a helicopter). Moreover, many of these forests are unsuitable for permanent agriculture, not just due to their remoteness, but also because they sometimes overlie soils of low fertility.

Second, social and political forces will defend the remaining natural forests and biodiversity in places where remoteness does not act as a biophysical barrier. This will happen where the value of natural forests in supporting and improving livelihoods and providing vital environmental services is recognized empirically, and the knowledge is converted into an effective policy at the national and provincial levels. However, this reality embraces a profound problem. The national Government’s view of what constitutes “vital forests” is often not the same as that of villagers. The recent history of the Five-Million Hectare Restoration Project is a case in point. The national Government plans to reforest vast areas that are said to be “empty lands.” However, a closer look reveals that these are often lands where the local people have evolved elaborate systems of resource use. Establishing plantations in these areas would not necessarily benefit society in net terms because many livelihoods would be displaced.

The third question is: In what ways might existing natural forests be important to continued progress on poverty elimination in Viet Nam?

Ethnic minorities in Viet Nam (who are usually the poorest of the poor) tend to rely on forest resources (ADB et al., 2003); thus, maintenance of those resources is vital for protecting and, in some cases, improving their livelihood. This statement is open to challenge, however, because in some cases the continued reliance on forest resources might be an obstacle to improving living standards. For example, a pessimistic outlook on the poverty reduction potential of forests holds that the extraction of forest

resources “is usually labor-intensive, land-extensive, and supply is inflexible vis-à-vis demand changes” (Wunder, 2001). A more optimistic outlook is justified in cases where forest resources play a vital role in avoiding or mitigating poverty (i.e., not necessarily in eliminating poverty); where local people express a preference for continuing to rely on forest resources and are able to do so; and, of course, where forest resources can help eliminate poverty.

The convergence in Viet Nam between areas of high poverty incidence and areas of remaining natural forest cover is significant. This can be seen in Maps 7 and 8, which juxtapose a map of poverty incidence countrywide and areas of remaining natural forest. Both tend to be situated away from the major cities (Ho Chi Minh City and Hanoi notably), away from the coasts, and concentrated in the remote and hilly areas of the north and central portions of the country.

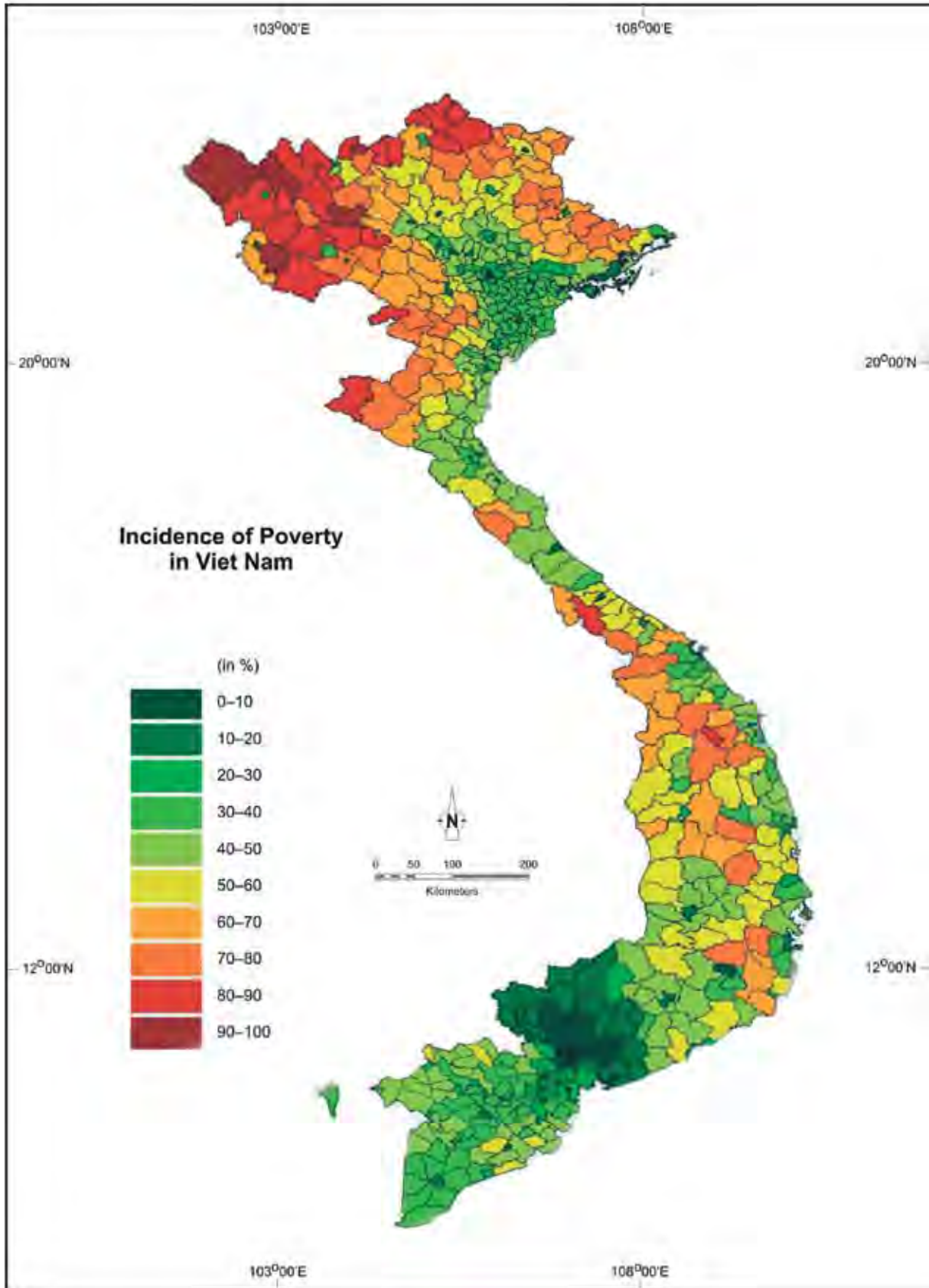
This is no accident. The areas of high poverty incidence and remaining natural forests are largely out of reach of the modern economy, and far from urban areas, large paved roads, and ports. For natural forests, elevation reinforces this phenomenon and explains why some have remained relatively intact.

These facts help clarify why (i) the poor in Viet Nam, and especially the ethnic minorities, are disproportionately dependent on forest resources; (ii) some of the poor in Viet Nam use forest resources as a safety net; and (iii) the continued use of forest resources in these areas might be favored for poverty reduction. Forest resources are relatively abundant in some of these areas, and few alternatives are available. However, some exceptions to this pattern can be found.

The protection of forests can be important for the maintenance of livelihood through direct harvesting and marketing, as well as other channels. Forests often provide vital local environmental services (e.g., restoration of soil fertility in swidden systems, regulation of water cycles, germplasm for agriculture, control of erosion, etc.).

Poverty reduction can be favored not just by protecting certain kinds of forest resource use by smallholders, but also by developing new income sources. Due to their proximity to areas of natural forest, the poor might have a comparative advantage in harvesting, processing, and marketing forest products. Their proximity to forests also might give them a comparative advantage in managing payment schemes for environmental services, such as the protection of watersheds and biodiversity, ecotourism business, and carbon sequestration markets. The poor do not

Map 7



Source: Minot et al., 2003.

Map 8



Source: Rhind and Iremonger, 1996.

have a comparative advantage in terms of the knowledge, skills, and capital required to carry out these marketing opportunities. However, prudent policy support can minimize these disadvantages.

Summary and conclusion

In Viet Nam, as in many other countries, improvements in living standards have been contemporaneous with, and partly linked to, the rapid loss of forest covers. This process has yielded mixed results. On the one hand, deforestation has been related to the establishment and expansion of sedentary and modernized agriculture, urbanization, and the growth of industry, as well as the rising per capita consumption of a growing population. On the other hand, this process has undermined certain livelihoods, disrupted the local environmental services of forests, decreased national forest produce supplies, damaged biodiversity, and provoked costly downstream effects, such as land erosion and river sedimentation.

Are policies aimed at eliminating remaining poverty, arresting deforestation, and massively reforesting the country, compatible goals? Potentially, they are. However, sensitivity to certain realities is needed to optimize this compatibility. These realities can be summarized as follows:

While economic development can slow and reverse forest cover loss in certain circumstances, reliance on this phenomenon in Viet Nam would be unwise. The turning point is many years off, and forest transition entails a different set of environmental problems that could be worse.

Historical deforestation has favored increased per capita income in Viet Nam to the detriment of the environment. While this process has slowed, it has not ended.

Deforestation has disrupted the livelihood of some low-income communities, particularly in remote areas where ethnic minorities historically have relied heavily on forest resources, and where alternative livelihoods are not easy or possible to establish.

In some cases, reforestation can strongly favor local livelihood improvements, especially where people can participate in the planted forest economy via smallholder projects (e.g., outgrower schemes where farmers plant trees to supply private companies), or through wage labor on large plantations. The conditions must be optimal for livelihood improvements, including reliable markets, stable prices, and security of tenure for smallholders. However, the poorest of

the poor tend not to have land or security of tenure by definition.

Under certain circumstances, reforestation can be extremely detrimental to local livelihood, especially where massive reforestation is superimposed on so-called empty lands that, in fact, are supporting local livelihood.

Two linked conclusions can be drawn from these findings. First, the effects of changes in forest covers (i.e., deforestation and reforestation) on possibilities for achieving poverty reduction vary greatly, depending on the local configuration of livelihood. Second, given this complexity, blanket forest policies aimed at wide, contiguous areas of land should be avoided. A needs assessment in villages and communes is important to evaluate ahead how policy changes might affect livelihood and, thus, make local policy course corrections as needed.

This reinforces the importance of allowing a great deal of discretion on the formulation of forest policies at the provincial and district levels where the nature of local livelihood is usually better understood. This local level fine-tuning of policies is complemented best by participatory stakeholder assessments to ensure forest policies have the greatest chance of serving the needs of people who are most disadvantaged.

Efficient communication and decision making among ministries and government institutions is needed at all levels in Viet Nam to ensure optimum resolution of the trade-offs between poverty reduction, on the one hand, and forest cover protection and restoration, on the other. Two factors inhibit this kind of communication and decision making, which is a cause for concern. First, responsibility for these two issues tends to be compartmentalized. The Ministry of Labor, Invalids, and Social Affairs has the lead responsibility for poverty reduction and allocates virtually no attention to forestry issues. Conversely, the Forest Department of the Ministry for Agriculture and Development is responsible for forests, but almost does not give explicit attention to poverty reduction. Second, coordination and information exchange between the central and provincial levels are limited. As a result, policy breakthroughs at the national level would not translate necessarily into effective implementation at the provincial and subprovincial levels. On the positive side, however, steps were taken in early 2005 to increase the integration of poverty reduction planning and policy across ministries at the national level. This could mark the

beginning of a process in Viet Nam that truly integrates poverty reduction and forest conservation.

Poverty Reduction, Increased Conservation, and Environmental Protection through Participatory Breeding: A Case Study from India

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Introduction

In this case study, poverty refers to poor and grossly inadequate household income that manifests itself in several ways. For example, farming communities residing in tribal areas have difficulty in producing rice for their own consumption, even for a few months, due to low yields in staple food crops. And since these communities are poor, they cannot afford to buy food grains from open markets to meet their needs. Thus, inadequate food intake is one reason for malnutrition and other health problems.

The introduction of high-yielding varieties (HYVs) mitigated India's food crisis in the 1960s. These HYVs were developed using formal plant breeding methodologies, initially in staple food crops, such as rice and wheat. The Green Revolution, as it is popularly known, helped the country achieve food security and, eventually, produce a surplus. However, several inputs and specific management were needed in the production of HYVs. This meant that only the richer farmers had access to these varieties, while large rural and tribal areas were left behind.

High levels of chemical inputs were applied to lands cultivated with HYVs season after season, eventually leading to soil degradation. Furthermore, although the HYVs were developed for their resistance to biotic stresses, pests and diseases associated with the HYVs increased over time. The negative changes in the agricultural environment and natural resources began to have an impact on biodiversity and associated ecosystems.

Traditionally, farmers routinely preserved rice diversity at their own cost. However, poor and unstable rice yields forced farmers to grow HYVs although they did not prefer these varieties. The Government's large-scale initiatives, which involved providing seeds and other chemical inputs at afford-

able prices with buy-back arrangements for grains or provision of local markets for their sale, enabled farmers to earn income. This was an incentive for farmers to cultivate HYVs. This income, however, remained far below realistic needs. Thus, farming communities were compelled to borrow from moneylenders at exorbitant interest rates, which made them vulnerable to economic exploitation. Naturally, rice diversity began to decline.

As the situation in India demonstrates, poverty is strongly linked to conservation, ecosystems, and the agricultural environment. The key question was whether the undesirable links between poverty, the environment, and health could be broken through the formal plant breeding methodologies that formed the basis of the Green Revolution. If not, what were the alternatives? This study analyzes the food situation in a tribal and a rural area from this perspective, and identifies people-friendly and environmentally sound options for improving the yields of varieties preferred by farmers. It aims to demonstrate the following hypotheses:

- Improving the yields of preferred varieties would meet household consumption needs, while excess grains would fetch good market prices. The profits could be used to purchase the inputs needed to improve yields of subsequent crops, thus contributing to poverty reduction;
- Better farming techniques, cooperative storage of grains at village seed banks (VSBs), and equitable sharing of marketing benefits would promote self-management and capacity building at the village level, and improve yields;
- The use of traditional agricultural inputs, such as farmyard manure in the pristine lands, would ensure conditions similar to organic farming, protect the ecology and environment, and allow access to profitable markets for land races;
- Food security in the form of adequate availability of, and access to, food for consumption would contribute to good health; and
- Economic stability would help revive rice diversity and conserve land races.

Experimental sites

TRIBAL AREA

In India, a tribe is described as "a social group with territorial affiliation; endogamous, with no specialization of functions, respecting tribal leaders, hereditary

or otherwise; united in language or dialect; recognizing social distance from other caste structures; following tribal traditions, beliefs, and customs, illiberal of naturalization of ideas from alien sources; and above all, conscious of a homogeneity of ethnic and territorial integration” (Madhava Menon et al., 1996). Tribal farmers also have evolved distinct characteristics. For instance, they rarely diverge from their ancestral livelihood path, including cultural and agricultural practices, despite being economically poor. They account for 8.5% (according to the 1991 census) of the Indian population, with the highest proportion in Madhya Pradesh and Orissa states.

The ecology and environment of the tribal areas are unique. For example, the crops in these areas have evolved a set of traits selected over a long period by the local people. Important traits are those relevant to cooking and consumption preferences, including taste and quality (Worede and Mekbib, 1993). Such traits are specific to each site and variety. Such adopted, people-specific varieties are termed land races to reflect their evolutionary path.

Jeypore block in the State of Orissa is a popular tribal tract, home to many rice land races. It is deemed to be a center of origin of rice. According to the 1991 census, Orissa has a population of 31.66 million, of which 7.03 million (22.2%) are tribal people.

In Jeypore, rice is cultivated at altitudes ranging from 100 meters (m) to 200 m above sea level. Uplands usually are 200 m above sea level, while lowlands are about 100 m and below. Lands in between are referred to as medium lands. Since irrigation is rarely possible, all lands depend entirely on rainfall, which is erratic and irregular. In the years of this study (1998–2002), rainfall varied widely during the active crop growth period (July–September) and around harvest time (November–December). Most of the farmers apply farmyard manure, though quantities might be insufficient. The planting of preferred land races is timed to allow grains to be harvested and used during festivals and family rituals.

RURAL AREA

Thalli is a rural area about 80 km from Bangalore. Unlike the tribal areas, the environment in rural areas is conducive to growing HYVs. However, several farmers still value tradition and traditional land races. Hence, the identification of ways for those preferring land races to secure their livelihood, while conserving their agricultural diversity and natural resources, is important.

Thalli hosts a range of nutritive millets, and farmers were particularly keen to upgrade the performance of a preferred land race of finger millet referred to as *pichakaddi ragi* in the local language. The seeds of this land race existed as mixtures, and crop yields raised from those seeds were poor and unstable. The first requirement, therefore, was to purify *pichakaddi ragi*.

In the tribal and rural areas, farmers needed to be able to purify their preferred land races, select good seeds before harvest, and develop a cultivation plan to achieve profitable yields. Such initiatives were positioned to ensure sustainable livelihood security and provide economic and social benefits. In describing such a poverty reduction process, the study explains how participatory processes with farmer-identified priorities potentially can lead to the conservation of natural resources and the protection of the environment. Further, the study suggests how the lessons learned can be harnessed to replicate and enhance successful programs that integrate conservation and poverty reduction.

Participatory plant breeding

Participatory plant breeding (PPB) is a participatory process integrating science, plant breeding, and the traditional knowledge of farmers. Scientists involve farmers on an equal plane, and demonstrate methods of improving their livelihood by imparting and enhancing their scientific knowledge. Logical evaluation of practical approaches to meet the needs of the farming community rated PPB as an optimal option. PPB allowed people to improve their preferred land races in their own environment. The methodology could be tailored to draw on the strength of the farmers’ traditional knowledge and remain within their means. Thus, in many respects, PPB has specific advantages over formal plant breeding methods.

Earlier experience made it clear that for any farmer-partnered programs to succeed, farmers should have confidence in the organizations they work with. In particular, the program must incorporate the farmers’ indigenous knowledge, and associate farmers as equal partners from the beginning. The program also should be integrated with the Panchayat Raj Institutions (PRIs), which includes farmers as regular members, to ensure smooth and efficient implementation.

The M.S. Swaminathan Research Foundation (MSSRF) in Chennai and the Green Foundation in Bangalore have been working with farmers in their

Map 9



PPB = Participatory plant breeding.

respective sites for such a long time that people recognize and respect these institutions as their benefactors. An MSSRF site office at Jeypore was an added advantage in working with the local farmers. Farmers were to participate in the work to ensure sustainability and the possibility of replication. Safe participatory strategies were adopted such that the

new paradigms were kept simple, productive, and cost-effective to promote voluntary participation. After visiting the farmers' fields and talking with the farmers, cultivation methods were modified to purify popular land races. These were carried out despite the constraints in the fields and with respect for the farmers' tastes and strong preferences, leaving

complex PPB options as a long-term goal and focusing first on short-term benefits. The strategies were adopted to suit the current and updateable knowledge base of farmer-partners.

STRATEGY USED TO PURIFY JEYPORE RICE VARIETIES

Using effective methods of sharing scientific knowledge, farmers were persuaded that they needed to modify their cultivation methods to achieve higher yields. By consensus, experimental plots of equal size were laid adjacent to one another. Traditional practices were used on one plot and modified methods on the other. Both plots were sown and harvested by the farmers with practical guidance from, and participation of, the MSSRF scientists. The plots that used the modified method showed a substantial improvement in grain yield (Table 17). At harvest, farmers were trained on the concept and utility of pure seeds, and how to select these pure seeds from individual plants. Over three seasons, farmers gained sufficient knowledge and experience on growing good rice crops, purifying land races, and producing pure seeds.

METHOD OF PURIFYING THALLI FINGER MILLET

Since an authentic record describing the diagnostic features of pichakaddi ragi did not exist, five farmers were identified as indigenous technical knowledge holders (ITKHs) using a new method of identification. Selected farmers grew several rows of pichakaddi

ragi in well-laid plots in several sites. Like rice, effective cultivation methods of pichakaddi ragi were used to raise good crops. The ITKHs were asked individually to tag the plants in the reproductive phase that, based on their knowledge, resembled authentic pichakaddi ragi. Selected plants carrying multiple tags numbered 1–5 were harvested separately, and their seeds saved for planting the following year. Further selection was made based on statistical analysis of data on several quantitative traits of selected plants. This cycle was repeated over three seasons. The process not only purified pichakaddi ragi, it increased yields severalfold. Farmers observed yield improvements of up to 200% compared to what they used to obtain. They attributed this yield increase to seed purity, row planting with more spacing (allowing proper tillering), synchronous maturity, and good seed filling.

Salient features of the studies

PPB, with the equal participation of farmers, respected the requirements of the farmers, and was implemented with their cooperation. When the technology was initially operationalized, scientists worked with the farmers in the field. Problems—such as field layout and spaced-out planting in rows with minimal labor support—were addressed, and remedies suggested. This process increased the farmers’ confidence in the technology and ensured that they used

Table 17: Yields of Selected Rice Land Races under Traditional and Modified Cultivation Methods at Jeypore

Land type	Land race	Average yield (kg/ha)		
		M	T	M/T
Lowland	<i>Machchakanta</i>	1,671	1,418	1.20
	<i>Bayagunda</i>	3,679	2,321	1.60
	<i>Gadakuta</i>	1,524	961	1.60
	<i>Barapanka</i>	3,438	2,533	1.40
	<i>Kalachudi (Umriachudi)</i>	2,562	2,007	1.30
Medium land	<i>Bodikaburi</i>	2,838	1,736	1.60
Upland	<i>Pandakagura</i>	1,188	1,178	1.01
	<i>Paradhan</i>	1,028	622	1.70
	<i>Matidhan</i>	1,199	1,133	1.06

ha = hectare; kg = kilogram; M = modified cultivation methods; T = traditional cultivation methods.

it faithfully in subsequent seasons without assistance from the MSSRF. Farmers never needed monetary or other incentives. This implied that once basic constraints and opportunities for participatory action had been recognized, respected, and acted upon, the participation of farmers—even those in difficult economic conditions—would be voluntary and total.

By the end of the 3-year experiment, some important lessons had been learned. For instance, the amount and distribution of rainfall during the experimental seasons in Jeypore were highly erratic. Conditions ranging from cyclones to long spells of drought and high temperatures were experienced within a single-crop season, resulting in varying magnitudes of yield stress. Nevertheless, community-preferred crops, such as rice land races, were genetically resilient and withstood the harsh weather. Meanwhile, HYVs in nearby areas suffered irretrievably. Thus, even in the face of multiple risks and ecosystem uncertainty, the PPB program succeeded. The main reason for this success was the synergy between the adaptive management of the rice crop and the farmers' cultivation experience and indigenous technical knowledge.

The appreciable yield improvement during the first year through modified cultivation methods, despite the uncertainties and odds, satisfied the farmers. This suggests that waiting to have all the information in place before taking action, and judging outcomes beforehand, might be impractical and even imprudent in unpredictable ecosystems.

Upscaling through participatory extension

Replication and upscaling of the PPB initiatives were the next steps in Jeypore. This would help transfer the economic benefits of upgraded land races to farming communities in the experimental sites and other villages in the region. In this context, farmers felt that those in nearby areas should visit the plots under modified cultivation and hold on-the-spot discussions. MSSRF encouraged the PPB farmers to take the lead in this activity. This farmer-to-farmer extension, put in place over a 3-year period, worked extremely well. The modified cultivation technology spread to several villages, increasing the demand for quality land race seeds and creating a new urgency for stepping up seed production. Simultaneously, at the farmers' request, periodic training and demonstration visits by MSSRF scientists helped farmers gain technical knowledge that they could integrate with their

traditional skills. For example, they used a long bamboo pole to mark rows, and women quickly adapted to spacing seedlings 20 centimeters apart quickly. Such modified practices were integrated with newly acquired technical knowledge, such as the application of farmyard manure before the crop season as the monsoon receded, to allow degeneration and incorporation of nutrients in the soil. Such initiatives sustained and improved the benefits of PPB.

One village, Nuaguda, that was not a test site for PPB participated voluntarily in all the meetings with farmers held by MSSRF, despite being about 40 km from Jeypore. Nuaguda turned out to be the best village at popularizing the modified cultivation module at the village level and substantially increasing the yields of land races. This was an instance of farmers voluntarily applying useable PPB technology to non-experimental areas.

While purifying land races, farmers identified the *Kalajeera* race as suitable for immediate seed multiplication and marketing. With its black husk, this land race has traditional significance since black is the preferred color for tribal functions. It has a strong aroma, and the cooked rice is white with a highly desired taste. Tribal farmers know that people living in Orissa's urban areas also would like *Kalajeera*. MSSRF facilitated the display of this land race in public exhibitions and local functions. Demand for this land race indicated its rising popularity and potential to fetch attractive prices. Within a year, the selling price of *Kalajeera* paddy shot up from Rs4–5 to Rs18–20 per kilogram, and *Kalajeera* rice from Rs7–8 to Rs22–25 per kilogram.

Participatory seed production also was profitable. In the first year, eight farmers in the village of Tolla allotted a contiguous area of 6.42 acres for seed production. With the participation of MSSRF, farmers learned the correct techniques for raising seed crops and selecting seeds. The net profit was 40%, equivalent to about Rs7,950 per hectare (Table 18). This benefit is expected to trigger an increase in seed production by farmers over the coming years.

Farmer-to-farmer extension is an easy way to replicate and scale up the PPB model in adjacent and remote sites. For example, the *Kalajeera* seed production strategy initially put in place in one village spread to 20 villages, covering 87 farmers located 12–120 km from the Jeypore PPB activity site. Coverage went from about 6.5–70 acres, with yields of 3–4 tons per hectare. MSSRF did not interfere, except to offer advice when needed by farmers.

Table 18: Benefit–Cost of Kalajeera Seed Production in Participatory Demonstration Plots of Seed Production

Village	Tolla
Contiguous plots (no.) assigned by farmers	8
Total area (acres)	6.42
Costs (Rs)	
Cost of initial seed provided by the MSSRF 170 kg x Rs7	1,190.00
Labor (transplanting)	750.00
Male: 30 x Rs.25	3,880.00
Female: 194 x Rs.20	3,600.00
Farmyard manure	1,000.00
Pesticides	450.00
Transport of material from field	2,000.00
Labor (harvest)	
Packing	1,500.00
Minor contingent costs (gunny bags, etc.)	659.00
Total cost	15,029.00
Seed yield	29 quintals
Quantity of seed sold	21 quintals
Quantity of seed retained by farmers for their use	8 quintals
Total sale of fresh seeds @ Rs17/per kg [2,100 x 17] (Rs)	35,700.00
Benefit [Rs35,700 – Rs15,029]	20,671.00
Benefit–Cost	1.4

kg = kilogram; MSSRF = M.S. Swaminathan Research Foundation; quintal = a unit of weight equivalent to 100 kg; Rs = Indian rupees.

Storage and marketing

In view of the popularity of the Kalajeera variety, villages felt that cooperative storage of grains and seeds was needed. In response, five villages constructed VSBs on their own initiative in village common areas. A VSB consists of a small, well-ventilated room (approximately 8 meters [m] long, 6 m wide, and 4 m high). The room has two cubicles where pure seeds are stored in one cubicle and grains in the other. Seeds and grains are stored in bamboo bins of appropriate

sizes and well-sealed with dung in accordance with the farmers' indigenous technical knowledge.

Self-management of VSBs and marketing

With counseling from MSSRF, the farming community unanimously decided on the management policies of VSBs:

- The Panchabati Grama Unnayan Samiti (PGUS), the apex body of farmers managed by a few elected representatives (usually five or six) from the member villages, would supervise the management of Kalajeera seed and grain production, marketing, and equitable distribution of profits, with the help of the PGUS president and five elected members; and
- Subcommittees with defined functions would help the Kalajeera Management Committee. Supervisory staff from MSSRF in Jeypore would be participating as counterparts of the committees, and would train and demonstrate the operational procedures. MSSRF also would oversee and advise the Kalajeera Management Committee on optimal functioning.

The focal points of markets also were discussed, and the following priorities were decided upon:

- To ensure quality, seed samples would be examined at the VSBs for uniformity and quality based on the farmers' indigenous practices. Likewise, grains would be appraised and graded according to two categories (Grades 1 and 2).
- Paddy that has been stored for a few months is known to fetch higher prices. However, farmers brought to the scientists' notice that some poor farmers would prefer to receive payment immediately. Thus, the options were to (i) advance some money as a loan, or (ii) sell fresh paddy at a lower price. After discussion, farmers agreed that 20% of the grain would be kept in VSBs, while the rest would be sold as fresh paddy in the first year and the sale amount shared proportionately. From the second year onwards, the stored paddy could be sold at a higher price.
- The possible markets that were identified include (i) fellow farmers from nearby villages, (ii) small local markets, (iii) local medium- and large-sized markets, and (iv) rice millers. The committee in charge of sales will explore feasible markets with the help of MSSRF scientists. People will decide the next course of action at their PGUS meeting.

- Problems related to a selected land race losing ground over time due to competitive markets selling the same land race, and the consequent fall in prices, were discussed at length. Farmers concluded that scientifically grown, purified, and graded land races would withstand competition. To be safe, farmers have started producing seeds of a few other preferred land races that could constitute the supportive second line of land races for commercialization. Provision has been made for midcourse corrections of this pilot marketing model after 1 year of operation.

PPB, food security, agro-diversity conservation, and poverty reduction

PPB offers a successful poverty-reduction approach that promotes the conservation of natural resources or agro-biodiversity, enhancement of these resources, cooperative marketing, and equitable sharing of benefits. Most importantly, this has led to purposeful conservation at no extra cost to the farmer. Specific outcomes are given below.

Food and nutritional security

The improved productivity of land races demonstrated by PPB has spurred farmers to purify other land races with an assortment of preferred attributes, such as medicinal properties and different levels of aroma. Thus, people could produce and market a variety of desired land races in addition to meeting their diverse food requirements. Such options should ensure food and economic security at the village level, which is crucial for poverty reduction.

An earlier hypothesis put forward by P.V. Sukhatme (1982) was that insufficient calorie intake generally results in protein malnutrition. An adequate supply of nutritious rice land races should help overcome calorie deficiencies and, in turn, reduce nutritional deficiencies. However, the projects did not quantify this general observation on health security.

Economic and social benefits

The demand for purified land races, such as Kalajeera, and the marketing model put in place are expected to go a long way toward ensuring economic gains and stability for poor farmers. Before the introduction of PPB and VSBs, people suffered as a result of the scarcity of good seeds and/or the high cost of seeds in conjunc-

tion with poor yields. A lack of adaptation strategies in the face of unpredictable weather and the unsuitability of traditional cultivation practices compounded these problems. Furthermore, farmers often were forced to borrow money at exorbitant interest rates, which intensified their income insecurity. With PPB initiatives and their associated empowerment strategies, the communities recovered and moved toward a state of economic and social stability.

VSBs provided a mechanism to help the poor and needy following the traditional process prevailing in local governance structures, such as the PRI. Under the PRI system, the village community identifies the needy and lends them seeds for planting or grains for consumption (or both). After the harvest, 150% of the quantity of seeds or grains borrowed must be returned. Such PRI codes of conduct ensure timely help for the poor, while replenishing and increasing VSB's stocks. The operation of PRIs provides important lessons in self-determination and decentralization of governance structures, especially in relation to natural resource management and poverty reduction.

VSBs constitute important links for people to bank their farm produce and money. The banks operate with cash and kind (seeds, grains, etc.), and have become an important depository for quality rice and *ragi* land race grains produced using organic farming techniques. The cooperative storage facility enables the disposal of seeds and grains at optimum time and profit. Furthermore, the low benefit-cost ratio has encouraged communities to extend the PPB model to other crops and cropping systems. The increased income enabled people to meet their clothing, housing, and other family needs, thus raising their social status significantly. Many farmers pointed this out when interviewed by scientists on the impact of PPB.

Catalyzing conservation

A cultivation-cum-conservation plan in which farmers grow their family-preferred germplasm around large plots where they cultivate a productive land race, such as Kalajeera, was demonstrated also. Farmers adopted this avenue to grow one or two lines of each land race they desired for their family functions. Across a set of farmers, the entire germplasm then would be multiplied. This new model was tested, found to work well, and did not involve special funds or incentives.

Recognizing gender roles

The PPB model enlisted the participation of women. Though men and women carried out a majority of the work together, men generally undertook the heavier chores, such as plowing, leveling, and land preparation. Women performed “nurturing” tasks, such as transplanting, weeding, seed preparation, seed selection, and care of livestock. The PPB model has helped women reduce the drudgery of haphazard transplanting of rice seedlings in the traditional way. Row planting allows them to stand after each row has been planted on instead of bending over continuously, as required by traditional haphazard planting.

The application of chemical and biochemical inputs was gender-related. Men mostly decided on the application of chemical inputs, whereas women mostly decided on matters relating to the preparation and application of biopesticides. The Green Foundation noted this difference, and encouraged women to become entrepreneurs in the production and sale of biopesticides and natural fertilizers, such as vermicompost. Women also mostly decided on the time of harvest and attended to post-harvest work, such as winnowing and cleaning of seeds. Proper storage in VSBs was also their responsibility. Poor women, particularly the landless, took part in PPB and benefited from the VSBs.

Lessons learned

- High-end technologies have little place for poor farmers. The only viable options are those that farmers can implement, appeal to their traditional logic, are cost-effective, can meet their food needs, and provide immediate economic relief.
- Farmers should “feel” the scientific remedies. In the case of land race purification, they understood where the problem was and how to address it. PPB options in which farmers test advanced generation material developed in laboratories (as found in many PPB studies across the world) do not provide that feeling. Consequently, farmers do not “own” such materials for upscaling, and instead consider them ready-made recipes. The PPB options of this case study were contrasting and farmer-centric in many respects.
- The entry point for any farmer intervention should emphasize the local block or village-level PRI. The farmers and PRIs should be partners in the management of field activities by helping each other and participating in a coordinated manner.

In Jeypore during the first year of the study, clear evidence was found that meaningful observations were impossible when people took insufficient care of our exploratory pilot trials. The situation changed dramatically in subsequent years when PRIs were made an integral component of PPB activities. Since elected PRI members can command the necessary administrative and implementing authority, they should be involved in replicating and upscaling activities.

- All experimental inferences and decisions must be shared with the farmers. Their comments, based on their experience, are often valid and must be given due weight.

Constraints

- Enhancing participatory strategies to cover diverse crops and cropping systems, and integrating them with livestock management at the household level, was a key demand from the community. Avenues to address such legitimate demands must be incorporated into projects.
- Planning and having a framework are requisites, although networking activities across partner institutions are important. This would involve additional resources, as well as the capacity of the project to address such issues adequately.
- Focusing on projects regarding important farmers’ problems should allow adequate space for partnering with the Government, whose help is essential in reaching all areas of a state. Government initiatives on plant breeding still focus mainly on endowed areas and high-end technology. Such formal plant breeding options must act in synergy with site-specific PPB to derive cumulative benefits.
- Providing an avenue to increase the calorie intake of the poor by improving the production of nutritious and farmer-desired crop varieties, this project though does not focus specifically on health and nutrition. Farmers who observe that their traditional crops and varieties satisfy their hunger more effectively than HYVs corroborate this to an extent. PPB, therefore, should focus more on nutritional security.

Recommendations

Conservation based on incentives or government funds are usually unsustainable. The farming community

will not integrate with a mandated activity. Thus, conservation stops with funding. On the other hand, the utility and economic benefits of biodiversity can be catalytic in sustaining conservation. Hence, the aim is to make conservation an integral part of poverty reduction paradigms rather than carry out conservation for its own sake.

The purpose of sustainable development is to derive optimal economic, social, and environmental benefits from natural resources and technologies. Consequently, it should be developed based on the indigenous knowledge and capacity of the recipient communities, rather than textbook technology. As local communities are willing to learn from practice, an option to benefit the local poor must take into account their problems and prioritize them with their participation (e.g., a PPB option to improve a land race). If the top priority can be addressed successfully and can meet the needs of the community, more complicated pathways would become candidates for participatory evaluation.

Farmer-to-farmer knowledge extension to replicate beneficial paradigms is one way of enhancing the capacity of local communities to promote development. Capacity building in securing sustainable livelihood would trigger the growth of newer options for community development.

Policy perspectives

Concerted help from the Government in furthering proven technologies and development paradigms would contribute significantly to poverty reduction efforts. Based on the PPB case study, the following help avenues become apparent:

- One area of great concern to the poor when putting together a strategy for their livelihood security based on integrated natural resource management is the marketing of economic produce generated through the activities. Deterrents in development initiatives include the dynamics of the market, fluctuating prices of commodities (such as purified rice land races), and falling demand due to good or bad proliferation of the seeds of land races or other produce. The Government could step in to ensure a stable price or arrange buy-back programs for poor farmers.
- Large-scale seed production of farmers' land races in smallholdings owned by the farmers poses a problem. Further production of seeds in farmers' fields under uncertain weather and

organic conditions would not ensure identical good quality seeds. With additional financial and infrastructure support, farmers can offset problems in the production of quality seeds to a certain extent. Such support could include, for example, building life-saving irrigation systems, including micro water-harvesting facilities; providing threshing yards and large organized seed storing systems; and procuring farmers' seeds.

- The experience of large-scale diversified government efforts in meeting the needs of a large section of the population should be harnessed and adopted to solve the problems of the poor. Such efforts should include a scope for formal and participatory approaches to ensure synergy. More synergy means more benefits in the short term.

From Field to Policy: Linking Livelihood, Health, and Conservation in Baimaxueshan Nature Reserve, People's Republic of China

Wu Yusong

Introduction

With a population of 1.3 billion and sustained annual GDP growth rates nearing 10%, the People's Republic of China (PRC) is the world's largest and fastest developing nation. The changes in the livelihood of the PRC people over the last 20 years of transition to a market-based economy are obvious, particularly in large cities and eastern coastal provinces. However, 70% of the population still live in far less-developed rural areas, and depend directly on natural resources for their livelihood through land modification, resource extraction, animal husbandry, tourism, etc. These rural people, who rely on natural resources, also tend to be the PRC's poorest. More than 100 million of them live below the international poverty line of \$1 per day. Moreover, because of economic destitution and heavy reliance on rapidly degrading natural resources—often coupled with a lack of civil society, communication, or education—the PRC's rural poor are particularly vulnerable to changes in policies, institutions, microeconomies, and the environment.

In the modern PRC, however, change is the status quo. This is particularly true in the light of policy

directives formulated by the central government and filtered down to every level of administration throughout the provinces, counties, townships, and villages. Central directives, such as the one in 1998 that banned logging following massive floodings due to the overflowing of the Yangtze River, have a history of radically altering the terrain for poverty reduction, rural development, and environmental preservation.

In 2001, with support from the World Wide Fund for Nature (WWF) Macroeconomics for Sustainable Development Programme Office and WWF United Kingdom, WWF China initiated the Poverty and Environment Project. Its aim was to demonstrate a win-win strategy for community-based resource management and biodiversity protection that could be disseminated to policy makers. This case study will present the success of community-based natural resource management within the Baimaxueshan Nature Reserve, Yunnan Province of the PRC, and show how the livelihoods of local communities have improved. Further, it will demonstrate how sustainable use of natural resources has had a positive impact on rural livelihood, while improving women's health care through sound and equitable environmental management networking, policy dialogue on local rights, and institutionalizing the process.

Understanding the Southwest PRC's forests

BIOLOGICAL IMPORTANCE OF THE SOUTHWEST PRC'S FORESTS

The uplands of the southwestern PRC, stretching from Shaanxi's Qinling Mountains to the Hengduan Mountains of northwestern Yunnan Province, are home to some of the country's last large stands of natural forests. In addition to providing timber for construction, fuelwood for local communities, and countless plants and animals for food and medicinal uses, these forests protect the upper watersheds of Asia's mightiest rivers. The Mekong, Yangtze, Bramaputra, and Salween originate from the Tibetan Plateau and flow through this area, cutting through gorges over a mile deep, and creating some of the most spectacular and forbidding landscapes on earth. Many ancient species, once widely distributed in Asia, that survived the harsh effects of the Pleistocene Period and the subsequent Ice Age can be found only in the deep valleys of this region. As a result, the southwest PRC has the most biologically diverse temperate forests on earth.

PEOPLE OF THE SOUTHWEST UPLANDS: POVERTY AND CULTURAL DIVERSITY

The tremendous biological diversity of the uplands of the southwest PRC is matched by an equal diversity of cultures. More than half of the 56 officially recognized ethnic minority "nationalities" of the PRC are found here, and in much of the region, Han Chinese are in the minority. The people of the region are among the PRC's poorest, however. Indeed, the same forbidding terrain that has protected ecosystems from overexploitation and slowed the processes of cultural assimilation also has served as a barrier to economic development. The southwest PRC's upland farmers live far from markets in areas that are ill-suited to high-input intensive agriculture, and were left behind during the surge in the PRC's rural economy during the 1980s. Economic activities in these areas often have involved unsustainable extraction of mineral or forest resources. This has taken a serious toll on complex and fragile upland environments while bringing limited benefits to local communities. In Yunnan Province alone, 73 counties register per capita incomes below the national poverty line of 825 yuan (CNY) (\$1 = CNY8.28) per year. This indicates that the eco-region and the people living there are vulnerable.

THE COUNTY, THE NATURE RESERVE, AND THE COMMUNITIES OF THE CASE STUDY

Deqin County, in the northwest of Yunnan Province, is sandwiched between the Mekong and Yangtze rivers at elevations ranging from 1,500 m to 5,400 m above sea level. It is bordered by Sichuan Province to the north and the Tibetan Autonomous Region to the west. Deep valleys and tall mountains characterize the county, resulting in extremely diverse climate, soil, and vegetation patterns and unique and fragile ecosystems. Baimaxueshan (White Horse Snow Mountain) is one of the more than 20 peaks in the area with an elevation of 5,000 m or more. It gives its name to the nature reserve that covers one third of the county. Some scholars have speculated that it was this region, not Tibet, that inspired James Hilton's classic utopian narrative of Shangri-la, *Lost Horizon*. Baimaxueshan is the habitat of more than 10,000 species of higher plants and a large number of endemic birds and mammals, including the highly endangered Yunnan snub-nosed monkey (*Rhinopithecus bieti*). The upland temperate forests here and elsewhere in the southwest PRC are the most biodiverse in the world.

With a territory of 7,504 km², Deqin County has 11,557 households and 58,168 people. The population has been growing, although it is still a sparsely populated county for the PRC with only 7.75 people per km². It has 13 ethnic minority nationalities, with Tibetans accounting for more than 80% of the population. Deqin is a nationally designated “poverty county.” Up to 30% of its households are in food deficit for 4–6 months of the year. As of 2001, 17% of the total population (about 10,000 people) lived in poverty, according to domestic standards (per capita income of CNY825). Of these people, 60% live in and around the nature reserve.

Fuelwood and (more rarely) hydropower are the major sources of energy. WWF China measured an average daily fuelwood consumption of 5 kg per capita in 1998. A typical household subsists on staple grains they have planted (e.g., maize, mountain barley, winter wheat), a few grazing animals (e.g., goats, yaks, cows), and also on a few apple or walnut trees they have grown. As in most upland minority areas, access to formal education is limited. Women, who are chiefly responsible for animal rearing, fuel and water collection, and other domestic tasks, experience particularly high rates of illiteracy (about 80%), with a corresponding low ability to gain access to technical knowledge and training. Language constraints and high rates of illiteracy make wage labor outside the village rare. A meager cash income is derived from the sale of fuelwood and edible fungi foraged from the forests. Housing, animal pens, water pipes, and other basic infrastructure are made from timber harvested from the forests.

Dilemmas of conservation and development in the Southwest PRC's forests

In a region with virtually no industry and few resources other than those from the forests, worsening poverty increases the pressure on those resources. In many upland areas, local government revenues come primarily from taxes on logging. Therefore, the ban means fewer funds are available to support forest protection. At the same time, traditional local subsistence depends on the use of local resources and attempts to generate income from activities such as collecting fuelwood, harvesting timber, grazing, collecting edible and medicinal plants, and hunting animals. This brings local people into increasing conflict with forestry staff.

Nevertheless, the situation in Baimaxueshan is representative of the wider phenomenon. In an extreme case, after the establishment of the nature reserve, every family in one of the villages included in WWF China's pilot site had at least one member who had been fined or arrested for timber or fuelwood cutting. Local forestry staff reported that illegal encroachments in the reserve have increased since the 1998 logging ban. Communities lack the incentive to maintain or improve their livelihood without degrading their natural surroundings. Nature reserve employees have neither the skills nor the resources to manage the vast forest areas under their jurisdiction effectively, or to engage communities in anything but an adversarial way. Furthermore, lack of fiscal and policy support exacerbates the problems of local communities and local government.

LOCAL CONTEXT ANALYSIS: DEQIN COUNTY AND BAIMAXUESHAN AREA

This section presents the conflicts that have resulted from the demands made on natural resources and local development policies.

Local community aspects

- **Food and water shortages.** A shortage of farmland, lack of sufficient productive inputs, poor irrigation channels, and frequent natural disasters due to intensive logging contribute to the lower-than-average grain production (compared to the rest of the Yunnan Province). This results in 3 months of food shortages per year on the average in this area, which in turn is also one main reason for illegal logging and hunting in this area. Poor irrigation channels due to increasingly serious topsoil erosion and forest degradation also lead to water shortages for human and animal husbandry needs. Poor infrastructure and inadequate technology and information are the most important factors linked to food and water shortages.
- **Heavy dependence on forest products.** Forest products have direct and indirect uses. Fuelwood consumption and timber requirements for house construction are well above the average for the Yunnan Province. The average household consumes roughly 20–25 cubic meters (cm³) of fuelwood per year, and roughly 150–200 cm³ of timber for house construction. Total fuelwood consumption is estimated at about 200,000 cm³ annually.

Another direct use of forests is the collection of NTFPs. Since local communities are unable to produce enough grain to satisfy their needs, they must buy grain from the market. Before the logging ban, people could earn cash by laboring for or serving logging companies. Since the logging ban, however, the main source of cash income has shifted to NTFP collection, which accounts for 80% of cash incomes. Edible mushrooms and traditional Chinese medicinal plants are the primary targets for collection. As with timber, access is open with no limitation on collection and no management system. This has caused a decline in the availability of NTFPs and, thereby, threatening forest quality and biodiversity, as well as long-term chances for income generation in this area. In addition, due to high but fluctuating prices of some NTFPs, serious conflicts over NTFP collections among local communities are reported frequently.

Similar problems regarding grazing lands also arise. Animal husbandry is the second largest source of cash income for local communities, and has become especially important since the logging ban. For historical and geographical reasons, tenure regimes for grazing lands follow a traditional scheme that does not limit the size of each family's herd. In addition, Tibetan culture emphasizes the intrinsic value of livestock ownership for social status over possible cash profits in the market, and market-bought chemical fertilizers (as opposed to manure) are inaccessibly expensive for local farmers. As a result, overgrazing has become increasingly acute. Consequently, the quality of grazing lands has declined, reducing the amount of milk produced by yaks to make butter. To preserve production levels, therefore, families have increased the size of their herds, aggravating the situation even more. Such conflicts decrease incomes for all parties, and harm long-term local relations.

- **Labor shortage and poor health care.** Despite the diversity of rural income generation and production activities, income is still insufficient to support livelihood. Each household typically will conduct about 10 kinds of productive activity. Since there has been a direct ratio between a family's labor and income from the advent of the household responsibility system in the early

1980s, this shortage has resulted in high rates of school dropouts. As in other areas in the PRC, women are marginalized in terms of education, health care, and capacity building.

Poor basic infrastructure services lead to time-consuming, labor-intensive activities for women. Traditionally, one family will consume 50–60 kg of fuelwood for cooking. This means an adult woman has to carry about 75 kg of fuelwood each day from the mountain. On the average, this will take 2–3 hours and can only be done twice a day. The situation is the same for collecting water, fodder, and so forth. Women commonly have gynecological health problems due to years of carrying heavy loads.

Poor sanitary conditions are another cause of health problems among women and children. According to local Tibetan living customs, only rich families (about one or two families in each subvillage) have an indoor toilet, and this is reserved for monks and men. Women can use only a toilet in the stable or outside.

One of the main problems that local people face in terms of sustainable livelihood improvements is the link between poverty and diseases. Based on WWF China's 10 case studies and 100 household questionnaires in the Baimaxueshan area, the poorest of the poor of the community have one patient per family. Due to low cash income and low yields from farmlands, any income from the sale of forest products is used mainly to buy food grains. Local people seldom see a doctor unless their illness is serious. The vicious cycle, whereby poverty causes disease and disease causes further poverty, is one of the biggest barriers for local people. Village women often cannot go to a hospital or buy medicine due to the lack of cash.

Policy and governmental aspects

The local government is focusing on accelerating the pace and process of local development. Its main strategies include upgrading basic infrastructure (e.g., building roads, improving irrigation channels, producing biogas, and developing tourism). Although this is important, the local government has built roads within the nature reserve to improve local transportation and communication, leading to biodiversity loss and deforestation in key areas. These roads also make illegal logging more convenient. Good intentions leading to negative impacts also

can be found with tourism development. The local government has launched an ecotourism campaign, with the reserve included in the plan. However, local government officials lack a clear understanding of what ecotourism means and what a sustainable plan entails. Future potential threats include biodiversity pressures from increased population density, and local conflicts arising from the lack of a benefit-sharing system.

In addition, compensation for wildlife damage is insufficient at the provincial and county levels. Therefore, even though the central government has a compensation policy, annual payouts are determined centrally, regardless of conditions, and the amount locals receive remains inadequate. Indeed, the average wildlife damage compensation represents just one tenth of the true value. This has caused serious conflict between reserve authorities and the local community.

Also, management staff in the nature reserve is insufficient. Further, the staff follows the traditional conservation discourse that considers local people a threat and an enemy of the forest. This is directly linked to the lose-lose situation in terms of the development of local livelihood and conservation targets. The Baimaxueshan Nature Reserve in Deqin County covers approximately 220,000 ha, yet the reserve staff comprises just 40 people—meaning each employee is responsible for 5,500 ha of reserve land. This shortage of human resources precludes any coordination of community affairs and limits the staff's ability to enforce logging regulations inside the reserve. Consequently, reserve authorities act as little more than forest guards and are unable to consider the effects on or input from local communities.

MESO CONTEXT ANALYSIS

Due to the PRC's size and governmental structure, provincial-level institutions were considered as the meso-influential factors. This is so because of their role as implementors and adapters of central directives at the local level and quasi-independent policy-formulating organs.

Yunnan Province is in the PRC's relatively undeveloped southwestern corner. The national institutional and market reforms that have driven the PRC's breathtaking economic growth over the last 25 years along the eastern seaboard and in large urban centers have been muffled at best in the country's western interior. Until recently, the latter regions lacked area-

specific government attention and typically receive foreign direct investment representing roughly one order of magnitude of the eastern provinces. Ecologically, however, areas of the western interior tend to support far more biodiversity and are more ecologically critical than the eastern lowlands.

Provincial poverty reduction. Provincial development agencies, such as the Yunnan Poverty Alleviation Office, are the main government agencies focusing on rural development and poverty reduction. Each county has earmarked funding for poverty reduction, with the local governor acting as the executive in charge of such work. This situation is unprecedented in the PRC's history and among many developing countries. The development of basic infrastructure in these rural areas has been given major impetus. Despite the possible impact of infrastructure construction on biodiversity conservation, this emphasis, nevertheless, has built a strong foundation for long-term rural development—improvements that could not have been achieved by development at the individual household level.

Provincial development philosophy has shifted significantly from county- to community- and household-targeted development. These changes have incorporated, at least in part, the concept of local participation and decision making in poverty reduction, which indicates a gradual ripening of the methodologies and practices of poverty reduction.

Nevertheless, a thorough analysis of new potential causes of poverty is lacking. After 20 years of the central government's poverty reduction program, poverty has declined in many areas. Zones that remain poor—the poorest of the poor—often face particularly complicated poverty-inducing situations. Besides economic factors, issues—such as environmental degradation, access rights for natural resource use, health care, and tax burdens—are emerging as important drivers of the poverty reduction process. In June 2004, central government agencies reported that despite recent advances in the battle against rural poverty, 800,000 people in the PRC had fallen back below the domestic poverty line (approximately \$100 per year) due to natural disasters in the previous year. Annually, the PRC experiences many natural disasters, such as floods and droughts. Several of them are the result of geographical location. Over the past decades, however, some disasters have been exacerbated by continued and severe environmental degradation, including

deforestation, resource mining, unchecked erosion and siltation, and air and water pollution.

Provincial environmental protection. Yunnan Province is covered by 9.5 million ha of forests, representing 7.4% of the PRC's forest land. Population growth and rapid economic expansion have led to considerable deforestation, including a 30–50% decline in forest cover over the last 50 years. However, 44% of Yunnan Province still is covered with forests. Typical of a province with rich forest resources, Yunnan has many protected areas, including 166 nature reserves with more being created yearly. The establishment of protected areas began in the early 1950s to conserve special types of resources and ecosystems. Protected areas account for 15–20% of the province's natural forest area, covering 2 million ha.

Multilevel legislation and policy burden the PRC nature reserves. In addition to following the national Forest Law and Nature Reserve Management Regulations, reserves must implement a series of locally specific laws and regulations. Moreover, the top-down approach to establishing a protected area in the PRC does not involve consultation with stakeholders. This can be the root cause of conflicts between nature reserve authorities and other stakeholders, such as local communities.

The main purpose of establishing a protected area is to preserve the biodiversity or unique endemic species. However, nature reserves exist within the social realities of increased competition for resources, compounded by growing populations, rapidly changing policies, the presence of multiple stakeholders with diverse interests, and other development trends. To conserve biodiversity and forest resources, the most valuable forests often are delimited inside a protected area. Unfortunately, mainstream understanding of poverty–environment links often omits natural resource access as a fundamental aspect. Moreover, based on conventional assumptions about resource use and management, nature reserve authorities tend to consider local people one of the greatest threats to forests and wildlife. As such, the laws and related regulations of forest reserves often aim to limit the access rights of local peoples.

The transitional phase of understanding poverty seldom includes the concept of the rural poor gaining more extensive control over productive assets such as land, water, forests and other natural resources, as

well as capital, infrastructure, technology, and other resources established at the center of rural poverty reduction goals.

MACRO CONTEXT ANALYSIS

The Government of the PRC recognizes the importance of the southwestern forests and the need to deal with persistent poverty in the area. The official attitude toward forests and forestry has undergone a transformation over the last 15 years—from an almost exclusively logging-oriented approach to a focus on conservation. During the 1980s and 2000s, hundreds of protected areas were established in the southwest, and large-scale watershed protection and reforestation schemes were launched. This culminated in the declaration of a ban on logging in natural forests of the upper Yangtze watershed following severe floods along the central and lower Yangtze in the summer of 1998.

While the logging ban and expansion of protected areas show the depth of the PRC's commitment to protect the southwestern forests, such measures could increase poverty among the local population. The impoverishment of these people does not guarantee effective biodiversity protection. And since the PRC's system on protected areas is chronically underfunded and understaffed, conflicts with local people tend to produce outcomes that are suboptimal for conservation and the local people's welfare. Without security of use rights, local people exploit natural resources opportunistically. They also have no incentive to practice sustainable management. As a result, the benefits they receive are unpredictable, and they live with the constant threat of fines or arrest.

Over the last 15 years, the Government has also attempted to address the growing gap between rich and poor regions. Areas of endemic poverty were identified, and special poverty reduction funds were created in an attempt to help these areas share in the rapid economic growth elsewhere in the country. As one of the country's last centers of persistent poverty, the southwest region received billions of yuan from such funds. The results, however, have been mixed. The Great Western Development Plan, drafted in 2000 and which affects 12 western provinces, is meant to close the development gap between the PRC's relatively poor, rural, inaccessible, and geographically and ethnically diverse west and the more prosperous east. Though this initiative encourages environmental improvement, which is considered important to economic development in poor areas,

it does not recognize the PRC's nature reserves as necessary vehicles in implementing this synergy and demonstrating the feasibility of ecologically integrated development.

One of the largest government development programs in the PRC is the Village-Based Integrated Poverty Reduction Plan for the Poorer Western Region, or Village Plan, started in 2001. Poverty reduction planning in the PRC previously was undertaken at the township or county level, isolated from other local policies. In the new program, the village is the planning unit, allowing better targeting and integration with other local development activities.

In addition, national legislative and planning initiatives include:

- **The 11th Five-Year Plan.** This directive, formulated by the State Development and Reform Commission, serves as a road map for all national initiatives during the planning phase. Formulated every 5 years since the ascendance of the Communist Party, this plan sets the agenda and the direction of development work at all levels of government. The next Five-Year Plan might incorporate an emphasis on environmental preservation as an integrated facet of poverty reduction and regional development.
- **Nature Reserve Law.** This legislation, to be developed by the State Forestry Administration and approved by the National People's Congress, will govern the management and philosophy of the PRC's 1,999 nature reserves. This revision might make room for, and emphasize, local community participation in natural resource management.
- **Village Organic Law.** This policy, which calls for democratic participation in self-governance at the village level, is a cornerstone in national recognition of village civil rights. A strengthening of this policy could extend village management rights to local natural resources and improve tenure contracts for village residents.

The central government announced an initiative to create a "Green GDP," a concept that entails measuring yearly environmental changes alongside traditional economic ones. Though this indicates that the Government is paying some attention to environmental issues, the initiative is still in its infancy. The concept would include only environmental factors for the index, ignoring social and cultural impacts.

Strategic interventions: design and action—comanagement networking for better livelihood

A wide range of experiences in developing countries has shown that provision of infrastructure, social services, technological improvements, and credit are necessary components of strategies designed to address rural poverty. Without a stable access to land and environmental resources, however, the rural poor are left without a solid foundation for increasing incomes and reinvesting in environmental resources. Research also shows that imbalances are heavily biased against women, who have been excluded and marginalized from the process for a number of historical and contemporary reasons, and in a number of ways.

This study believes that (i) poor people are not the cause of most environmental degradation since their consumption and production are much lower than those of the rich, yet the poor bear the consequences of environmental degradation; (ii) given the right incentives, the poor will invest in environmental improvements to enhance their livelihood and well-being by applying their own technical knowledge and adopting new technologies that are appropriate to their needs and circumstances; (iii) local communities are major and important stakeholders in the planning process, which means that bottom-up or participatory planning approaches should be considered a factor of success in managing natural resources—i.e., poor people must be seen as part of the solution rather than part of the problem, to improving environmental management; (iv) viewing local communities as unified stakeholder groups with similar needs and interests is always a danger; and (v) institutional reforms must allow the rural poor to increase their control over, and access to, natural resource wealth and environmental assets in the areas where they live.

The interventions designed in Baimaxueshan are meant to address the causes of challenges observed in the poverty and environment nexus. Since the Baimaxueshan area was chosen as the pilot site, the project plan emphasized local issues in their wider context. At the same time, however, it was designed to be easily adopted and reproduced in similar areas across the region.

COMMUNITY PARTICIPATION IN INTEGRATED CONSERVATION AND DEVELOPMENT ACTION

The community collective forest covers more than half the forest in Baimaxueshan Nature Reserve.

The study concluded that 80% of the average total income came from free access to environmental goods, meaning, the forest provides rural dwellers with a means of livelihood. To achieve a win-win solution in terms of livelihood development and natural resource conservation, WWF China acts as a facilitator to build trust among local communities, Baimaxueshan Nature Reserve Bureau, and outside NGOs. Local villages have participated in the integrated conservation and development project, which includes

- intensifying land use through the introduction of new seed varieties, establishment of a seed fund system, technical training, improvements to irrigation channels, etc., thereby alleviating food shortages (yield increases of 50–150%);
- improving animal husbandry productivity through veterinary training and establishment of a village veterinary fund;
- reducing fuelwood consumption by more than 50% through the introduction of wood-saving stoves and new fodder preparation techniques;
- building physical infrastructure improvements, water tanks, and grain processing facilities, etc., while emphasizing sustainable management of these assets;
- involving local communities in sustainable natural resources management techniques, such as the reforestation of previous logging sites; developing local environmental protection regulations; and facilitating the comanagement of NTFP use, such as *matsutake* mushroom harvesting; and
- cooperating with local Tibetan Buddhist monastics to invite *Gexi* (doctoral-level Buddhists regarded as living Buddhas) to pray for mountain enclosure for reforestation, strengthening enforcement of local regulations.

After 3 years of project implementation, local villagers' progression from their initial status as observers to participants in self-initiated activities has had a tremendous positive impact at various levels. Livelihood levels improved with a 60–150% increase in cash income. The quality and quantity of forest covers improved, with better management of about 20,000 ha of community collective forests and habitat for the Yunnan snub-nosed monkeys. Local governance and resource management capacity was strengthened with the establishment of a comanagement network on sustainable NTFP management, and a forest patrolling system initiated by the local community. By involving 74 sub-villages in

Baimaxueshan, the project has had positive impacts on other communities. These improvements are in addition to other community development activities, such as improving sanitary toilet conditions and providing health training to women and children. In addition, WWF China found out that the livelihood improvements achieved in the reserve have benefited local women particularly.

Women play an important role in the collection and management of NTFPs. During the collection season, almost 80% of local women are involved in collection on the mountain. Further, more than 80% said they have more confidence when they improve their cash income from NTFP collections. Involving women in the business and marketing of NTFPs gave them more opportunities to interact with outsiders and improve their capacity for self-governance (e.g., negotiating with outsiders, enforcing local regulations, etc.) and financial management. Most importantly, all women thought that an increase in cash income from collecting NTFPs allowed them to spend more money on children's education, health care, and ritual activities.

These women were concerned about the damage to, and collapse of, irrigation channels during the rainy season. Heavy rain and soil erosion easily destroy traditional irrigation channels constructed and linked with timber. In addition, the rainy season comes when men are away from the villages for work, leaving the women and the elderly at home. In this situation, women find it almost impossible to rebuild destroyed water channels, resulting in water shortages or the consumption of muddy water. The project implemented schemes to help solve this major problem faced by women.

Heavy labor has undermined women's health. New energy-saving stoves and fodder preparation techniques helped women save time spent on housework and other laborious activities, while the chimneys on the new stoves reduced the rate and risk of developing eye diseases, and the new demonstration sanitary toilets lowered the risk of women and children contracting other diseases.

These achievements have not arisen from WWF China's endeavors alone; they also are linked to the efforts of local government agencies and the wisdom of local communities. Influenced by WWF China's Integrated Conservation and Development Project concept, local government agencies (e.g., the local Agriculture Bureau, the Hydropower and Water Resource Management Bureau, and others)

participate in the conservation effort. In particular, they support basic infrastructure improvements that WWF China, as an NGO, cannot carry out. In addition, by taking into account traditional religious beliefs regarding conservation and the community's views on NTFP management, these agencies are learning from local wisdom and traditional practices. In brief, the project is a joint effort of government agencies at different levels, local communities, and WWF China.

MAKING SPACE FOR COMMUNITY PARTICIPATION

The sustainable management of matsutake was thought to be one of the main alternative approaches to generating more income, while linking conservation and development issues at the community level. However, no single party can achieve this goal alone, which illustrates the basic concept of comanagement of natural resources involving multiple stakeholders. The comanagement project focused more attention on empowering the local community in decision making, and setting up an equitable benefit-sharing system. Local farmers organized themselves into groups based on the established sustainable NTFP management system, and discussed participatory management. These talks covered the sustainable management of grazing lands, cutting regulations within the reserve, the resource management agreement, new technologies, the sharing of market information between the management bureau and local communities, and the establishment of a regular communication channel between officials and local communities.

As a result of these activities, local people's income has increased considerably. For example, in previous years, one family might have collected 30 kg of matsutake and earned about CNY2,000. Now, the same family might collect 50–60 kg, generating about CNY6,000—an increase of 150–200%. (These figures represent averages for the region.) Following these successes, a network for sustainable natural resource management was created, and more local communities have asked to join the network and share the responsibilities and benefits of the cooperative efforts. Among the local staff and farmers, the capacity for and awareness of resource comanagement has improved significantly during project implementation.

The concept of comanagement techniques introduced and implemented in reserve villages, whereby villagers are involved in the management of the nature reserve alongside reserve staff, is not new.

It is recognized at the national level in the PRC as an important problem-solving technique, particularly for resource disputes. However, some issues still remain regarding the understanding of true comanagement practices. Many government leaders see comanagement as a work-based system (e.g., hiring local villagers to enforce reserve regulations alongside outside staff), as opposed to a rights-based system that gives villagers, as residents of the land, the authority to be involved in the decision-making processes that control the course of their lives. Consequently, important aspects of the project include training villagers and staff in comanagement negotiation skills, setting up communication channels, and improving awareness of both parties of the issues at stake. Ultimately, comanagement philosophies are to be incorporated into local policy, with villagers often suggesting new management techniques.

Comanagement was the guiding principle for on-the-ground demonstrations and policy advocacy. Through comanagement, the project hoped to empower local communities by involving them in decision-making processes, particularly in the formulation of reserve policies, and to increase official recognition at all levels of a rights-based local initiative. Comanagement, therefore, should be understood more as a new paradigm rather than a practice. It can be implemented and achieved only through teamwork and cooperation among multiple parties. Based on this understanding, some power sharing in making decisions and controlling outcomes is a precondition for any system of comanagement.

After implementation, the project achieved its planned goals, objectives, and outputs. Sustainable resource management approaches were developed and tested in selected project sites, and then disseminated to the other areas. During project implementation, the staff of Baimaxueshan and local farmers enhanced their capacity for forest management. In particular, local farmers' negotiating skills improved in terms of protecting their rights.

Focus of the policy dialogue process on local rights in natural resource management

Today, the World Bank's definition of poverty as a "pronounced deprivation in well-being" is widely accepted. From this perspective, poverty is regarded as the deprivation of a multifaceted set of material goods, assets, conditions, and opportunities. These

aspects suggested that it was crucial to consider poverty and environmental links to provide useful insights to policy makers on how to improve the overall situation in similar areas.

WWF China views poverty more specifically as a social relationship of competition among individuals, social groups, and the Government in the pursuit of wealth and political power. This definition has significant policy and operational implications because it requires not only economic growth to overcome poverty, but also a transformation of the social relations at the root of poverty.

AWARENESS BUILDING AND POLICY DIALOGUE BASED ON FIELD DEMONSTRATIONS

Many attempts to support comanagement encounter difficulties that originate in the social or physical environment where the activities are taking place. Rather than being generated organically, outside sources in the international community often drive comanagement initiatives. In addition, though local governments often recognize the benefits of comanagement, their current institutional arrangements cannot satisfy human and financial resource requirements. Most important, however, is the continued refusal of government organizations at different levels to recognize the capacity and rights of local people to manage resources and to decide. These essential aspects of a comanagement program can be referred to as the enabling environment.

Based on previous project implementation and comanagement training in Baimaxueshan Nature Reserve, local government officers have realized the importance of comanagement as an alternative for achieving sustainable resource management and livelihood. The Baimaxueshan Nature Reserve Management Bureau proposed adjusting past institutional arrangements to support future comanagement activities in the Baimaxueshan area. Local communities and related community-based resource management issues are considered one of the main objectives of work within the official management system.

CONSTANT POLICY DIALOGUE THROUGH THE NATIONAL ADVISORY COMMITTEE

To fully understand poverty and environment problems in the study area, numerous visits and discussions were held at provincial, prefecture, and county levels, particularly in the early stage of the project. Further, by identifying some key policy makers who would become members of the National Advisory

Committees (NACs), the project developed a sense of ownership of the project outcomes among the members and the government agencies they represent. The wide coverage of government policy-making bodies at national and provincial levels where advisory committee members are associated, was instrumental in helping them better understand poverty and environmental problems and their dynamic links from different perspectives, as well as build links to disseminate outputs.

During the preparation of the national policy assessment work, NAC members provided the team with strong support, including up-to-date insights on policy directions. NAC members in the State Forestry Administration, the State Environmental Protection Administration, and the Poverty Alleviation Office of the State Council provided special help. Local government officers also provided a large amount of valuable information and data to help with fieldwork and case studies. The establishment of NAC also helped foster dialogues among stakeholders, policy makers, researchers, and field practitioners.

CONFERENCE ON POVERTY AND ENVIRONMENT LINKS AT THE NATIONAL LEVEL

In recent years, an increasing number of domestic, international, government and nongovernment institutions, and individuals have been involved in practical experiences of environment–poverty links in the PRC. To provide a forum and facilitate dialogues among the Government, other PRC organizations, and international experts, as well as to raise awareness and exchange experiences on how environment–poverty challenges might be addressed in the PRC, WWF China initiated an alliance in cooperation with the United Kingdom’s (UK) Department for International Development (DFID), the World Bank, and ADB. In addition, the State Development and Reform Committee of the Government sponsored the international “Workshop on Poverty and Environment Dynamics: Challenges and Opportunities for the PRC” in Beijing in January 2004. Participants included the State Development and Reform Committee, the State Agricultural Administration, the Developmental Research Center of the State Council, the State Forestry Administration, the Chinese Academy of Social Science, the Chinese Agricultural University, representatives from eight central and western provincial governments, members of mass media, and representatives of international organizations.

Through dialogues and other forms of communication, some common grounds were found, including (i) the Government should encourage and support independent teams to assess and evaluate the performance and impact of major poverty and environment policies that have been, or are being, implemented; and (ii) methodologies for the assessment and valuation of environmental services, as well as for the valuation of resource utilization, need to be developed.

COOPERATION WITH NONCONSERVATION GOVERNMENT AGENCIES TO BUILD CAPACITY AND LEVERAGE GOVERNMENT INPUTS ON CONSERVATION

Assessment and research work was initiated on the Village Plan project, exploring particularly its treatment of the poverty–environment links. The project helped produce a guidebook and a checklist for planners at county and provincial levels to help them integrate environmental considerations into poverty reduction planning more effectively. To increase its impact, the guidebook and the checklist were designed for use when advising on village plans and as a guide to future poverty project planning. These documents also incorporated environment and ecology concepts and explanations to be used as a training manual by the staff of poverty reduction offices at the county and provincial levels.

In the PRC, international conservation organizations generally do not work with development agencies. WWF China initiated the assessment of a government poverty reduction project, which can be seen as a beginning. This step shows that conservation and development organizations should work more closely to achieve win-win solutions for sustainable development. During the assessment of the Village Plan project, government officers from development agencies, such as the Yunnan Poverty Alleviation Office, participated in all phases of the project, including the preliminary study, assessment and research work in the field, development of practical tools, and so forth. This participation helped put into practice the outcome of the research, while the process served as an excellent advocacy process for meso-level decision makers. The World Bank's Beijing Office also participated in the project, which helped expand activities from Yunnan Province to Sichuan Province. This established the project as a regional action. The World Bank's input also added value to the impact of the project.

LEGITIMIZING AND INSTITUTIONALIZING LOCAL RIGHTS IN NATURAL RESOURCE MANAGEMENT AT THE NATIONAL LEVEL

At the local level, comanagement is based on traditional knowledge, customs, and practices in preserving forests and local agro-ecosystems. Rules, guidelines, and social organizations are established and reestablished in response to the ever-changing socioeconomic and political situations and conflicts affecting local control of forest resources.

At the meso and macro levels, comanagement brings us to an expanded concept of responsibility, an ideal that is superior to the concept of participation. Responsibility necessarily implies the institutionalization of local and traditional stakeholder systems (knowledge, statutory and organizational context, local expertise). Through this comes recognition by the legal system.

The challenge is how to establish an equitable benefit-sharing system that supports sustainable natural resource management. Minimum legal preconditions required for comanagement, and the decentralization it demands, must be created. The true mastery of natural resource management can be reached only if legal conditions for the separation of power, as well as the clarification of roles and responsibilities for each actor, are fulfilled.

Comanagement, as an alternative initiative-based approach and a new paradigm, can help achieve an equitable decision-making and benefit-sharing regime. The guiding principles of comanagement actions, therefore, should include (i) acceptance of traditional customs and community rights in managing resources, (ii) equity and social justice, (iii) sustainable production and ecosystem equilibrium, and (iv) participation by all stakeholders and community members.

In late 2004, WWF China held an international conference in Beijing, entitled, "Comanagement of Natural Resources in the PRC: Experiences and Policy Implications." The aim of the conference was to summarize comanagement experiences and project results as a means to promote the understanding and adoption of comanagement institutions at the national level. Unlike previous policy advocacy work, this conference focused on the prospects for national legislation that recognizes community rights. The policy and legal framework recommendations emphasized

- recognizing local rights and social capital for resource management;

- increasing the flexibility of the definition of nature reserves;
- creating new institutional arrangements to help meet reserve objectives;
- involving local participants in reserve conflict resolution; and
- advocating comanagement as a principle, mechanism, and conflict resolution process in reserve management.

Stakeholders at all levels participated in the conference. At the national level, participants included officials from the National People's Congress, the State Environmental Protection Administration, and the State Forestry Administration. Representatives from local governments in charge of reserve and resource management were also present, along with local reserve authorities, local comanagement practitioners, villagers, local NGOs, and other interested parties. International organizations that were invited included the Conservation International the PRC Office, DFID Beijing Office, World Bank Beijing Office, and others. Mr. Mao Rubai, director of the Environment and Resource Committee of the National People's Congress, mentioned that the PRC's first Reserve Law will be developed in 2006. He also proposed comments on behalf of the National People's Congress. The discussion on comanagement issues related to local rights on resource management inspired valuable ideas for future legislation.

Conclusions

The project shows that local demonstrations in pilot sites are insufficient for regional adoption and, thus, for sustainability. Even if a concept can be proven to work effectively in one pilot site, greater and institutionalized forces are often at play that control the fate of isolated initiatives. Consequently, the Poverty and Environment Project aims to pay more attention to shifts in legitimacy, collaboration, responsibility, and incentives to cultivate the latent conditions necessary for widespread sustainability. By addressing this social and political framework, the project hopes to achieve the strategic goal of sustainable participatory management of critical natural resources.

A series of gaps hampers further progress in the modern PRC's poverty-environment nexus. Combining ground action with training and policy advocacy, the project has shown that in nature reserves and government agencies across the Yunnan Province and the southwest region, chasms exist between the

valuable lessons learned through ground demonstrations and policy implementation; between successes in one pilot reserve and implementation in other regional reserves facing similar issues; between research activities of one institution or NGO and the actions of another; between local governments and nature reserves; and between the recognition of needs-based and rights-based initiatives.

Much has been said and done about the livelihood and ecological issues faced by residents in areas, such as the Baimaxueshan Nature Reserve. Through demonstrated comanagement techniques, concrete and repeatable steps have been taken to alleviate many of these problems, and the people whose lives are affected are continuing these. However, to ensure that such pilot programs are sustainable, the lessons learned must be enshrined in policy. Although progress has been made, particularly at local government levels within the Baimaxueshan Reserve, the gains in such pilot programs are fragile without continued legislative and representative support from the higher levels of county, provincial, and central governments.

Another lesson emphasized over the course of the project is the need for greater focus on the implementation of successful practices. A pilot site is, in essence, an island for experimentation. It remains just that unless its successes are repeated in similar areas. This problem is acute in the Yunnan Province. The achievements in villages within the Baimaxueshan Reserve are commendable. However, Yunnan Province now has more than 166 nature reserves, with more being established every year. Although many officials (e.g., in the Yunnan Forestry Office) now understand the issues created for local peoples when a nature reserve is established around them, this knowledge does not always translate into the implementation of comanagement. As a result, despite the knowledge and requisite channels being in place to help alleviate these issues, the same problems are being encountered. As long as this gap between understanding and implementation remains, any hope of spreading the lessons learned in one site to others across the province is limited.

A third issue involves responsibility. The project found that local governments whose jurisdictions include nature reserves tend to withhold funding earmarked for communities within the reserve, and spend the money elsewhere in the county. Although these officials recognize their responsibility toward the reserve's communities, they still tend to transfer this responsibility to the reserve's management

bureau. Since the latter lacks the funds and ability to carry out social development issues, local communities often go unsupported.

Finally, a persistent gap in understanding remains among high-level government agencies. The State Forestry Administration, for example, recognizes the concept of comanagement, but ignores local rights to natural resource management. As another example, under the current policy framework, NTFP management is considered an alternative resource use that shifts the pressure from timber to other forest products. This view, however, does not take into account local villagers' social and cultural capital, and hinders community empowerment in resource management. These are disincentives for local people to practice sustainable resource use, resulting in persistent ecological pressure.

Such is the intractable context of the southwest PRC's poverty–environment nexus. However, through 4 years of research and action experience, the project has identified some tools that are exceptionally effective in negotiating these obstacles. In particular, these include the NAC, group advocacy, on-the-ground demonstrations, and capacity building.

NAC's involvement in the project from the early stages proved particularly valuable in terms of advocacy and consultation. The group was well-informed and updated on project details, which gave NAC a good understanding of project issues. This understanding, coupled with the diverse makeup and broad expertise of the group, encouraged NAC to make valuable suggestions on project implementation. Moreover, because these suggestions came from within NAC, group representatives are now set to continue considering poverty and environmental issues in a sustainable way under their own motivation and interest.

Group advocacy, as opposed to an isolated approach, was also important in achieving program goals. As the local presence of an international conservation NGO, WWF China can function only as a marginal player in domestic activities, particularly those meant to address poverty issues. To make a strong impact in policy advocacy, the participation of groups with established government ties—ADB,

Conservation International, DFID, IUCN, and the World Bank—had to be ensured to bring weight to the discussions. Such an approach effectively combined strength with know-how to deepen the effectiveness of advocacy, particularly at the national level. The experience of this cooperation also will contribute to future collaborative efforts on policy advocacy.

The project also found on-the-ground demonstrations to be a crucial tool in changing policy. Experience has shown that advice based on principles or theories alone is ineffective for policy advocacy. In the PRC, officials demand hard evidence of successful implementation in addition to academic-based support, before considering the benefits of a policy proposal. Continued pilot demonstrations at Baimaxueshan, therefore, allowed local and national authorities to grasp tangible achievements that could be codified at higher levels. For example, while the concept of comanagement has long been supported in the PRC government circles, it no longer is an unproven idea offering the possibility of benefit. It is now an actively sought tool following concrete demonstrations.

Finally, the importance of two-way capacity building has been evident throughout the project. Training and educating local staff and local communities in comanagement techniques, for example, is important. However, the policy makers who influence the sustainability of local projects through legislation and support must be involved also. Creating a sense of mutual understanding and empathy among stakeholders at different levels is important in contextualizing the framework within which parties operate. Local staff and villagers, through cross-visits and field trips, need the chance to meet with high-level administrators so that they might witness local realities and problems. This process gives the reports a face, which helps personalize poverty and environmental issues.

More importantly, local enthusiasm and awareness are strong. From within and without nature reserves in the Yunnan Province, citizens and local officials are interested in the possibilities of rural development and ecological conservation working hand in hand.

RESPONSE STRATEGIES

Do decision makers hear and respond to what the poor say about poverty and the environment? Recent Experience from Pakistan

Khawar Mumtaz, Usman Ali Ifrikhar, and Meher Marker Noshirwani

Introduction

This case study analyzes two parallel processes that came together through a combination of luck and opportunity in advocating the inclusion of poverty–environment concerns in Pakistan’s Poverty Reduction Strategy Paper (PRSP). Much is now known about the significance of the poverty–environment nexus, and its ascendancy in the international arena. However, the discourse and processes that brought the poverty–environment nexus to the forefront of policy debates in Pakistan has received little analysis. The first section, therefore, delineates the context of the two processes: (i) the increasing awareness in Pakistan of the multiple causes of poverty in general, and (ii) the links between poverty and environment in particular. The section goes on to introduce two processes that have been instrumental in putting the poverty–environment agenda on the policy map—the International Union for Conservation of Nature (IUCN) Pakistan-led advocacy on Pakistan’s PRSP, and the United Kingdom’s Department for International Development (DFID)-sponsored Pakistan Participatory Poverty Assessment (PPA).

THE ORIGINS OF POVERTY–ENVIRONMENT DISCOURSE IN PAKISTAN

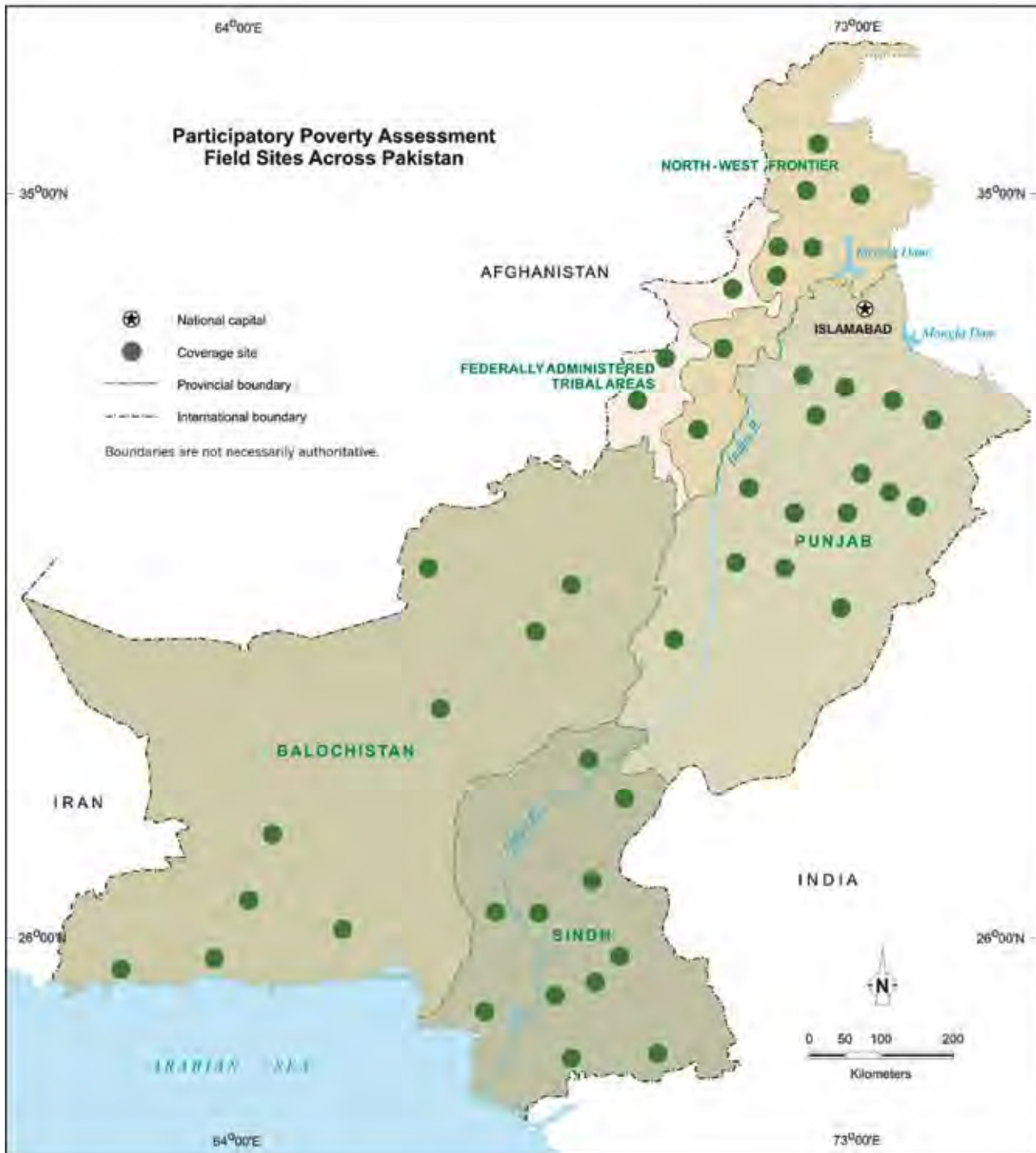
The genesis of poverty–environment discourse in Pakistan is not found in mainstream environmental strategies. The origin arguably is rooted in the

evolution of alternative development discourse in Pakistan, particularly in the community-based initiatives of the 1980s. The most notable among them are the Aga Khan Rural Support Program (AKRSP), the Kalam Integrated Development Project (KIDP), and the Orangi Pilot Project (OPP). The initial focus of these initiatives differed. AKRSP started as a rural development program that began integrating natural resource management. KIDP was a forestry project that evolved to integrate rural development concerns. OPP brought the community-based approach to an urban setting through the provision of urban environmental services. Nevertheless, the common thread in all these initiatives was the participatory process. Participation of poor communities—albeit in pilot, small-scale program and project interventions—began to unearth something logical, yet remarkable, to its proponents: that the poor are concerned predominantly with the maintenance of their natural resource base and environmental quality to ensure livelihood security, positive health outcomes, and reduced vulnerability. In a way, participatory processes facilitated the nascent ascendancy of poverty–environment discourse in Pakistan. These initiatives, as it turns out, can be seen as efforts to help the poor overcome their vulnerability by (i) developing their individual and collective capacities; (ii) providing access to credit and encouraging savings; and (iii) investing in skills, human resources, natural resource management and, most importantly, collective institutions.

PARTICIPATORY PROCESSES

In the late 1980s, participatory processes went through an important twist of fate, as Pakistan initiated, for the first time, a participatory strategy development process in formulating its National

Map 10



Source: Planning Commission, Government of Pakistan, Islamabad.

Conservation Strategy (NCS).³² The product, the NCS document, has been described as “one of the best-known national conservation strategies, externally admired for its vision and potential at the time it was adopted” (Hanson et al., 2000). The NCS document also was recognized for being extensive in its attempt “to meet the needs of a country faced with multiple challenges of population growth, poverty, issues of governance and decades of war and turbulence along its borders... and wisely focused on issues of sustainable natural resource use and environmental protection” (Hanson et al., 2000).

However, it is the participatory process that has been exemplary in highlighting the interaction between environment and development. What the process embodies is the (i) framework provided; (ii) baseline information collected; (iii) model of participatory strategy development introduced; and (iv) network of stakeholders mobilized such as government, civil society organizations, private sector, and funding agencies. Collectively, the process and the document brought to the forefront the need to transform the way “development is undertaken, to ensure that it is not destructive of the natural resource base on which it rests” (Hanson et al., 2000). Arguably, the diversity of stakeholder views during the NCS process brought out aspects of the poverty–environment nexus at a more macroscale, namely the need for a poor country to ensure the maintenance of its natural resource base for the current and future well-being of its people and economy.

The remarkable success of the NCS participatory process greatly influenced subsequent conservation strategies and action plans. This is particularly applicable to the Sarhad Provincial Conservation Strategy, the Balochistan Conservation Strategy, and the Biodiversity Action Plan. In these three cases, the processes were instrumental in accumulating and advancing poverty–environment thinking. To quote the Sarhad Provincial Conservation Strategy: “improving the social and economic conditions of the rural and low-income urban poor requires integrated rural development initiatives, including sustainable natural resource management, provision of basic services, extension of more education and health facilities, and skills training, with a heavy emphasis on community involvement” (Government of North-West Frontier Province (NWFP) and IUCN, 1996).

As a result of this, poverty–environment links began to take a more prominent position in mainstream environmental strategies, plans, and policies.

The National Environmental Action Plan gave the poverty–environment discourse another boost. Here, advancement of key poverty–environment links became prominent, such as poor people’s access to timber and fuelwood supplies and increasing deforestation, safe drinking water and sanitation, and exposure to water and air pollution.

Two funding agency reports further illuminated the current thinking on poverty–environment links. ADB published *Poverty in Pakistan: Issues, Causes, and Institutional Responses*, which was finalized through a broad-based consultative process. In addition, DFID supported the study *Participatory Poverty Assessment in Pakistan* (Government of Pakistan, Planning Commission, 2003), which was the first exercise of its kind to capture the analysis by the poor on how they experience poverty. *Pakistan National Human Development Report 2003* (Akmal et al., 2003) also deserves mention for highlighting health as a critical factor in pushing marginal and poor households into deeper poverty. These reports not only substantiated the already developed poverty–environment discourse in Pakistan, such as the crucial role the environment plays in the lives of the poor, particularly in securing livelihood opportunities and protecting health. They also added a new, critical dimension to the poverty–environment language: the vulnerability of the poor to environmental stresses and shocks.

THE IMPETUS FOR PARTICIPATION

One of the important outcomes of participatory processes in Pakistan has been the development of goodwill and partnerships among government agencies, the private sector, and civil society organizations (CSOs). Arguably, much of the drive toward such actions has come from CSOs. In turn, advocacy emerged around participatory processes and, over time, the Government has become more accepting and granted more space to explore participatory policy and strategy initiatives. Hence, with concern growing on the part of funding agencies, civil society, and the Government about the rising levels of poverty in the 1990s, the PPA process was initiated.

In 1997, the Planning and Development Division of the Government decided to conduct a PPA in Pakistan. In 1998, a PPA design mission was formed

³²According to Banuri and Khan (2001), two clear aspects of the community development model can be found in the National Conservation Strategy (NCS): “the strengthening of individual institutions/organizations; and the strengthening of what could be called ‘issue networks’ or ‘policy communities’ ” (p. 16).

consisting of government and civil society representatives, bringing together expertise in poverty analysis, policy making, and participatory inquiry. The mission consulted with local communities in some of the poorer areas of Pakistan, government officials at the provincial and federal levels, and CSOs. During the consultations, a consensus was reached on the need for a PPA. The objectives, design, and outputs of Pakistan's PPA were based on these consultations.

Essentially, PPA is a process for including poor people's views in the analysis of poverty, and in the design of strategies to reduce it. Hence, the poor are considered the key, primary stakeholders, while other primary stakeholders include policy makers at the federal, provincial, and district government levels, as well as CSOs. PPA considers public opinion, the media, researchers, and academics secondary stakeholders. The objectives of PPAs are to potentially strengthen poverty reduction programs in a number of ways, for example, by (i) enriching and broadening the understanding of poverty through analysis by the poor themselves, (ii) safeguarding the conclusions drawn from quantitative studies, and (iii) involving the poor in a process of engagement with government and civil society to bring a pro-poor focus to policies and programs. In the long term, the PPA process can create new relationships between policy makers and poor communities.

More importantly, the Pakistan PPA signaled for the first time the use of a participatory process on mainstream development strategies in the country. After all, the information collected from PPA was to be fed into poverty reduction strategies. Hence, the Government began to develop Pakistan's PRSP in 2000. In general, PRSPs outline a national program for poverty reduction, which is the foundation of lending programs of the International Monetary Fund (IMF) and the World Bank. The World Bank and IMF developed the PRSP approach to respond to weaknesses in relations between poor countries and the Bretton Woods Institutions, particularly the lack of poverty focus and country ownership of reforms. The development of Pakistan's PRSP also entailed the adoption of the participatory process, as the following core principles of PRSPs demonstrate:

- Country-driven — involving broad-based participation by civil society and the private sector in all operational steps;
- Results-oriented — focusing on outcomes that benefit the poor;

- Comprehensive in recognizing the multidimensional nature of poverty;
- Partnership-oriented — involving coordinated participation of development partners (bilateral, multilateral, and nongovernmental); and
- Based on a long-term perspective of poverty reduction.

As is apparent, the environmental community in government and CSOs was more conversant and experienced with participatory processes. However, the same did not apply to the mainstream development community, meaning the development of Pakistan's PRSP was expected to generate its own setup problems. Consequently, the stage was set for the IUCN Pakistan-led advocacy process within these modalities of PRSP. The approach of this process, which is explained in this case study, involved building strategic alliances with the Government, civil society, and the influential Environmental Donor Coordination Group (EDCG) of Pakistan.

The PPA process—institutional framework, fieldwork, and follow-up

INSTITUTIONAL FRAMEWORK

PPAs were carried out in all four provinces of Pakistan, as well as in Federally Administered Tribal Areas, Northern Areas, and Azad Jammu and Kashmir. In January 2001, steps were taken to set up the institutional mechanism for implementing the PPA in Pakistan. Provincial and national steering committees were established with the responsibility for macro-level oversight of PPA. To provide hands-on support to the process, particularly during the fieldwork, a management committee was set up in each province. This committee comprised government representatives and the nongovernment organization (NGO) involved in the fieldwork. The management committees reported to the provincial and national steering committees.

The institutional framework aimed to bring primary public and private stakeholders together. The federal Planning and Development Division was the lead institutional player. In each province, a lead NGO was selected to manage the training and fieldwork, and to document PPA findings. Shirkat Gah—an NGO with a long record in participatory research and action, poverty reduction, and policy-level activities—was named the coordinating NGO in Punjab Province. In Sindh, Shirkat Gah was responsible for documenting the PPA

and preparing the Sindh PPA report. Each provincial government also appointed a PPA focal point from their planning and development departments.

A significant feature of the exercise was the close collaboration between the Government and the NGOs. Each field team of five members included a government representative. This exposed some government officials directly to extreme conditions in the field, thereby ensuring government ownership of the PPA. Elected representatives, particularly *nazims* and *naib nazims*, in various districts assisted in the fieldwork process and were involved in site selections in their districts.

FIELDWORK FRAMEWORK

The second stage of the PPA involved training, pilot testing of the fieldwork guide, fieldwork, and its documentation in each of Pakistan's provinces and administrative regions.

Basic research questions that the Pakistan PPA sought to address were

- Who are the poor within each site, and who are better off?
- What have been the principal changes affecting the area over different periods, and what factors have influenced these processes?
- What resources, socioeconomic and gender relationships, organizations, and institutions are relevant to the area or group?

Field teams used detailed tables of themes and issues on sustainable livelihood to facilitate discussion and analysis among local participants, and to examine the way policies and institutions affect them. Since reaching the very poor and enabling them to share the analysis of their realities were overarching aims of the PPA, views were sought separately from young and old men, women, children, and minority groups. A single "community" view on an issue was not assumed. The primary approach and methodology used for the field research was participatory reflection and action (PRA). This included specific tools, such as social and natural resource mapping, well-being ranking, network and Venn diagramming, seasonal calendars, historical time lines, etc. As a secondary support method for the triangulation of findings, some basic quantitative data were generated on the PPA sites using a specially designed questionnaire, which enabled the PRA-based site studies to be located statistically within the wider province or area.

Shirkat Gah and other NGOs facilitating the PPA, as well as the field researchers, were unaware of what the study would reveal since this was the first exercise of its kind and scale. The fieldwork consisted of several stages, beginning with a thorough selection process to identify fieldworkers, a 2-week intensive training of the field teams, and a week-long pilot to apply the training in the field. This was followed by 3 months of fieldwork in each province. Teams of two women and three men spent approximately 24 days in each site, with 12 days each in poor and better-off subsites. At the end of the fieldwork, a site report was prepared. When all were completed, a synthesis workshop was held to share the findings.

For the analysis, PPA used the livelihood framework, which facilitates analysis by examining the assets and capital that the poor mobilize in devising livelihood strategies. These include natural capital, produced capital (including physical infrastructure and credit), human capital (nutrition, health, education, and local knowledge), social capital (social institutions and support systems), and political capital related to influence and powerlessness. Thus, natural resources were among the key issues discussed with the communities.

The number of sites for each province (51 in all) was determined in advance based on the province's size and population, and districts were selected to ensure the inclusion of different agro-ecological zones. A selection of urban and rural sites (at a rural-urban ratio of 2:1) within the districts then was made. In each district, the poorest site covering up to 200 households was selected for the study. This involved steps at the provincial, district, and union council levels, using the PRA tool of well-being ranking. All union councils in a selected district were ranked under the categories of well-off, better-off, poor, and very poor. Once the union councils were selected, a similar process of participatory analysis was conducted at the union council level to select two subsites: the poorest and the relatively better-off. This selection was designed to allow a comparative analysis of poverty.

In the final stage, key findings were disseminated and followed up at the provincial, area, and national levels through a public dissemination program. This case study will elaborate on this process, and reflect on the outcome and response to the PPA results.

The PPA has proven to be a successful tool, ensuring analysis by the poor of their own conditions, providing rich insights, and incorporating the

complex links that are at the root of poverty. The Pakistan PPA reaffirmed the multidimensional nature of poverty and pointed to the priorities of the poor. It also provided possible answers on how to improve public policies, institutions, and regulatory frameworks, and how to bring about changes to increase the opportunities available to the poor.

Recent estimates classify one third of Pakistan's population of 140 million as poor. An analysis of the survey data confirmed that poverty and extreme poverty, especially in the rural areas, are widespread in Pakistan. In all provinces, large numbers of people earn and consume very little and suffer from low human development indicators. Women and children endure much of the worst poverty, and members of minority groups are overrepresented among the poorest. For Pakistan as a whole, income poverty dropped substantially in the 1980s. This, however, was not sustained in the 1990s, and several key social indicators have shown little or no improvement since then.

EXPERIENCES IN THE FIELD

The field teams consisted of people from urban and rural backgrounds. Although many were familiar with the conditions in rural areas, they nevertheless were surprised at the conditions they saw and experienced in villages where the poorest of the poor lived. Witnessing poverty with the poor and encountering daily hardship was a difficult experience for all team members, who often were deeply moved and expressed shock at the ground realities of the poor. At the same time, the hospitality of the communities and their gratitude left a lasting impression on the field teams.

Generally, local communities welcomed the PPA teams warmly. In most cases, since the sites were villages where the poorest of the poor lived, the community seldom experienced visits from outsiders. Difficulties faced by the teams varied from site to site. In some, teams had difficulty finding people with time to participate in the analysis, especially women. In Punjab, women employed in domestic service and paid embroidery work were preoccupied with the pressure of earning, and had little time to spare. Daily wage earners from village and urban sites were absent all day, returning home late in the evenings. However, because teams were living in the research locations, they were able to adjust timings to suit different groups.

Scattered populations put additional pressure on the teams as they traveled, often on foot, to reach different, mostly remote, settlements. Illness (some-

times leading to short absences or dropouts), stress, and the pressure of personal commitments created strong bonds among team members. Despite these problems, however, generally all teams completed the fieldwork on schedule.

At the same time, the fieldwork raised expectations among communities, particularly on what the PPA would bring them. This was accompanied by a fear that the PPA process would assess their incomes, allowing the Government to levy taxes on them. In other places, such as Punjab and Sindh, security was an issue that required special arrangements to ensure the safety of the field team.

WHAT THE PPA REVEALED

The 51 sites of the Pakistan PPA, spread across all provinces and administrative regions of the country, provide an insightful account and analysis of poverty from the perspective of the poor. The PPA does not define the poor; the poor themselves define and describe poverty. "Across Pakistan, the language that poor people used to describe themselves, both in Urdu and in local languages, clearly expressed not just their lack of financial or material assets, but also their sense of helplessness, vulnerability, powerlessness, and lack of respect (Government of Pakistan, Planning Commission, 2003)." Similarly, the definitions of poverty blended into a description of their assets. In Sindh, for example, a poor man was said to be one who had "one acre of land and one cow." Furthermore, while economic dimensions of poverty, such as the lack of income or material resources, were important, the perceptions of poverty went beyond to encompass nonmaterial concerns with social, political, and cultural identity. The poor had a multidimensional perception of poverty.

The most important finding of PPA was that even the richest district could have pockets of abject poverty. Moreover, PPA found that poverty has structural roots; environmental resources are critical for the livelihood of the poor; and the physical capacity of the poor is perhaps the only asset they possess, which means good health is one of the imperative elements required to emerge from poverty.

THE POVERTY-HEALTH-ENVIRONMENT NEXUS

As noted, PPA defined the environment in terms of natural capital, which in turn was defined as land, water, marine, and wild resources. Therefore, the term "natural capital environment" was defined in the PPA as environmental goods and services.

In the PPA, the poor viewed forests, wildlife, land, water, and domestic livestock as vital assets. Any natural disaster or policy actions that destroyed or degraded natural resources were seen to have a major impact on their livelihood. In many areas covered by PPA, the poor emphasized the declining size and quality of the natural resource base. In the northern areas of Pakistan, for example, forests are declining; while in Sindh, livestock is decreasing due to the shortage of fodder. In other provinces, household landholdings were becoming smaller and fragmented.

Seasonal changes impacted livelihood directly in terms of loss of production and income. Each season brought its own specific stress factors that affected people's livelihoods in different ways, leading to temporary falls into poverty of poor households at particular times of the year, with risks of permanent impoverishment. In rural Punjab, for instance, winter livestock deaths were more common, made worse by shortages of animal fodder and fuelwood, and frequent illnesses. In summer, human illnesses increased, milk yields from livestock fell, livestock diseases increased, and the lack of rain resulted in crop failure.

Access to land and water emerged as a particularly high priority, with people expressing an urgent call for the protection of natural resources. Ownership of cultivable land was critical to farmers, while the quality and fertility of land determined its significance in the eyes of the poor, who relied heavily on their land and livestock for their livelihood. Villagers in a particularly infertile village of Punjab said in despair, "Our business is to sit on heaps of sand and eat sand" (Old man, Thal Punjab). In another village in Sindh, the landless noted resignedly: "The villagers don't own any land. They have land only for their graves" (Male analysts in Hasso Dako, Ghotki district, Sindh).

The poor identified water as the most important natural resource: "We long for sweet water" (Poor men and women in Sindh). Across Pakistan, repeated droughts have reduced the availability and quality of water, which has had a major impact on the livelihood and vulnerability of the poor. In Punjab, droughts and floods, especially in the arid regions of south Punjab and in the rain-fed areas of the north, have resulted in the continuous decline in agricultural productivity, with land becoming barren and drinking water supplies difficult to ensure. In urban and rural areas, easy access to safe drinking water was identified as vital to ensuring good health and reducing the burden on women.

In irrigated areas of central Punjab, the decline in land fertility over the last decade has degraded the livelihood of the local poor. Similarly, people in Badin District, Sindh, raised the issue of hunger. The main diet of the poor is *roti* (made of rice flour and eaten with pulses, prawns, and fish). No vegetables are grown in the village. Due to the shortage of livestock, little milk and butter are available. The poor felt that they were weak and unhealthy because of the lack of food, and saw their predicament as being at the interface of shrinking natural resources and increasing vulnerability.

In the rain-fed barani areas of northern Punjab, and other areas where the value of land depends on the availability of water, rain assumes an even greater significance. "Our livelihood totally depends upon rainfall. If there is reasonable rain, we have good crop production. We have been living from hand-to-mouth over the last 3 years" (Old women, Thanda Thal, Punjab). "We can only produce crops if it rains. Our livelihood is connected to rainfall" (Woman, Nawabwala, Punjab).

An increase in the periods of drought, as well as the unequal distribution of available water due to better-off people appropriating more than their share, meant that the poor had even less access to water. In Sindh, landlords control peasants by rationing water supplies for irrigation and drinking. The poor, thus, identified equal and fair provision of water to farmers and the development of alternative irrigation options as solutions to their needs.

The drastic decline in natural forest cover also has affected the poor due to the reduced availability of fuel and fodder, which in turn has reduced the number of livestock that are often the backbone of household economies. For instance, in Chak 12 in Khanewal, south Punjab, the Government imposed entry restrictions to the nearby forest, stopping women who traditionally foraged there for food and fodder. In a dry and dusty remote village, where men migrate to nearby towns for employment, women are left behind to rely on their livestock for sustenance. The water is brackish, the only crop grown is wheat, and the village suffers from environmental degradation, which exposes the poor to stresses, shocks, and vulnerability.

Natural capital traditionally has been a primary—and usually free—asset of the rural poor, who have built their livelihood upon these resources. The PPA confirmed that the poorest people depend heavily on natural resources. Further, it revealed a direct

correlation between the decline in natural capital and the vulnerability of the poor, leaving them with unmet basic livelihood needs and heavy dependence on loans that often lead to lifelong bondage. PPA also highlighted graphically the impact of the structural roots of the poor's deprivation.

The concentration of landholdings in the hands of powerful landlords was seen as being directly responsible for restricting the poor's access to resources, increasing their poverty, and making them more vulnerable to exploitation and risks. In many areas of the PPA, the rural labor force is landless and lives on the margins of the community in extreme conditions of poverty and is completely dependent on the vagaries of local landlords. The prevalent social structures prevent development and democratization, and curtail fundamental human rights.

The poor identified health-care institutions as the most important and critical to their lives. However, it was also the area where the poor felt most disappointed with current state provisions. Indeed, PPA identified a large gap between what the Government is supposed to provide and what poor communities actually receive, and presented a depressing picture of the health status of the poor and health-care services. It also highlights the remarkably close links between health, livelihood, and vulnerability. Across many sites, poor health strained the meager income and resources of the poor and poorest. "I had twins in my womb, I had blood in my mouth, but no one was there to take me to a hospital" (Poor woman, Urla, Punjab).

Repeatedly, findings from various sites highlighted the significance of good health as the primary means of meeting basic needs. Prolonged illness—and the related expenses for medical care—was singled out as the most important factor that could plunge a relatively better-off family into poverty. As the PPA national report states: "Ill health, physical weakness, and low nutritional status deplete the levels of human capital of the poor and adversely affect their ability to improve their well-being" (Government of Pakistan, Planning Commission, 2003).

The unavailability of government health-care services, even with the minimum of basic facilities, equipment, medicine, and staff (and limited access to whatever was available) added to the misery of the poor in PPA sites. In the absence of adequate or accessible services, the poor are forced to turn to private medical care that is usually beyond their means. In any case, the private practitioners were mostly unqualified in far-flung rural communities.

In Sindh, common health problems were linked to water issues. For example, the most common water-related disease named by the poor was diarrhea. In Jacobabad, Sindh, the lack of water affected the health of humans and animals. In urban Punjab PPA sites, people cited the polluted environment as the root cause of weaknesses and various diseases in humans. In urban Rawalpindi, people reported that flooding of the open drain during the rainy season, combined with the polluted environment and shortage of clean drinking water, had caused chronic health problems and the spread of tuberculosis. In Sindh and Punjab, women had to walk long distances in search of drinking water, and in many cases when water was available it was not potable.

PPA established beyond doubt the interrelationship between social conditions and stratification, natural resources, policy making, and governance. Further, it confirmed that a combination of factors has resulted in endemic poverty in Pakistan, and prevented the poor from lifting themselves out of it. PPA also included mitigation measures and solutions suggested by the poor.

Recent local government reforms provide the opportunity for the Government and funding agencies to review past failures with respect to the remodeling of basic social services, including the provision of much-needed health services. However, the problem relates not only to the management of services provided. The low level of investment in basic services and infrastructure will have to be increased significantly, and the voices of the poor will have to be taken into account in decision making, for real changes to occur.

PRSP advocacy process in action

This section elaborates on and analyzes the IUCN Pakistan-led participatory advocacy process for the inclusion of poverty–environment concerns in the PRSP. Any participatory process, such as this one and the PPAs, is not a monolith; it is imbued with dynamism and complexities. Hence, this process took on a dimension of its own, and its impetus came after the Ministry of Finance circulated the Pakistan interim PRSP in 2001.

From the outset, the interim PRSP process unsurprisingly met with criticism because of its weak participatory approach. After all, the actors involved in the development of the interim PRSP were not well-versed in participatory processes. The input of

the Ministry of Environment, for example, was not even solicited. Civil society and the academe latched onto the weakness of the participatory process, criticizing the tokenistic approach and emphasizing that the interim PRSP is a combination of the enhanced structural adjustment facility conditionalities and a few poverty reduction measures. The net result, they concluded, was increased rather than reduced poverty.

Mainstream critics of the interim PRSP focused on three critical missing dimensions—environmental considerations, gender integration, and employment generation. From the point of view of the Government of Pakistan, however, the primary purpose of the interim PRSP was to secure concessionary funding from Bretton Woods institutions under the Poverty Reduction and Growth Facility, and to negotiate with bilateral funding agencies and other international financial institutions from a position of strength. As the criticisms started to reverberate within Government, funding agencies, and civil society circles, opportunities for addressing the gaps in interim PRSP opened up. IUCN Pakistan entered the mainstream criticism as a result of a strategic approach, soliciting the influential Pakistan EDCG. The EDCG had been created for purposes of linking and coordinating environmental funding in Pakistan. The entry into the advocacy process came at the suggestion of IUCN Pakistan in the form of a letter written by the EDCG to the PRSP Secretariat, Ministry of Finance.

The Government of Pakistan was keen to address the criticisms leveled against the interim PRSP and negotiate concessionary financing with funding agencies. Thus, the Government requested that funding agencies provide technical expertise to include environmental considerations in the PRSP (as well as to cover other identified gaps). IUCN Pakistan continued its advocacy role by linking funding agencies with the Ministry of Finance, which paid dividends. This led to a DFID-funded technical assistance project on the integration of environmental concerns into the PRSP. Capturing the relationship developed with DFID during this time led to the constitution of an environment consortium comprising IUCN Pakistan, Environmental Resources Management (UK), and GHK International (UK). The Canadian International Development Agency and the International Labour Organisation facilitated similar agreements with consultant groups on gender integration and employment generation.

PARTICIPATORY PROCESS ON THE INCLUSION OF ENVIRONMENTAL CONCERNS

The stage was set for the IUCN Pakistan-led advocacy process. The environment consortium, which gathered to develop a strategy on the best approach to technical assistance, felt that the project had to be seen more specifically as an advocacy process. IUCN Pakistan's key strength and experience is in undertaking participatory, multistakeholder processes through engagement with the Ministry of Environment and "green" sector institutions, and the provision of technical assistance. However, since IUCN Pakistan did not have much experience in engaging mainstream development agencies, a shift in its strategic approach and partnerships with the Ministry of Finance and the Planning Commission of Pakistan was required. The idea was to come up with a mutual, common understanding of the issues and recommendations, focusing on the interface of development and environment.

The environment consortium also established contact with consultant groups on gender integration and employment generation to build an integrated approach and harness advocacy, knowing that poverty–environment concerns cut across these groups' themes. Under the environment consortium, IUCN Pakistan took the PRSP consultative process to all four provinces and two subnational regions (Northern Areas and Azad Kashmir). The provincial governments led the process, with the federal Government as an invitee. Public representatives, NGOs, and representatives of the private sector were included as equal dialogue partners in the process.

It was essential to supplant the impression that PRSP was only a federal Government process and product by emphasizing that PRSP offered a variety of actors, sectors, and scales the opportunity to provide their input, contribute to a broader understanding of the causes of poverty, and recommend relevant solutions. This is what began to emerge. Generally, participants discussed the links between environment, livelihood, health, and vulnerability of the poor, and the need for PRSP to be cognizant of environmental factors. Specific provincial and local poverty–environment links also emerged, for example, drought in Balochistan, deforestation in the North–West Frontier Provinces and Northern Areas, and water scarcity and seawater intrusion in lower Sindh. Further highlighting the PRSP's shortcomings, these examples

prompted broader coalition building for the inclusion of poverty–environment concerns.

Most critically, PPA findings also surfaced during this time, with poor people identifying poverty–environment concerns as vital. This was a crucial input to the PRSP process, and meant that the PPA and PRSP processes coincided. To that point, Pakistan’s capacity and advocacy on poverty–environment concerns were limited largely to theories. The research and the statements of the poor substantiated much of what was being theorized. Equally important was the PPA process of the final national level PRSP workshop, which allowed the key PPA consultant to present the findings highlighting poverty–environment concerns. At that time, a framework for incorporating these concerns into the PRSP also was developed and presented.

As the consultations progressed, the Ministry of Environment saw a key role for itself in the PRSP, and requested a stand-alone section on poverty–environment links in the PRSP. This, in turn, would mean increased budgetary allocations and importance for the environment sector, something the Ministry of Environment keenly sought. The Ministry of Finance had no objection to a stand-alone section, but was more interested in poverty–environment indicators as part of the PRSP performance appraisal. However, the Ministry of Environment, which would have the responsibility of monitoring poverty–environment indicators, was hesitant and felt they had limited capacity to monitor and report. IUCN Pakistan and its constituency, on the other hand, wanted to integrate poverty–environment concerns across the PRSP.

A compromise was reached, taking into account all three approaches. Since sectoral contributions still were being developed for the final PRSP and were not available, the first step was to develop a stand-alone section and poverty–environment indicators. Later, when sectoral contributions and a final draft PRSP were available, IUCN Pakistan carried out an informal strategic environmental assessment. This fulfilled the objectives of IUCN Pakistan and its constituency to attempt to integrate environmental concerns across the PRSP.

CHALLENGES TO INTEGRATING POVERTY–ENVIRONMENT CONCERNS

This initiative faced several daunting challenges, particularly relating to basic attitudes and mind-sets. For example, like many economic planners in the developing world, the Ministry of Finance’s economic team

believed in economic growth today and environmental protection tomorrow. Moreover, the Ministry of Finance, as the interim PRSP demonstrated, lacked awareness and knowledge on environmental factors exacerbating poverty. In the minds of these planners, environmental protection was a luxury that Pakistan could not afford.

Not surprisingly, therefore, the Ministry of Finance, the Ministry of Water and Power, and the Ministry of Petroleum and Natural Resources suspected that the environmental community, through the PRSP, would retard business of economic development. The partnerships and dialogue with the Ministry of Finance and the Planning Commission, along with the PPA findings, went a long way in defending the argument that environmental management can play a key role in economic development and poverty reduction.

Another dominant view was that poor people damage and degrade the environment. Less appreciated was how environmental degradation resulted in the loss of livelihood, deteriorating health, and increased vulnerability of the poor. Again, the findings of the PPA—specifically, that the poor would give such high priority to environmental conditions—astonished many in the environment and development communities.

While successful advocacy did result in a mammoth change to the PRSP, long-term challenges remain. The integration of poverty–environment concerns in the PRSP could be seen as a requirement of external funding agencies, prompting the respective ministries and sectors to go about their business as usual. Hence, advocacy on the PRSP process must continue, and implementation on the environment front will require sustained commitment and capacity.

LESSONS LEARNED FROM THE PRSP PROCESS

This subsection highlights the key lessons learned during the PRSP process. One of the key lessons emerging from this initiative has been that policy processes are not neat, linear, rational cycles, but haphazard and chaotic. This implies that environmentalists need to be strategic and take advantage of changing events. Through luck and opportunity, this process brought together the growing criticism of the interim PRSP, the established EDCG and funding agency concerns, the objective of the Ministry of Finance to prepare a sound PRSP and request technical assistance, and the PPA findings. However, IUCN Pakistan still had to act on these conditions.

The strategic and simultaneous engagements with the Ministry of Finance, the Planning Commission, the Ministry of Environment, and the EDCG turned out to be a critical factor in the advocacy process. This facilitated, among other things, access to the mainstream development arena and meant that IUCN Pakistan and the environment consortium had to be taken seriously. The arrangement also worked as a buffer, preventing the interests of any one party from taking precedence over another. Instead, the concerns of all parties contributed to the provision of sound technical advice. Finally, the recognition that the Ministry of Environment should not be the only counterpart on poverty–environment links in general and on PRSP in particular was vital. The Ministry of Finance and the Planning Commission are equally important counterparts on poverty–environment links.

Participatory processes are complex and require innovation, patience, long-term commitment, and sensitive handling. For example, this initiative necessitated unique arrangements among public, private, and civil society sectors in a project framework. This highlighted unusual and difficult circumstances because of differences in work culture, staff quality, time management, governance, and decision making. For these partnerships to be successful, general mistrust among these sectors had to be overcome and partnerships had to be built through political management, consistent and dynamic engagement, and dialogue. The advocacy must continue to ensure that identified links are implemented.

Perhaps the most important success of the initiative was supplanting the impression that the PRSP was only a federal government process and product. Bringing the process to a diversified set of actors (provincial governments, civil society, funding agencies, etc.), sectors, and scales meant that these actors mattered and had something to contribute. In some sense, this created a relationship with the PRSP and acted as a driver of change.

Where are we now?

This final section raises a basic question: were the two processes worth undertaking? The answer—as this case study has demonstrated—has to take note of the rationale of participatory processes. Thus, a more apt question is: have participatory processes made such a difference that decision makers hear, and respond to what the poor say about poverty and the environment? The short answer can be broken

into two parts. First, decision makers are arguably more aware of the situation of the poor. Second, the response to this awareness is not as clear, however, since aspects on how to help the poor cope better and make their livelihood sustainable will depend on a number of factors, such as research, policies, legislation, projects and programs, capacity building, and implementation.

More systematically, this section examines processes and determines the extent to which the objectives of the PPA and the IUCN Pakistan-led advocacy were achieved and the recommendations reflected in the PRSP. Since advocacy campaign outcomes take time to manifest themselves, this section also analyzes the provincial PRSPs of Sindh and Punjab—the two provinces where Shirkat Gah was directly responsible for the PPAs, and where provincial PRSPs have been drafted—to see whether the awareness and advocacy filtered through to these documents. The section concludes with an examination of the institutional issues to identify the gaps between policy and on-the-ground realities.

PRSP AND PPA

The Ministry of Finance released Pakistan's PRSP, *Accelerating Economic Growth and Reducing Poverty: The Road Ahead*, in December 2003. The document outlines “the broad framework and the strategy of poverty reduction based on four pillars: (a) accelerating economic growth while maintaining macroeconomic stability; (b) improving governance; (c) investing in human capital; and (d) targeting the poor and the vulnerable. PRSP also highlights the programs and policies of the Government under each of these pillars and proposed indicators to monitor the outcomes of these policies as well as intermediate indicators for social sectors.”

A preliminary analysis of PRSP shows that the main focus is on economic growth, with a few direct references to the PPA, and a few indirect references to the information generated by the PPA. PRSP recognizes the PPA as a tool to supplement the discussions with communities, and refers to the key findings of the PPA. However, it also states that “the sampling of the PPA fieldwork was statistically not representative and care must be taken in drawing conclusions from it. PPA can point to the existence of common concerns or problems that the poor may be facing across communities, but the statistical distribution of these problems can only be verified through a proper survey.”

PPA also is reflected in the section Environment–Poverty Nexus, which states: “Pakistan’s goal of achieving sustained economic growth for poverty reduction includes environmental sustainability.” This section also mentions the PPA’s results and recommendations from the field on working toward poverty reduction through environmental management. Access to resources is recognized, as is the dependency of the poor on the natural resource base and assets, such as land and water, which the poor identified as natural capital in the PPA.

The link between environment and health, and the effects on women and children, are emphasized. PRSP also includes the vulnerability of the poor to environmental disaster, conflict, and the shrinking natural resource base. PRSP notes that the government is aware of the poverty–environment links in Pakistan, and has taken efforts over the last 2 decades to create institutions and adopt policy measures to address these problems.

The provincial PRSPs also were supposed to include the PPA findings in their respective strategy papers. The Sindh PRSP has been drafted, but has not been released officially.

The Planning and Development Board of Punjab completed the Punjab PRSP in October 2003. This document refers to the Punjab PPA in a number of places. The main findings of PPA are mentioned in the overview of poverty in the province. Lack of access to main roads, salinity, water logging, drought, flood and rainwater drainage, and lack of basic services for schools and health centers are mentioned as factors emerging from PPA. PRSP also states that “these correlations along with the characteristics of poverty provide the indicative framework for the effective targeting of scarce resources within the poverty reduction strategy for Punjab.”

The PPA process and the framework of issues discussed, as well as their main findings, have been incorporated in the document. However, the strategies and objectives for the health sector only mention improvements in management structure, reorganization of health facilities, multilevel referral systems, and more reliance on the private sector. The Punjab PRSP does not mention access to health care through improved roads and transport system, which was the primary concern of the poor. It does include the building of a road network, however.

For the environment sector, the links between poverty, environment, and health are recognized. While not all issues that emerged from PPA are

included in PRSP, the policies clearly have been informed by the insights in PRSP, as well as in subsequent official documents, such as the *Medium-Term Development Framework 2005–2010*, the Government’s program and policy document for the next 5 years that subsumes PRSP.

Conclusion

The federal and provincial PRSPs specifically mention poverty, health, and environment links. In this sense, these PRSPs have come a long way in understanding the multifaceted dimensions of poverty and, at least on paper, they have begun to address these links. However, it is premature to judge PRSP’s impact on poverty. PPA took 3 years from design to implementation, and the poverty–environment concerns were included only recently through IUCN-led advocacy. Nonetheless, a crucial start has been made, which might be sufficient justification for the PPA and the IUCN Pakistan-led PRSP processes. Moreover, interesting changes are taking place on the ground. In a number of sites in Sindh and Punjab, local authorities have addressed some priority issues that emerged during the PPA fieldwork and are continuing to do so particularly in the follow-up stage of PPA. Plans are also in place in some Punjab districts to use the PPA methodology across the districts to identify people’s perceptions of social services and their recommendations for addressing the needs.

Real change or impact on poverty emanating from the strategy remains to be seen. It will depend heavily on factors, which include (i) further research on the specifics of poverty–health–environment links; (ii) amendments to macroeconomic and sectoral policies supportive of environmental management; (iii) legislation that protects and provides access to the poor; (iv) capacity building of government, civil society, and private sectors on pro-poor approaches; and perhaps most importantly, (v) implementation of pro-poor projects and programs. In this sense, devolution in Pakistan holds promise in the harmonization of policy and on-the-ground realities. More importantly, devolution can set in motion the operation and implementation of PRSPs through devolved local levels of government that can be more responsive and are better placed to address the specific poverty–environment links of poor inhabitants. For this to be effective, the devolution of powers to local governments needs to be successful as a project in itself. In turn, local governments must have

the capacity to address the needs of the poor, and be responsible and accountable for doing so.

This case study has shown that participatory processes have been instrumental in highlighting, addressing, and implementing poverty, health, and environment links across scales and sectors, and will continue to hold appeal for future harmonization.

Overcoming Gender Inequities in Access to Natural Resources in Asia

Silke Reichrath

Natural resources, from agricultural land to forests and fisheries, underpin nutrition and income for rural populations in many Asian countries. They also supply fodder for domestic animals, fuel for cooking and heating, medicines, and construction materials. The importance of each resource varies between locations, socioeconomic and ethnic groups, and men and women. Common property resources (CPRs) that can be gathered in forests, collected from the margins of fields, or fished in lakes and coastal areas tend to be most important to poorer households, and to more remote communities with less access to alternative incomes through wage employment or agriculture. This implies their particular importance to Asia, where two thirds of the world's poor live (International Fund for Agricultural Development [IFAD], 2002).

CPRs hold a particular significance for women. Women tend to be the primary gatherers since they are responsible for supplying household needs such as food, fuel, fodder, and medicine. At the same time, they are less likely to own private land for cultivating these resources. They also tend to be overrepresented among the poor, especially if they are (i) heads of households; (ii) belong to ethnic minorities, indigenous groups, or scheduled castes; and/or (iii) live in remote hilly, mountainous, dryland, or coastal areas. Moreover, women from these social groups and in these disadvantaged geographic locations depend more on natural resources than their wealthier counterparts in more favorable locations and from majority social groups. This heavy dependence is rooted in their lack of easy access to alternative livelihood through education, employment, markets, and government services.

Access to natural resources is determined by ownership and management regimes of varying complexity. These range from exclusive state or private ownership to systems of overlapping and sometimes contradictory customary and statutory access, use, management,

and ownership rights. Access and property rights are stratified by gender, economic group, occupation, and ethnicity. For example, the poor might have gathering rights to dropped fruit and grain on the fields of wealthier neighbors; women might cultivate gardens on their husbands' land; and ethnic minorities might gather firewood and medicinal plants from state forests. These rights are subject to continuous renegotiation at the community and national levels. The ability of each user group to influence the outcome of these renegotiations depends on their relative bargaining position. This bargaining position is determined by a range of factors, including access to decision-making forums, information, level of education, access to courts and other mediators, connections to state officials or NGOs, financial resources, material assets, and historical claims. This section will focus on gender differences in access to natural resources under various property and management regimes, and gender differentials in bargaining power over these resources.

The importance of common property resources

CPRs add about \$5 billion a year to the incomes of poor rural households in India, about 12% of their income, and twice the foreign direct investment or official development aid to India in 1996. CPRs are defined as “resources accessible to the whole community of a village and to which no individual has exclusive property rights.” They can include—depending on the ecosystem—pastures, forests, wastelands, common threshing grounds, waste dumps, watershed drainages, ponds, tanks, rivers, etc. found on state, communal, or private lands. They provide households with “food, fuel, fodder, fiber, small timber, manure, bamboo, medicinal herbs, oils, materials for house building and handicraft, resin, gum, honey, spices,” etc. Fuel and fodder are the most important CPRs for household use (Beck and Ghosh, 2000). Remote communities in particular get most of their daily needs for food, fuel, fodder, medicine, and construction materials from the forests, rangelands, water bodies, and other areas around them.

For example, among minority groups in the upland areas of Viet Nam, traditional communal resource-use patterns based on the combination of paddy cultivation, swidden agriculture, and resource gathering continue today. Better-off families use forest products (firewood, rats, bamboo, wood, and palm) mostly as supplementary food and income

sources. Poorer families, however, depend heavily on forest products to alleviate food shortages and to earn income. They sell broom grass, medicinal plants, and bamboo, as well as collect wild tubers for consumption. Poor and middle-income families rely on swidden agriculture for food. Swidden agriculture and gathering of forest products are predominantly women's work, while men focus more on paddy rice cultivation and the care of large animals (Ireson-Doolittle and Ireson, 1999).

Medicinal plants are particularly important to ethnic minority communities in the highlands, where 70% of medicinal plants in Viet Nam's markets originate. Traders along the entire market chain are largely women. Collectors do the initial processing and then sell to middle-women, who in turn sell to female merchants in Hanoi or the People's Republic of China (PRC). Herbal medicine is important in Viet Nam, where the largely rural population has limited access to modern medicine and the Government has promoted traditional medicine. Demand for herbal medicines has increased further with the reduction of government subsidies for modern health care. However, the increased demand creates the risk of overexploitation of medicinal plants. Secure tenure rights for women might provide the incentive and necessary decision-making authority to cultivate medicinal plants for long-term supply (Sowerwine, 1999).

The option to derive food, income, construction materials, fuel, and medicine from CPRs has multiple impacts on the health of user populations. Where CPRs provide a mainstay of the daily menu, they can reduce malnutrition. Where they are used mainly as side dishes or sauces, they add valuable nutrients to a diet otherwise based largely on starches and staple foods. Access to clean water is indispensable for a healthy community. Properly constructed housing can reduce the incidence of mosquito-borne diseases or respiratory diseases, depending on the climate. Medicinal plants can alleviate many common ailments, and are indispensable where modern medical care is not accessible. Finally, income derived from the sale of CPRs can be used to obtain health care services where these are available.

CPRs are particularly important to the poor, especially in times of scarcity. Women and children are the primary gatherers in most cases. Traditionally, community institutions have managed CPRs by establishing flexible rules to allow for regeneration of the resource and for, more or less, equitable access by community members. Women were usually excluded

from decision-making institutions for CPRs, though some traditional institutions included female elders. The management of CPRs is thus "an indigenous system which works through unequal power structures to provide significant benefits to the poor" (Beck and Nesmith, 2001).

Privatization, encroachment, agricultural intensification, productive ventures such as plantations, overexploitation, and degradation due to population pressure are eroding access to CPRs (Beck and Nesmith, 2001). Agricultural intensification has led to the reclamation of wastelands, pastures, and marshes; the privatization or enclosure of common areas; and the degradation of forests. Increased collection of CPRs due to a growing population, or in cases where CPRs acquire a market value, has resulted in unsustainable levels of gathering. Such degradation often triggers stricter access limitations to allow resources to recuperate.

The implications of changes in access to natural resources are greater for women who are responsible for obtaining the resources. In some cases, they have completely lost their access to CPRs. A reduction or loss of access to these resources increases the time they spend gathering, reducing time available for other income-generating activities, child care, trips to health centers, and other essential activities. It undermines the health of women, who have to carry heavy loads over longer distances, as well as their families, who lose access to nutritional foods and herbal medicines. It also leads to the decline of indigenous knowledge about traditional foods and medicines. Further, it increases poverty because of the loss of income from marketable CPRs, and the additional expense of purchasing replacements (Beck and Ghosh, 2000; Li, 1993). Increased poverty has negative repercussions for a family's health, given the lack of resources to access health care, nutritious food, and clean water.

In Viet Nam, for example, forests designated as village commons sometimes are allocated to households, especially if they are barren lands designated for reforestation. Combined with the commercial exploitation of timber and population pressures, this reduces access to CPRs. Less access to forest areas for swidden agriculture means less fallow time and lower yields. This implies more work for women, who have to cultivate more land, often farther away, to produce the same amount of food. The loss of access to forests and barren lands also means women have to spend more time foraging over greater distances,

or planting gardens to substitute for wild plants (Ireson-Doolittle and Ireson, 1999).

Individual property

Traditionally, the government has owned most CPRs in Asia since state ownership covered all land that was not privately owned. In practice, the local communities managed this common land and established sustainable use patterns. Over time, however, natural resources such as timber, minerals, and hydropower, became more attractive on international markets and more accessible due to technological advancements. Since governments legally owned the land, they granted logging and mining licenses, and established hydropower and plantation projects on these lands. Local communities were not consulted, and lost access to some or all natural resources on which they depended. Informal and state-sponsored migration rapidly increased the population, brought in newcomers who were not subject to community-based regulations of natural resource use, and led to degradation of CPRs.

The loss of local livelihood and degradation of natural resources were linked to the local communities' insecurity of land tenure. In response, many governments in South and Southeast Asia embarked on reforms of their property rights systems. Usually, the need for secure tenure has been addressed through land titling and registration. In addition to encouraging sustainable resource management and protecting local livelihood, titling is meant to create more liquid land markets, enable owners to use the land as collateral for credit, facilitate government planning, raise productivity, and encourage investments. Several governments went beyond titling and redistributed use and/or ownership rights to agricultural or forest land to increase productivity, and provided landless poor or rural communities with access to land. For example, in the former communist countries of Southeast Asia, long-term use rights to state-owned land have been allocated to households. In South Asia, communal lands or large estates have been subdivided and registered as household property.

Exclusive individual ownership is clearly the most secure form of tenure. However, the introduction or strengthening of individual or household property rights often reduces women's access to natural resources. Under customary rules, women might not have the right to buy or inherit land directly, though

they have management and use rights. However, in land titling processes, land usually is registered in the name of the head of the household, who is assumed to be male. Even where women have legal rights to a joint registration of user rights (e.g., in Viet Nam), women are not always aware of their rights, the bureaucratic processes, and the potential implications of not claiming their rights (Tinker, 1999). Women in ethnic minority communities face additional hurdles because they do not speak the official language and are sometimes explicitly excluded due to cultural norms (Sowerwine, 1999).

For example, the PRC, Lao People's Democratic Republic (Lao PDR), and Viet Nam have shifted from a system of collective natural resource management and agricultural production to a system based on household responsibility and long-term user rights. User rights were assigned to households based on the number of household members. Even though women are equal before the law, land is usually registered in the name of the male head of the household. Households are now the main units of production, which has given the head of the household a prominent role in decision making about household resources, family labor, the sale of products, and the use of the proceeds. The result has been a return to more patriarchal gender roles and power relations within the household (Anh, 1999; Zongmin, 1999). This is the case even in matrilineal lowland the Lao PDR, where daughters traditionally inherit the parental home and land in return for caring for the parents in their old age (Ireson-Doolittle, 1999; Viravong, 1999).

While women typically have the right to use the land registered in their father's or husband's name, this arrangement becomes problematic at times of marriage, divorce, death of the husband, or male out-migration. A newly married bride cannot bring the land assigned to her father's household in her name to her new household. Hence, she is landless in her own right, and her use of her husband's land reduces the amount of land available per family member. Similarly, a divorced woman cannot take her share in her husband's household land with her, and becomes landless until the next redistribution of land-use rights (Anh, 1999). When the head of the household migrates for employment, family members remaining behind are unable to use the land-use right registration as collateral for credit (Song and Jiggins, 2000; Zongmin, 1999).

These issues are gradually being recognized and addressed. For example, Viet Nam has introduced

legislation that makes the joint registration of family assets and land-use rights in both spouses' names mandatory, accompanied by public information campaigns and initiatives to reissue land-use certificates that had been issued in the name of the male head of household (World Bank, 2002). In future initiatives, joint titling should be built into the design of land policies at their inception, including the use of registration forms requesting both spouses' names, clear instructions to land registration personnel, and public awareness campaigns about the importance of joint registration.

Customary resource management regimes

Even where land titles are registered in the name of both spouses, land titling still means a loss of the subsidiary usufruct rights existing under customary regimes. Many customary tenure systems give women and men different levels of use rights to diverse plants or products of a plant, depending on the seasons on the same plot of land. Even where women obtain titles to land of their own, or joint registration with their spouse, the subsidiary rights of poorer and/or minority women are extinguished. The complex bundles of gathering rights and proprietary rights to the various categories of resources on the same land usually are not reflected in legal codes, individual land titles, or even formal definitions of common property. Individual ownership rights, thus, tend to be much more inequitable than the multiple overlapping use rights of customary systems (Razavi, 2002; Rocheleau, Thomas-Slayter, and Wangari, 1996).

Customary regimes are by no means egalitarian. They usually involve a local authority (e.g., a council of elders or religious leaders) distributing different use rights to community lands and resources based on need, ecological factors, and usage history. Women usually are excluded from decision-making institutions, though some include female elders (Rocheleau and Edmunds, 1997; Beck and Nesmith, 2001).

In other cases, customary use patterns have evolved over time through a continuing negotiation between users, without a central authority assigning rights. This is the case especially for CPRs on or around private property, and for the distribution of use rights within households. In these instances, the range of what can be negotiated depends on wealth, identity group, age, marital status, and gender. Men from dominant social groups have more influence in

shaping these access regimes than women from poor households and ethnic minorities. However, they cannot exclude any resident from resource access entirely (Rocheleau and Edmunds, 1997).

Women's spaces in these customary regimes often are between fields, along roads and fences, around men's trees, or on wastelands, where they collect firewood, medicinal plants, wild foods, and grasses for weaving and thatching. Their customary rights allow mostly for renewable use (planting crops, harvesting leaves, gathering deadwood), rather than consumptive use (cutting trees, selling land, diverting water), and do not confer control over the resource. Customary rights vary between countries, ecosystems, ethnic groups, kinship groups, and villages. They depend on historical precedent and daily use patterns, relationships, gender roles, and the investment of labor. This makes them highly complex, negotiable, and responsive to ecological, economic, and social changes (Rocheleau and Edmunds, 1997). However, they are often conferred through gendered institutions, such as marriage and inheritance. Thus, they depend on women's relationships with men (Rocheleau, Thomas-Slayter, and Wangari, 1996).

Rather than calling for individual property rights for women or joint titles, which still eliminates the subsidiary rights of poor or marginalized women, flexibility is needed in many situations to design natural resource management systems that recognize multiple overlapping bundles of user rights. These systems should strengthen rather than eliminate subsidiary rights, adapt to changing environmental and socio-economic conditions, and emphasize sustainable and renewable uses. While they can incorporate elements of customary regimes, they also can improve on them by introducing modern scientific and technological knowledge, and encouraging women's equitable access to resources and participation in decision making. Such systems can be developed only with the participation of all resource users, which is required to understand the local social relations of resource use, preserve and strengthen subsidiary rights, and ensure the legitimacy of the resulting tenure system (Nichols and Komjathy, 2002; Rocheleau and Edmunds, 1997).

Comanagement of natural resources

Building on these customary resource management regimes, government agencies, international funding

agencies, and nongovernmental development organizations have established comanagement or community-based natural resource management programs in many Asian countries. Comanagement is “the sharing of power, responsibilities, and benefits with respect to the management of natural resources (including their exploitation and conservation) among government and individual or collective users.” A wide variety of comanagement arrangements exist, some with more local decision-making authority and others with more government authority. Examples include stewardship contracts (usufruct rights to state lands), extractive reserves, and lease contracts with communities (Persoon and Van Est, 2003). Community-based natural resource management also can involve agreements between community-based user groups and government counterparts to restrict the use of natural resources, reforest deforested areas, or use more sustainable harvesting or agricultural practices in exchange for alternative income-generating options, employment, or cash payments.

Under formal comanagement or community-based management programs, organized user groups mediate access to resources. Membership rights often are restricted to the male heads of households (Sundar, 2000), or based on the ability to contribute financially and/or in kind through participation in communal labor. Women often do not have their own money to contribute, or the time and mobility to join patrols, which disqualifies them from sharing in the benefits of the program.

Women usually constitute less than 10% of most forest user groups in government-initiated programs in India and Nepal, and are absent from most locally initiated groups. In earlier government-organized groups, only one member per household was allowed to be a member, which was almost always a senior male. More recently, a shift has occurred toward the inclusion of one man and one woman per household, which still excludes younger household members. Only three Indian states allow all adults to be members. In Nepal, only heads of households can be registered as forest user group members. Even where women are included in forest user groups, many are not active or effective. “Only a small percentage usually attend the meetings. If they do attend, they rarely speak up; and if they speak, their opinions carry little weight” (Agarwal, 2001). Differentials in influence, wealth, education, information, and mobility between women and men from different socioeconomic groups lead to imbalances

in decision making about the resource within the user groups.

Hence, women seldom are consulted when forest management plans and rules are negotiated, despite their superior knowledge about many plant species and the local environment because they are the main fuel and fodder collectors. This has important implications for women’s citizenship rights and empowerment, the effectiveness of the management plans, and equity in resource access. Women have less chance of learning leadership skills or “acquiring new knowledge, such as about new silviculture practices, since they are rarely part of the teams that receive such training.” The failure to take women’s greater knowledge of forest resources into consideration when planning forest development and new planting reduces the prospects for biodiversity conservation and effective regeneration. Rehabilitation measures are harder to enforce when women are not involved in designing them since they are perceived as unfair. All-male patrols are also less effective at apprehending female intruders, and often do not notice when resources are missing since they are less familiar with the forest (Agarwal, 2001).

Women are not consulted about entry bans to forest areas, even though these bans impact on women profoundly. They have to travel greater distances daily to collect firewood and other NTFPs. Sometimes daughters have to quit school to help their mothers. Carrying heavy loads over longer distances results in back problems, gynecological difficulties, and injuries. Some women resort to stealing from neighboring forests, risking humiliation and fines. Some substitute other fuels such as twigs, agricultural waste, dry leaves, or cow dung, which increases cooking time and creates health hazards for eyes and lungs from the fumes. In high-altitude locations, women might have to forego heating fires in subzero temperatures, thereby increasing the rates of respiratory illnesses. This usually affects poor and middle-income rural households, since even the latter seldom purchase firewood or have sufficient private trees. However, the landless poor are the worst off because they have no crop waste or cattle dung. Restrictions on fuelwood collection usually persist even after the forests have started to regenerate and “much more firewood can be extracted sustainably than the conservative closure regimes ... allow” (Agarwal, 2001).

In addition, women have no say over the distribution of benefits from the regenerated forests,

and the use of community funds. Hence, community funds often are spent on items that do not benefit women. Funds distributed to men individually sometimes are spent on personal items rather than household needs for food, education, and health care. Shares in forest resources often are distributed based on contribution, or auctioned off, even though “women across class lines [are] vehemently opposed to forest products being auctioned and want [...] rules that allow [...] everyone equal access to grass or firewood.” Forest management plans made by men tend to emphasize cash-yielding tree species instead of the trees with domestic use value that women prioritize (Agarwal, 2001).

While programs initiated by governments or funding agencies generally have fared better in including women than locally initiated user groups, they also can undermine local achievements in localities where self-initiated user groups have become inclusive. For example, in Uttarakhand in the Central Himalayas, a region with high male labor migration and a history of community organization to protect local forest access, women had carved out significant decision-making authority in local forest management institutions. In some cases, women were included in the main forest management institutions; in other cases, women’s organizations influenced decisions, or women obtained the right to enclose their own patches of communal land. Many local arrangements succeeded in allowing forests to regenerate, and to provide the necessary NTFPs and water regeneration. Many were representative of different castes and hamlets. Local institutions were easily accessible since they did not involve a distant and difficult-to-navigate bureaucracy (Sarin, 2001).

However, the forest department initiated a new village joint forest management (VJFM) program. The program did not build on local arrangements and on the gains women had made. The VJFM program was negotiated with elite men in the village without the women’s knowledge. Although it was meant to facilitate local user participation, the program reduced the villagers’ control over forest resources in many localities. The sudden influx of money caused men to take an increased interest in forest management. Well-paid male guards were hired instead of the female volunteer patrols. The self-initiated user groups lost their decision-making authority. Most villagers were unclear about the new rules. The shift of accountability from the villagers to the forest department increased cor-

ruption. Where previously the aim of local user groups had been to ensure the supply of fuel and fodder, the VJFM program shifted the emphasis to revenue generation from resin and timber species. The influx of money created inequities between villages with and without projects, and conflicts arose within project villages over the use of the funds (Sarin, 2001).

This shows the dangers of comanagement agreements signed with the community without a careful analysis of community structures, particularly the membership of the counterpart committee that allocates resource access and use rights. While partly due to a lack of awareness, intracommunity differentiation also might be overlooked to reduce the complexity of the situation, simplify transactions, and make the arrangements workable and durable. A review of a large body of communal property arrangements found that the homogeneity of user groups, or at least of their identities and interests, is one of the factors that makes these arrangements functional and durable (Agrawal, 2001). A perceived need for homogeneity can lead to a conscious or unconscious glossing over of intracommunity differences.

Thus, the gender dimensions of access to land, water, decision making, and development assistance need to be highlighted in comanagement initiatives to ensure that women are not excluded from the new decision making institutions. Their inclusion in decision making limits the risk that women will lose their customary access to natural resources and bear a disproportionate amount of the costs of restricted resource management and/or lose out on the benefits. Addressing social differences within communities can reduce or avoid intracommunity and intrahousehold conflicts and inequities created by the enclosure of commons for the use of a limited number of community members.

The importance of an analysis of the roles women and men play in natural resource management, their perspectives and needs, and the impact of project activities has been recognized increasingly in recent interventions. It was one of the questions of PPA in Pakistan, which sought the views of young and old men, women, children, and minority groups in separate discussions (Mumtaz et al., this volume).

The PPB model in India also is based on careful and participatory gender analysis. This has allowed the initiative to identify men and women’s roles in planting, harvesting, and postharvest processing. This knowledge then enabled the team to support specific income-generating activities for women entrepre-

neers, as well as support women's role in providing nutritious food for their families (Arunachalam et al., this volume).

In the Community-based Haor and Floodplain Resource Management (CBHFRM) project in Bangladesh, gender analysis showed that adult women usually do not participate in fisheries. Nevertheless, women were invited to participate in designing an action plan for resource regeneration, and in training activities related to natural resource management and to alternative income-generating activities (Nishat et al., this volume).

Gender analysis—in the framework of the WWF project in Yunnan Province, PRC—demonstrated women's important roles in collecting and managing NTFPs and in the rearing of animals, their lack of access to health care and education, and several specific problems that the project could address. The project managed to improve the irrigation system, introduce fuel-efficient stoves to reduce women's workload in fuel collection, and support women in marketing the gathered NTFPs and managing the financial resources obtained from them (Yusong, this volume).

In these cases, gender analysis was an essential first step in making women visible, understanding their roles (and the particular challenges and needs derived from these roles), and designing project activities that would support women's activities and meet some of their practical everyday needs. To obtain results that reflect the different perspectives in a community, and that are acceptable to all community members, the gender analysis needs to be inclusive. All the different social groups must be invited to participate.

While gender analysis is a crucial step, it is not sufficient. To make resource management plans inclusive, affirmative action measures are required to ensure women's participation in community discussions and decision making. It also requires a carefully designed participatory methodology to facilitate a process where women are not only physically present, but also able to express themselves and participate substantively in decision-making processes.

Inclusive participatory planning processes

Participation means different things to different users of the term. Various typologies of participation have been developed, such as Arnstein's (1969) ladder encompassing passive participation (being informed),

consultative participation (being asked for opinions), influence on decisions, and control over decisions. Similarly, White's (1996) typology includes nominal participation (for legitimation), instrumental participation (for efficiency and cost-effectiveness), representative participation (for sustainability by giving people a voice in shaping projects), and transformative participation (for empowerment to strengthen people's ability to decide and act) (Cornwall, 2002).

To ensure the passive or nominal participation of women alone often requires affirmative action measures. These can include quotas of women on committees and in community meetings, or stipulations that at least one proposal has to be submitted by women. However, affirmative action alone is not sufficient because men still might dominate decision making in joint committees and in the development of women's proposals. Additional participatory tools are needed, which can include social mapping of community households for targeting projects, separate meetings for women, and clear equity criteria for the selection of ideas or proposals (World Bank, 2004b).

Several project teams in this volume have established separate women's committees or groups. The Yunnan Environment Development Program's (YEDP) pilot demonstration projects tried to involve women, and women have been added to "new" YEDP-inspired committees. While authority remained with the village elite represented on village committees, a new female elite was added by creating women's committees (Spencer et al., this volume). The Pred Nai Community Mangrove Forest project in Thailand also set up women's groups (Kaewmahanin et al., this volume).

Going beyond consultative and instrumental participation has been difficult for funding agencies, governments, and NGOs. The inclusion of women, especially from marginalized groups, in research and planning is time-consuming. As their views are diverse, consensus building—even within separate women's groups—can be a long-term process. Enabling women to formulate and voice their views and needs often requires preparatory capacity-building activities. The CBHFRM project found that extensive training in natural resource management, environmental awareness, and leadership skills, as well as practical income-generating skills, were required to overcome the capacity gap between women and men (Nishat et al., this volume). However, the time required to build women's "capacity

to speak and act” is often unavailable (Razavi, 2002) if rapid assessments are needed.

Sensitizing dominant community members to women’s needs and perspectives can take just as much time. In addition, adapting project designs to complex local circumstances “requires slow, gradual, and persistent learning by doing” on the part of the project facilitators. These long time lines run counter to the incentive system of international development programs, which reward quick results (Mansuri and Rao, 2004).

Being inclusive requires adjustments to the planning process. Project teams have to include women, as in the Pakistan PPA process (Mumtaz et al., this volume). Schedules need to be modified to a time of day, and a time of the year, when women can attend, including those from poor and socially marginalized households. A private location for meetings might facilitate women’s participation without violating social norms. Small groups might encourage women to speak up without having to give a public performance and risking ridicule or confrontation. Conversely, an emphasis on formal knowledge and tidy presentation might discourage women from participating (Cornwall, 2002).

Redd Barna found that identifying gender and age differences in views about social issues required engaging with the community over a period of months rather than days. The process included (i) discussions in small, homogeneous groups of young women, old women, young men, and old men, as well as presentations to the plenary with follow-up discussions; (ii) an analysis of intracommunity differences; and (iii) a community action plan for common interests with separate spaces for group action. Despite careful preparation, conflicts tended to emerge. However, the process helped raise awareness of different perspectives and respect for the priorities of others (Cornwall, 2002). Other axes of difference, such as economic status, can be added to the model to divide the community into locally relevant and meaningful groups.

An inclusive participatory planning process also requires skillful facilitation. Different sets of tools have been developed to facilitate participatory analysis and planning, including participatory rural appraisal (PRA) tools. However, the use of PRAs has been problematic where facilitators receive inadequate training. Training over a short time span often focuses on visible outputs, while neglecting social, institutional, and interpersonal dynamics. Many practitioners have

limited social science backgrounds, which reinforces a tendency to put more emphasis on visible outputs than on facilitating a process that allows villagers to express themselves. In addition, they often fail to see who participates and who is absent (and why). Representatives of the Indian NGO SARTHI found that male PRA trainers they worked with tended to be more active than females, but that they addressed mostly the male villagers. They also observed that including all village residents, or understanding the socioeconomic structure of a village, was difficult due to the distance between houses. In addition, they found that PRA methods were complex and highly visual, which made them particularly difficult to explain to less literate participants. Women also refused to criticize the access rules to local resources in a public forum. When prodded to do so, male participants, especially the forest guards, rebuked them harshly. As a result, staff and villagers felt more comfortable with informal small group discussions and long-term day-to-day interactions. SARTHI found that a longer-term research project generated a much more in-depth understanding of gender roles and social differentiation (Sarin, 1998).

Tension is often inherent between empowering local communities and enabling women in these communities to gain voice, influence over decisions, and access to resources. The experience with forest user groups in India and Nepal shows that increasing local influence can disempower women and undermine their livelihood. Participatory research and action methodologies are designed to challenge local discourse and institutions that exclude women or that portray them as weak and in need of protection or charity. However, these goals of changing local power relations are frequently at odds with results of the participatory action research, which reinforce traditional gender roles. Practitioners constantly have to balance responsiveness to local analysis and requests against pushing for equity within communities (Cornwall, 2002). To further complicate this dilemma, notions of gender equity are sometimes perceived as a Western imposition and interference with local culture, even if expressed by local stakeholders (Jolly, 2002).

Despite the difficulties and trade-offs, a successful participatory planning process can facilitate women’s participation. It can allow them to make their voices heard, and sensitize male peers to their needs, capabilities, and perspectives. If their requests are followed through, they lead to the integration of

activities that address their specific needs, or compensate for their reduced access to a resource under rehabilitation. However, the inclusion of women—and responsiveness to their special needs—by itself does not change local power relations.

Bargaining power

Project activities to address women's needs are often specific, separate initiatives for income generation, revolving loans, capacity building, or infrastructure. Often they terminate with the end of the direct and active involvement and funding of the external agent who initiated the process. Although access rights for women might be written into the resource management rules, these can be changed as externally motivated institutions become locally owned. Long-term change requires a modification of local power relations in favor of women.

In customary resource tenure regimes, rules are renegotiated and reinterpreted continuously. Patterns of access to resources are altered based on changes in environmental conditions, social needs, household composition, and economic activities. However, as these adjustments are mediated by negotiations, they depend on the negotiating position and skill of each community member. Under comanagement, rules are less flexible. Still, they are subject to renegotiation between community representatives and the state, and to interpretation at the local level. Even in private property regimes, members of the same household negotiate access to resources. Recognizing the importance of negotiation to resource allocations within communities, and within households, can allow women to defend and expand their rights by enhancing their bargaining power (Rocheleau and Edmunds, 1997).

Amartya Sen postulates that negotiations and cooperative conflict determine access to resources within a household. Men and women pursue cooperation for their mutual benefit and arrive at a deal on the conflicting issues. This deal is often implicit and based on wider behavior patterns in society. However, it might be more beneficial to one side than the other. The extent to which one side benefits more depends in part on the contributions they are perceived to be making to the household, which in turn depends on their education, employment, property, and access to productive resources. Income tends to be perceived as a contribution, whereas reproductive labor usually is overlooked. In addition, a person's

bargaining power depends on the extent to which a breakdown in cooperation represents a greater threat to one side than the other. Women's bargaining power within the household can be enhanced through education, and access to employment and resources (Sen, 1990 and 1999).

In addition to income and education, women's bargaining power within the household and vis-à-vis the community depends on their ability to draw on external support systems and alliances. Women's participation in natural resource user groups is determined by the membership rules, support from NGOs and state agencies, social and cultural norms, perceptions of their abilities, personal property, connections, experience, confidence, marital status, class, ethnicity, and caste (Agarwal, 2001). In South Asia, for example, gender norms constitute a powerful constraint on women's ability to participate in public discussions and obtain property or access rights. Household resources are allocated preferentially to men, lowering nutritional intake, reducing medical care, and decreasing survival chances for girls. However, initiatives to form women's groups and provide access to funding and natural resources can change these norms. Over time, these initiatives improve women's confidence, mobility, visibility, and perceived contribution to the household and community (IFAD, 2002).

Thus, community-based resource management initiatives can contribute to changing local gender relations and social inequities by increasing women's bargaining position. They can enhance women's access to decision-making forums, and provide alliances with external agents such as NGOs or government staff. Women's committees and groups, such as those set up by the YEDP in Yunnan Province, PRC and the Pred Nai community in Thailand, are one way of enhancing women's access to decision-making forums, organizing them collectively, and facilitating consensus-building and leadership trainings. However, if interactions with the men's groups and the main project are not strong, separate women's groups can risk isolating women's perspectives and needs. This could restrict women's expression to their own special group and activities.

Several projects have attempted to build women's leadership, negotiation, and entrepreneurial skills within mixed groups and activities. The PPB projects in India highlighted the importance of women's contributions, sought ways to make their work less hazardous to their health, and encouraged

women to become entrepreneurs (Arunachalam et al., this volume).

Community-based programs also improve women's material conditions by creating new livelihood options and strengthening their user rights to natural resources. The WWF project in the PRC successfully involved women in the business and marketing of NTFPs they were collecting, and built their negotiation and financial management skills (Yusong, this volume). The Pred Nai community project created income-generating opportunities for women in the processing of crackers from mangrove plants and the sale of wine (Kaewmahanin et al., this volume). The CBHFRM project created employment for women on the reforestation project, and set up a revolving loan fund for livestock and agricultural projects (Nishat et al., this volume).

As for strengthening women's rights to natural resources, the study on irrigation tanks in South India promises to explore the impact of a transfer of tank management and tank usufruct rights to poor people, particularly women (Balasubramanian, this volume).

The acquisition of new skills and a cash income, in turn, has increased confidence, raised esteem by fellow community members and external agents, and enhanced mobility. The income is often spent on food, children's education and family health care, though also on ritual activities (Yusong, this volume; Nishat et al., this volume).

Conclusion

Community-based natural resource management and comanagement offer promising possibilities to establish more equitable natural resource management systems, while making them more ecologically sustainable. They can build upon the flexibility and universal access of customary regimes, and improve them by incorporating modern scientific knowledge and technology, as well as equity considerations. Granting access to natural resources to all local residents allows these systems to avoid the exclusion of the poorest—particularly poor women—that is inherent in private property regimes. On a larger scale, these management systems also have the potential to address issues of population growth, market integration, and intensified use to a certain degree.

To fulfill the potential for increased gender equity, affirmative action measures to include women in decision making need to be integrated into

community-based or comanagement regimes. These measures might include separate women groups that are linked effectively to the wider resource management process, or quotas for women on community user groups and their leadership bodies. Quotas need to be accompanied by measures that make it possible for women to attend such as modified schedules, day care, locations that are accessible and acceptable to women, etc. In addition, affirmative action might include specific measures to solicit proposals from women or initiatives to improve women's livelihood. These initiatives might include the provision of drinking water close to residences, income-generating projects, revolving loan funds, and measures to enhance women's continuing natural resource gathering or cultivation activities.

While passive attendance at events can be enforced through quotas, active and effective participation in decision making often requires a long-term investment in training and capacity building. This includes raising awareness among male leaders and spouses, and confidence building and leadership trainings for women. It likewise implies capacity building of men and women on natural resource management, environmental issues, new production technologies, resource monitoring approaches, and knowledge of sustainable yields to bring them to an equal level. Specific training also might be needed for external facilitators of user groups in gender analysis and in gender-sensitive facilitation methodologies.

Done successfully, community-based management or comanagement of natural resources has the potential not only to address some of the immediate practical needs of women and include them in community decision making, but to enhance their bargaining power over the long term. Contributing tangibly to community decision making might enhance women's self-esteem and change the perceptions that other community members have of them. New skills and higher incomes could increase their visible contribution to the household, thereby improving women's standing in the household. Codified rights to access natural resources have the ability to establish the precedence that women are holders of rights, and provide them with a more reliable source of sustenance. This would make them less dependent on perceived favors from community and family members. These changes might contribute to a slow shift in local cultural practices, build female leadership, and improve the economic base of family livelihood.

Community Mangrove Management in Pred Nai Village, Thailand

Jaruwan Kaewmahanin, Somsak Sukwong, Robert Fisher, and Supaporn Worraropnpan³³

Introduction

This case study describes forest management activities undertaken in a mangrove forest by the Pred Nai Community Forestry Group in Thailand. The village of Pred Nai is in Trat Province near the border of Cambodia. The mangrove is one of the last surviving mangrove forests on Thailand's eastern seaboard. The portion within Pred Nai covers 1,728 hectares (ha) (including 320 ha of plantation). Commercial logging since the 1940s has destroyed or degraded a significant area of mangrove forests in and near Pred Nai.

This case study discusses community action to restore the mangrove, beginning with attempts to prevent commercial logging for charcoal production. This was followed by the restoration of mangrove trees through plantations, as well as protection to allow regeneration. This evolved into active management of the mangroves to increase the production of aquatic species. Although the mangrove forest is technically under the authority of the Royal Forest Department, this has not prevented community action.

Local-level institutional reforms for sustainable management

The community in Pred Nai is trying to ensure that the local mangrove forest is managed in a sustainable way. The degradation of the mangrove, an important habitat for aquatic animals (such as crabs), has affected the availability of these animals. Villagers also have perceived a reduction in coastal fisheries, which they consider to be due mainly to the degradation and destruction of mangrove forests.

Pred Nai was settled around the 1850s. Its current population is about 600 (170 households). The villagers' main occupation used to be rice cultivation.

They also harvested aquatic resources, such as crab, fish, and shellfish, as well as forest products as part of their livelihoods. Pred Nai's main economic activities now include running a rubber plantation, growing fruit gardens, cultivating shrimps, and fishing. Some villagers work as laborers. Landless villagers engage in fishery activities and work as laborers.

The mangrove forest was placed under a logging concession in 1941. By 1985, villagers became concerned that the logging concessionaires were overharvesting the mangrove and prohibiting villagers from harvesting crabs, shellfish, fish, and other products in the concession areas. Some local people converted degraded mangrove areas into shrimp farms and built a gate to block seawater, which further damaged the mangrove's ecology. In 1986, the villagers formed a group to stop logging and shrimp farming. Their efforts were successful; commercial logging ceased in 1987, the company was ousted from the village (the concession was legally terminated in 2000), and the seawater gate was destroyed.

Even after the concessions stopped, it was difficult to prevent outsiders from nearby villages and farther away from harvesting or destroying resources within the mangrove area. Nervous about any harvesting, local leaders prohibited harvesting in a conservation area that comprised a small part of the mangrove. Harvesting regulations for the grapsoid crab (*Metopograpsus* sp.)—a small crab harvested for sale and rarely consumed by the collectors—were developed in 1997. These regulations involved closing the harvest during the breeding period in October.

A forest management group for the mangrove was formed in 1998. Its activities included resource mapping and forest patrols. Drawing on the strengths of local traditions and village elders, Pred Nai villagers built on some of the organizational and institutional skills developed as a result of a village savings fund started in 1995, with the support of a respected monk. First, the villagers planted trees in the denuded mangrove area; some stands began to regenerate naturally under strict village protection. Second, villagers set out to increase the production of mud crab (*Scylla serrata*)—another economically

³³This paper is based on experiences gained in an action research project carried out in Pred Nai, Thailand, in collaboration with the community and funded by the Toyota Foundation. We wish to thank the people of Pred Nai for their cooperation and enthusiasm. We also wish to thank Jim Enright for help in providing the scientific names of marine species and for advice on mangrove ecology.

The paper is an expanded and revised version of a paper originally prepared for distribution at the World Parks Congress, Durban, 8–17 September 2003 and subsequently published as: Jaruwan Kaewmahanin, Somsak Sukwong, and R.J. Fisher. 2005. Pred Nai Community Forest, Trat Province, Thailand. Case Study No. 1 in R.J. Fisher, Stewart Maginnis, W.J. Jackson, Edmund Barrow, and Sally Jeanrenaud, *Poverty and Conservation: Landscapes, People, and Power*. Gland, Switzerland and Cambridge, UK: IUCN The World Conservation Union.

important aquatic animal—by starting a “crab bank.” People who caught egg-bearing crabs were asked to place them in one of the cages established by the management group in the canals.

A more detailed mangrove management planning exercise began with the technical support of the Regional Community Forestry Training Center for Asia and the Pacific (RECOFTC) from 2000.

The villagers also acted to prevent destructive fishing practices. In addition, they are experimenting with thinning the dense natural stands of *Cerriops*. The villagers exchange ideas with fishery researchers to help with the monitoring methods and the collection of relevant data. The process and results are analyzed and reflected in the subsequent planning cycle. This conscious learning process is an important aspect of the group’s success.

The villagers realized that the people of a single community could not implement successful and sustainable forest management because boundaries were not demarcated and there were no regulations on forest use. A mangrove network was developed with some other local villages. The network was first initiated and facilitated in villages sharing boundaries with Pred Nai and later expanded to many other villages. The communities all became members of the Community Coastal Resource Management Network, Trat Province. Through the exchange of knowledge and experiences, the villagers have learned from their successes and failures. Their collaboration has allowed them to initiate new ideas and practices that respond to community needs.³⁴

The movement to regain control of the mangroves was initiated by residents of Pred Nai who sought support from some local politicians. Subsequently, in 1998, RECOFTC was invited to provide technical support, especially for management planning. This was formalized and increased in 2000 through a small support project funded by the Toyota Foundation. The activity began as and remained a local initiative. Table 19 presents a chronological summary of the landmark dates in the Pred Nai story.

Ecosystem improvements

The project began with the restoration of the mangrove forest through plantations and protection,

Table 19: Chronology of Events at Pred Nai

Year	Event
1985	Villagers become concerned about the impacts of the mangrove logging concession
1986	Group formed to stop logging and shrimp farming
1987	Logging stopped
1995	Savings management group formed
1997	Grapsoid crab harvesting regulations
1998	Forest management group started RECOFTC support requested Mangrove management activities started
2000	RECOFTC involvement increases with Toyota Foundation Project Formalizing of Community Coastal Resource Management Network, Trat Province

RECOFTC = Regional Community Forestry Training Centre for Asia and the Pacific.

leading to the regeneration of mangrove trees. After 16 years of community action, fauna biodiversity has increased. Villagers report that stocks of crab, shellfish, and fish have grown also. Many water birds, such as the painted stork (*Mycteria leucocephala*), *Parphyris poliocephalus*, purple heron (*Ardea purpurea*), grey heron (*Ardea cineria*), lesser whistling duck (*Dendrocygna javanica*), and brahminy kite (*Haliastur indus*) are returning. Moreover, macaques (*Macaca fascicularis*) reportedly have come back after moving away during the logging period. *Hoy lod* or razor clams (*Solen strictus* Gould) that were absent for 20 years also have reappeared.

After a couple of years of protection and some conflicts over the use of forest resources, villagers are trying more proactive management methods, emphasizing sustainable use rather than more passive conservation.

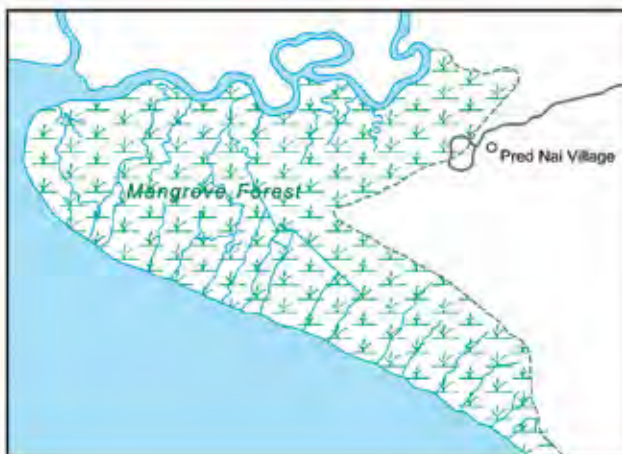
One of the most valuable local species is the mud crab, which is rare because so few mangroves remain. Some villagers who were interested in cultivating the mud crab formed a group to increase production. In addition to exchanging ideas among themselves, they are in contact with fishery researchers who specialize in crab aquarium breeding.

In conservation literature, a debate over whether sustainable use and biodiversity conservation are

³⁴ A film in Thai and English has been produced about this networking activity: A Community Coastal Resource Management Network in Trat Province, the Regional Community Forestry Training Centre for Asia and the Pacific (RECOFTC), 2002. Pred Nai also appears in the film: Forests, Local Knowledge and Livelihoods, IFAD/RECOFTC, 2000.

Map 11

Location Map of Pred Nai



- Mangrove Forest
 - National Capital
 - Provincial Capital
 - District Capital
 - Village
 - Main Road
 - Village Road
 - River
 - Village Boundary
 - District Boundary
 - Provincial Boundary
 - International Boundary
- Boundaries are not necessarily authoritative

compatible continues (see, for example, Robinson, 1999). In Pred Nai—and no doubt in many other cases of community-based conservation—previous use had undermined biodiversity severely. However, community-based initiatives have led to increased income and improved biodiversity, and community activity did not so much “conserve” biodiversity as reintroduce it.

In terms of biodiversity, the mangrove is now much healthier and biologically diverse. Apart from more aquatic animals and mangrove tree species, some aquatic animals and mangrove tree, bird, and mammal species have returned to the site. Also, while outcomes in biodiversity terms might not be perfect, they represent a major improvement. Third, in terms of the role of government policies, the original degradation was not the result of poor community practices. Rather, it was the consequence of government-issued logging concessions and the policy of promoting shrimp farming.

Poverty reduction

By Thai standards, Pred Nai village is not a particularly poor village. Livelihood and income sources are varied, and include horticultural activities and fishing. The connections between mangrove use, harvesting, and poverty are not simple because several categories of the poor can be found. Since each category has different types of assets and livelihood strategies, they are likely to be affected differently by changes to mangrove management.

The village has a significant number of relatively poor people, usually landless. Mangrove management has reduced poverty in their case and is likely to lead to improved livelihood security for other members of the community, especially those involved in fishing. Landless people can be subdivided into crab collectors and wage laborers who work in rubber gardens, shrimp farms, or in Trat town.

Some of the people in debt as a result of bankruptcy from shrimp farming or other causes might own land. For those within this group interested in crab collecting and fishing, better mangrove management has improved food security and provided alternative work.

The mangrove ecosystem is a valuable source of income for some villagers, and is the basis of a way of life for the village as a whole. The management initiative has helped ensure that the environmentally and economically important mangrove area is managed in a sustainable way. Improvements in the con-

dition of the mangrove have increased the availability of aquatic animals, especially crabs that are collected and sold. Mainly poorer members of the community, especially those without land, collect crabs. They obtain significant income from this activity, and income levels have improved.

After a few years of monitoring, the average daily harvest of grapsoid crab apparently has increased from 8 to 15 kilogram (kg) per collector per day. Significantly, the time spent collecting crabs has decreased—meaning collectors have more time for other income-generating activities—thereby increasing overall income and spreading risk across more activities.

Since the introduction of crab banks, an increase in mud crab harvests also has been reported. As Table 20 shows, the income, the number of collectors, and the quantity of aquatic animals harvested from the community mangrove forest are increasing.

With the improved catches of grapsoid crab, the income level of crab-collecting villagers has almost doubled. While exact figures on income from crab collection are not available, data suggests that the poorer villagers engaged in crab collection could earn 500–600 baht (B) (\$12–\$13) per day. An increase in mud crab harvests resulting from the innovative introduction of crab banks also has been reported. Artificial fish “houses” made from blocks of used car tires are being installed in canals within the mangrove. Villagers and outsiders said this reduces the time needed for fish harvesting.

Local management efforts also have spurred other community development activities. In addition to activities within the mangroves, Pred Nai villagers are trying to restore the seacoast within a 3,000-meter conservation zone and protect it from destructive fishing practices, such as the use of push nets and trawlers. A community patrol is enforcing the regulation against push nets with local government support. The success of the community forestry activities has encouraged the villagers to develop a marketing system, and a women’s group has been processing crackers made from mangrove plants and producing local wine for sale.

The savings management group formed in 1995 has more than 600 members, and a fund of about B6 million (about \$150,000). Other community groups were established, such as a women’s group, a youth group, and the network of people from various villages who use the mangrove area. The management initiative also has encouraged other villages to set up community forests.

Table 20: Harvest of Aquatic Animals and Income, 1998–2003

Type	1998	2003
Grapsoid crab	8 kg/day at B50/kg = B400/day	15 kg/day at B40/kg = B600/day
	6 collectors involved	30 collectors involved
Mud crab	B10,000/season (3 months) per cultivator ^a family	B15,000/season per cultivator family
	6 cultivator families	10 cultivator families
Clams	5 kg/day at B25/kg	6 kg/day at B30/kg
	5 collectors	10 collectors

Notes: Data collected in early 2004.

Exchange rate in December 2004: US\$1 = approximately 40 baht (B); kg = kilogram.

^aThe term “cultivator” is used because mud crabs are raised in ponds.

Thus, restoration and management activities have improved significantly livelihood security, especially for the poorer segment of the population. However, the impact on poverty in Pred Nai has not been just in terms of income generation,³⁵ but also in the sense of empowerment (e.g., increased capability for organization). The confidence people gained from successes, such as the savings fund and earlier mangrove conservation, helped build a sort of organizational confidence or social capital.

Gender matters

An important aspect of any attempts to deal with conservation, livelihood security, or poverty reduction is the equitable distribution of the costs and benefits of activities across groups within a society. This includes aspects relating to gender. This study has shown that improved livelihood security and incomes for relatively poor people were the main benefits of improved mangrove management at Pred Nai. These people did not appear to incur any major costs, nor were any groups harmed by the activities.

In terms of gender, the direct beneficiaries of the improved production of marine animals have been the collectors (all male) and, presumably, their families. There is no evidence that women have borne any additional costs as a result of the conservation activities. The only local trader collecting and

processing grapsoid crabs is a woman. From a gender perspective, an interesting aspect of the developments in Pred Nai is that women have been active participants in the Forest Management Committee (the current chairperson is a woman), as well as in the savings group.

Other benefits

The success of community action has had spin-offs in terms of increased confidence to engage in other activities, including the savings fund and, increasingly, ecotourism. Some additional benefits seem to have accrued in terms of health as increased income and work opportunities apparently have contributed to a reduction in drug consumption, although this has not been quantified.

Education is another important factor. The local school has been involved in management, and educational activities revolve around the mangrove. Villagers have collaborated with the schools, with some elders teaching school children about mangrove ecology and coastal resources. The mangrove community forest has served as a learning laboratory. Boys and girls have joined adult villagers in the planting program and the forest thinning experiment. The villagers also have constructed a walkway in the mangrove for educational purposes, which also could have potential for ecotourism. The Asia-Pacific Economic Cooperation (APEC)

³⁵The multidimensional nature of poverty must be understood. According to the World Bank (2000), poverty is concerned with lack of assets, powerlessness, and vulnerability.

sponsored a group of school children from various countries to attend an environmental camp and carry out fieldwork at Pred Nai in July 2003. The students learned about mangrove and coastal resources, generating a sense of pride in Pred Nai.

The link with education is especially important because a self-taught approach has been a major factor in the success of Pred Nai. The villagers started with reflection, and then developed their abilities to solve problems, learning new ways to manage the resources, their village, and their own lives. Expanding and institutionalizing this through the younger generation is a logical development of this approach.

Networking, external support, and partnerships

The success of the initiative depended on managing the mangrove area, as well as the people who use the mangrove. The project incorporated innovative partnerships and a wide range of participants.

After the mangrove concessions ended and the management group was set up, local users who depended on the area were not allowed to harvest any products. This caused resentment and conflicts. After discussions with community members, however, the villagers slowly began experimenting with less restrictive management and the committee became more inclusive.

Partnerships needed to be established with people from other villages who wished to use the resources. Villagers set up the Community Coastal Resource Management Network, which meets in different villages on a rotating basis. The development of the network demonstrated the recognition that managing mangroves at the site level alone is difficult without the cooperation of nearby communities.

The study has pointed out that this activity was based on a community initiative. However, the community asked RECOFTC to provide technical support and facilitation. RECOFTC primarily supported the community by facilitating forest management planning activities, and assisting with the formalization of the wider network of villages interested in mangrove conservation. The network, a local initiative, was initially more informal.

Technical support was provided through collaboration with government officials (fisheries and forests) and academics from regional universities. Villagers have gained experience by collaborating with outsiders, such as fishery experts, foresters, and

various institutions. Since some problems are beyond the scope of village action, links with other institutions are important. These include networks with other villages, collaboration with other institutions (e.g., government forestry and fishery departments), police patrols, and politicians. Religious institutions, such as temples in the Eastern Gulf region, also have been important partners.

The other main participants are local officials. Although the Government of Thailand does not legally recognize local management efforts, local officials have supported them, and have provided technical and moral support. The provincial governor became an active supporter of the community forest and the mangrove network after seeing what local efforts had achieved. An important lesson is that legal recognition is not essential if there is a collective interest and vision in managing resources.

Institutional sustainability

Because the initiative operates at the local level, the learning capacity of community members has increased. Villagers also learned to communicate and collaborate with outsiders. In the early days of community action, villagers contacted the ministerial level of government for help; when other problems arose within the community or nearby, they initiated local solutions. That achievements can be traced largely to initiatives and decision making from within the community bodes well for sustainability.

The villagers' success has become so well-known that many study tours from abroad have come to visit. Ecotourism also is being discussed. Both of these outcomes have potential benefits and risks. One of the risks (or costs) is the time involved in managing so many visitors. On the other hand, the visitors act as an incentive to pursue conservation efforts.

Within the village, some conflicts have arisen between conservation and resource utilization objectives. At one stage, the committee's focus on conservation came into conflict with people who wanted to use the mangrove resources as livelihood assets. The current committee chairperson is committed to sustainable use rather than narrow conservation.

Pred Nai is a good example of innovation in natural resource management, and in using savings for village development. The forest, as well as the broader landscape (including the sea, canals, and orchards), is managed, conserved, and sustained. Local efforts will be sustained as long as there are economic, envi-

ronmental, and cultural interests in managing the mangrove area. A potential threat to the initiative is restrictive and intrusive national legislation that usurps the rights and efforts of the local villagers in the name of the “national interest.”

Political and legislative context

Pred Nai has received fairly wide recognition as an exemplary community initiative. In 2001, an NGO presented the community with the Green Globe Award, and the Royal Forest Department awarded a prize to Pred Nai Community Forest in 2002. In 2004, it was one of the 30 communities globally recognized by the Equator Initiative. The recognition by the Royal Forest Department (now part of the Ministry of Environment) is particularly ironic given that legislative support for local forest management efforts has been debated for more than a decade in Thailand. On the surface, the ingredients for cooperative management are in place. Communities throughout Thailand are managing and protecting forests and the constitution which operated from 1997 until the coup of September 2006 stipulated that local communities have the right to participate in natural resource management. Upon closer inspection, however, many obstacles remain.

The policy reform process has stagnated, and conflicts are becoming more acute. Local networks of community forestry groups are pitted against a powerful coalition of bureaucrats, academics, and environmentalists who perceive rural people as destructive and consider their participation a threat to national interests. For many years there has been debate about a Community Forestry Bill, with a number of versions being prepared in turn. People’s organizations and their supporters submitted a ‘community-friendly’ version to Parliament in March 2000 after collecting 52,698 signatures. A parliamentary commission was set up to examine the bill and previous community forestry bills. However, the commission was canceled after only 3 months when Parliament was dissolved.

In response, a mass media campaign was initiated to lobby for changes to parliamentary regulations and more inclusive parliamentary commissions. After the new Government was elected, a new commission was set up. It included 13 people’s representatives, who made up one third of the members. The commission finalized the drafted bill, which the lower house of Parliament then approved.

However, the upper house (Senate) changed the bill’s intent and focus drastically. The crucial part of the bill, Article 18, states that people settled in national parks, wildlife sanctuaries, and watersheds before the forests were declared protected could continue to manage and use forest products in a sustainable way. The Senate deleted this provision for various reasons. Some senators said they were afraid that if the villagers received rights to manage the forest, they would convert the fertile forest to grow cash crops; others were afraid that “outsiders” might abuse the bill by encroaching on protected forest, and then claim the right to manage it. Further discussions occurred, but the process has been stalled since the constitutional crisis which has led to Thailand being ruled by a caretaker government since early 2006.

Conclusion

Community-based initiatives in general, and Pred Nai in particular, should not be romanticized. Within Pred Nai, differences of opinion and conflict have arisen regarding mangrove management, including a debate about conservation versus sustainable use. What is important is that the community members have managed the conflicts themselves through negotiation and dialogue. Pred Nai shows that communities can work cooperatively, and that community initiatives can improve biodiversity. Although biodiversity had been compromised, largely as a result of outside commercial interests and government policies, it has improved immensely since the villagers regained control. Pred Nai is an example of people empowering themselves through local initiative and organization, demonstrating that confidence can be gained through small successes and that community action can help improve livelihood and reduce poverty.

Wetland Resource Management in Bangladesh to Improve Livelihoods and Sustain Natural Resources

Aimun Nishat, Md Rakibul Haque, S.M. Munjurul Hannan Khan, Rashiduzzaman Ahmed, and Raquibul Amin

Introduction

Wetlands are invaluable ecosystems in Bangladesh, supporting up to 100 million people. People get food, fuel, fiber, fodder, house-building materials, etc. from

the wetlands. The important inland and coastal wetlands consist of the vast floodplains and delta system of the Ganges, Meghna, and Brahmaputra rivers. Bangladesh's wetlands area has been estimated at 7–8 million ha, about half the total area of the country depending on the time of year and annual weather patterns. However, the burgeoning human population and its constantly growing needs have massively depleted these resources. In the Ganges–Brahmaputra floodplains alone, an estimated 2.1 million ha of wetlands have been lost due to flood control, drainage, and irrigation projects. This case study reviews these national challenges and attempts to address them in selected sites.

Wetlands and the livelihoods of the poor

THE WETLAND ECOSYSTEM OF BANGLADESH

The abundance of water and wetlands has always been a major part of the history and geography of Bangladesh. Rajendra Cola (1012–1044 AD) wrote in Tirumulai about “Vangaladesa” as a land “where the rains never stopped ... on the shore of the expansive ocean producing pearls and the Ganga whose water-bearing fragrant flowers dashed against the bathing places” (Chowdhury, 1967).

Three mighty rivers—the Ganges (the Padma), Meghna, and Brahmaputra—flow across the country, and 90% of the incoming water runs into the Bay of Bengal through the lower Meghna estuary of Bangladesh. This outflow is second only to that of the Amazon River system in South America. These major river systems and their tributaries help form diverse wetland ecosystems, including mangrove forest, peat land, haor, baor, beel, seasonally inundated floodplains, and estuaries. Beels are the deepest pockets of floodplains, haor are bowl-shaped depressed water basins or river backswamps in the north and central part of Bangladesh, and baors are oxbow lakes. About 6.7% of the country is permanently under water, of which 21% is deeply flooded (more than 90 centimeters) and about 35% experiences shallow inundation (FAO, 1988).

DEPENDENCE ON THE WETLANDS, ESPECIALLY BY POOR HOUSEHOLDS

The livelihoods of about 100 million people are linked to the productivity and sustainability of the wetlands in Bangladesh. Wetlands have enormous economic functions for people, including commercial and non-

commercial uses, such as growing flood-tolerant rice; fishing; collecting mollusks; harvesting aquatic fruits, vegetables, cooking fuel, and fodder; raising ducks; catching turtles; collecting reeds; trapping water birds; cultivating winter crops; and navigation. Near the rivers and estuaries are newly accreted lands, known as *char*, which have been used for human settlement, rice cultivation, and fishing. Poor communities generally are dependent on forest products from the country's estuarine forests, while the mangroves provide an array of harvestable resources, including mud crabs, shrimp fry, honey, timber, fuelwood, thatching materials, etc. People revere and cherish the wetlands, which shape, influence, and mold their existence and philosophy of life. Various social and recreational activities, such as boat races, swimming competitions, and monsoon folk culture norms, are centered on the wetlands.

HEALTH, DIET, AND THE WETLAND ECOSYSTEM

The fishery sector alone provides nearly 80% of rural people's dietary protein requirements, and accounts for more than 5% of the gross domestic product (GDP) (Bangladesh Bureau of Statistics, 2002). According to the World Bank (1989), Bangladesh is the world leader in freshwater fish production per unit area, with 4,016 kg per square kilometer of water body, and per capita fish production of 5.5 kg. Throughout Bangladesh's history, fish and fisheries have played a significant role in nutrition, culture, and economy. According to an age-old adage, the Bangladeshis have always been known to be “machhe-bhate Bangali,” meaning the Bengalis thrive on an exclusive fish and rice diet, which poignantly illustrates the prime role of fish in the economy, food habits, diet, and nutrition of the people. The fisheries sector provides full-time employment to an estimated 2 million persons. Subsistence fishing is extremely important in maintaining the nutritional health of rural populations. About 76% of the rural households in haor areas and 57% of households in the central region of the country engage in subsistence fishing (Food Action Plan [FAP] 6, 1993).

HEALTH CONTEXT AND ACCESS TO CLEAN WATER: A GROWING ROLE FOR WETLANDS

Recently, the presence of arsenic in groundwater increased the role of surface water from the wetlands in supplying drinking water. As a wetland-dominated country, water is everywhere in varying quantity and quality. Rivers, beels, canals, and ponds are used for domestic purposes, including bathing, washing uten-

sils and clothing, and often drinking. However, people have tended to drink safe water from tube wells and dug wells. Water quality and quantity become crucial during the dry season when only the deepest parts of the depressions hold water. The number of tube wells in the country was low up to the early 1980s, leading to widespread waterborne diseases including diarrhea, dysentery, and jaundice. In recent years, extensive well drilling has contributed to a significant decrease in the incidence of these diseases. Between 8 million and 12 million shallow tube wells in Bangladesh reportedly supply water to about 10% of the population living in the large cities and some district towns. Inadequate sanitation—especially the use of unhygienic open latrines—was also the cause of diseases such as dysentery, cholera, and diarrhea. Data from the Bangladesh Bureau of Statistics (BBS, 2002) show that the Government of Bangladesh has achieved remarkable safe water coverage (97%), and the percentage of sanitary latrine usage increased from 16% to 39%. Still, waterborne diseases, caused mainly by poor human waste disposal, have not declined significantly. Data also show that only 17% of people wash their hands with soap and water after defecation.

The use of underground water, especially from shallow tube wells, resulted in exposure to arsenic in most parts of the country. The underground water in 40 of the country's 64 districts is contaminated with arsenic at a magnitude ranging from low to very high. Drinking arsenic-contaminated water over several years caused arsenicosis among the 20 million people inhabiting these rural areas. The Dhaka Community Hospital and the School of Environmental Studies of the Jadavpur University in Kolkata, India conducted a study of 1,630 adults and children in 18 affected districts of Bangladesh to understand the effects of arsenic on the health of the population in the survey area. The study found that 57.5% of people surveyed had skin lesions due to arsenic poisoning. A national initiative was also undertaken to test tube wells across the country for arsenic contamination, identify patients suffering from arsenic poisoning, and educate communities on how to deal with the problem. This program provided short-term options to ensure safe drinking water, including harvesting rainwater, boiling water from ponds, and other simple techniques for removing arsenic. Now aware of the deadly effects of arsenic poisoning, people are beginning to adopt alternative options to source safe drinking water.

Problems and challenges facing equitable and sustainable management of the wetlands

The wetlands of Bangladesh face many challenges, including

- development schemes;
- conversion of wetlands for agriculture;
- erosion, siltation, and sedimentation;
- draining of the wetlands;
- conversion of swamps;
- inequitable fishery policies; and
- lapses and gaps in policy, rules, and regulations.

DEVELOPMENT SCHEMES

Over the last few decades, physical infrastructure has expanded rapidly in the floodplains and haor areas of Bangladesh. Infrastructure erected for agricultural purposes—dikes, embankments, seasonal dams, sluice gates, etc.—has had a significant impact on water flows in the haor, baor, and floodplains. During the last 2 decades especially, Bangladesh has seen massive development in rural areas in the form of rapid expansion of road and feeder road networks and urban centers. This infrastructure often has been constructed without considering the possible environmental impacts, resulting in serious hazards to ecosystems, especially the wetlands. The hastily and poorly planned roads, drainage structures, sluice gates, land filling, etc. caused water logging and accelerated the siltation of water bodies, which in turn has had serious impacts on water regimes.

CONVERSION OF WETLANDS FOR AGRICULTURE

With a population density of more than 850 persons per square kilometer, the demand for land is enormous and constantly increasing. The exploitation of wetland ecosystems for other competing purposes began with agrarian settlements, which are constantly expanding. To increase rice production, high-yielding variety (HYV) rice was introduced, leading to more wetlands being reclaimed each season. Swamp forests and reed lands that were once extensively distributed are now on the verge of extinction. With the changes in land-use patterns, the populations of fish and migratory birds have declined. The beels are being drained and embankments built to save crops from flash floods.

EROSION, SILTATION, AND SEDIMENTATION AND THEIR IMPACT ON THE POOR

The most devastating natural factor leading to land degradation is riverbank erosion, which generally eats

away land slowly and gradually. However, this process often assumes devastating dimensions in the more active floodplains. The floodplains of the Ganges–Brahmaputra–Jamuna, Teesta, and Meghna rivers are most susceptible to riverbank erosion. Smaller rivers, particularly those in eastern Bangladesh, erode land to a lesser extent. An enormous volume of water flowing down from the Himalayan mountain range creates devastating floods that cause large-scale riverbank erosion and sedimentation. Besides natural processes, human activities such as irrational use of forest and other natural resources, upstream and downstream, aggravate the situation (Islam, 1986).

Rural people whose lands have been eroded generally migrate to towns. The loss of crucial land resources affects poor people most—economically, socially, and psychologically. When rural people lose their land in this way, they end up destitute and alienated from mainstream society and culture. Extensive erosion of riverbanks leaves thousands of people homeless every year, compelling them to abandon the affected areas in search of new settlements. Each year, riverbank erosion affects millions of people.

In the haor areas, the erosion of homesteads due to wave action during the monsoon—exacerbated by the destruction of swamp forests—is a major natural calamity that the villagers face. Huge quantities of sediment are carried downstream with the additional volume of water during the monsoon, silting up beels and haors. In turn, the siltation of water bodies and streams has adverse impacts on the population and diversity of the country's fishery resources, since beels and fresh water lakes become isolated from the rivers or canals due to the lack of connectivity. This is among the primary causes of reduced productivity of the wetlands.

DRAINING OF WETLANDS

The draining of haors, baors, and beels is a particularly common practice all over the country for irrigating agricultural land and fishing. Stakeholders in different locations have noticed the impacts of this unwise practice, namely the decline of aquatic species production and the destruction of habitats of other wetland-dependent species. The Government of Bangladesh recently initiated a new pilot-scale Community-based Management of Aquatic Ecosystems approach to restore aquatic habitats and increase the quality of life of dependent communities.

³⁶ *Kanda* is raised land in the haor.

³⁷ *Mouza* is the lowest map unit for revenue generation.

SWAMP CONVERSION AND IMPACT ON THE POOR

Freshwater swamp forests throughout the country have been destroyed in recent decades, except a few negligible fragmented patches surviving in the northeastern haor basin in Tanguar, Pasua, Sanir, Bara, Matian, Kharchar, Dekhar, Aila, Kawadighi, Muria, and Bawli haors. Clusters of reeds and scanty groves of hijal (*Barringtonia acutengula*) and karoch (*Pongamia pinnata*) still can be found, though they also are threatened with extinction. Haor swamp forests and reed lands and marshy areas have been cleared in favor of agricultural lands and human settlements, mostly by migrants from other parts of the country. The previously forested *kandas*³⁶ have been converted into land for agriculture, pastures, seedbeds, and others. A recent study found that more than 30% of the *kandas* in the three *mouzas*³⁷ of Pagnar haor have been converted into agricultural fields. Another 53% of the land is converted into pastures in the dry season, thus impeding the natural growth of vegetation.

Massive felling of swamp trees and cutting down of reeds in the haor and floodplains have led to the disappearance and depletion of biodiversity, including large mammals, reptiles, migratory and local birds, aquatic trees and reeds, medicinal plants, and various fish species. The disappearance of swamp forests aggravates livelihood insecurity among the poor as fish, nontraditional foods, housing materials, fodder, and fuel become increasingly scarce. Previously, the haor swamp forests served as natural barriers against the unavoidable wave action during the monsoon. Their disappearance has resulted in wave action becoming much more devastating, eroding village mounds in the process. People have been compelled to increase spending every year to protect their tiny homesteads. The traditional erosion-proof measures using indigenous technology are also difficult to adopt these days since the main raw material used for the purpose—a local tall grass that grows in the haor known as chailla (*Hemarthria protensa*)—is no longer abundant in the region due to overexploitation, grazing, and expanding agriculture.

INEQUITABLE FISHERY POLICIES

Fish stocks have been declining due to the lack of appropriate integrated policies for the sustainable

harvesting of wetland resources. The management of open waters has focused principally on generating revenue. The Ministry of Land leases out segments of rivers and large water bodies that have potential as a *jalmahal* or fishery (water estate). Before British rule in India, fisherfolk enjoyed customary rights to fish in rivers, beels, haors, and baors either for free, by paying a token toll, or by agreeing to share the catch with the estate holders or their agents.

During the flood season, access is open to all across the entire floodplain zone, except for the areas around beels that are included in the leased-out schedules. No fishing licenses are needed in the floodplain area during the monsoon. However, during the dry season, access is restricted and only those who can pay are allowed to fish. Generally, water bodies are leased out to the highest bidder for 3 years, a period in which the lessee exploits all the fish, irrespective of whether they are brooding fish or hatchlings. Consequently, fish stocks have been declining at an alarming rate. In addition, lessees have been observed from the haor and other floodplain areas hunting migratory and local birds and other wildlife; felling swamp trees; and extracting snails, mollusks, turtles, and reeds to generate illegal income from the water bodies. Inadequate leasing policies and the lack of monitoring of lessees have degraded wetland ecosystems. This, in turn, has worsened the poverty of local residents.

Fishing is not permitted in the leased-out areas without payment, as these areas are protected by the private armed guards of lessees. As the water level gradually recedes from the floodplains, haors, and small creeks during the dry season, fishing becomes increasingly difficult. Poor fisherfolk cannot fish in the leased area because they cannot afford the rent, though they might work for the lessee for very low wages. As a coping strategy, most rural fisherfolk migrate to cities or anywhere else in search of farming or nonfarming jobs. Those without other options still might try fishing in the rare, shallow ditches outside the leased-out prime fisheries. Thus, the leasing of open waters has benefited the rich and influential to the detriment of poor fisherfolk.

LAPSES AND GAPS IN POLICY, RULES, AND REGULATIONS

Bangladesh does not have a wetland policy, although it has prized wetlands that host the world's most diverse and abundant inland fisheries and other biodiversity. By working in the wetlands, the study found that integrated development of wetlands requires formulating

an appropriate wetland policy. Existing policies relating to fisheries, forests (including swamp forests), agriculture, land, or water are inadequate for conserving or developing wetlands as a whole. Instead, they lead to a piecemeal approach. Government lands within wetlands are leased out to generate revenue without considering the needs of the ecosystem. Similarly, the Department of Agricultural Extension follows its own policy to promote agricultural productivity through drainage, irrigation, or other operations, while ignoring the nature of crop-growing lands in the floodplains, haor, or baor. In addition to the sectoral priorities, laws and regulations related to forestry and fishery resource management are not enforced properly. Illegal felling of swamp trees, fishing, water extraction or diversion, and wildlife poaching by the elite and influential people are destroying wetland resources. These exploiters also are known to collude with law enforcement agencies during illegal extraction. Such resource mismanagement deprives the poor most of all.

People in and around the wetlands are not aware of the laws on resource harvesting and management. Government managers of the wetlands are reluctant to use the resources wisely unless it brings direct financial benefit to the respective department or authority. An integrated ecosystem approach is required to improve the well-being of the wetlands and the people that depend on them. This must take into account the interests of all relevant sectors and different stakeholders associated with the wetlands and their resources.

Institutional reforms to promote wetland conservation for poverty reduction

While sustainable management of wetlands has been lacking, civil society, the Government, and wetland inhabitants have been attempting to change this. The Government formulated the National Conservation Strategy, which provides guidelines for the conservation and sustainable use of resources and led to the preparation of the Environmental Policy in 1992. The National Environment Management Action Plan (NEMAP) was prepared through a participatory process, and the Environmental Protection Act was enacted in 1995. To implement the NEMAP, the Government and the United Nations Development Programme formulated the Sustainable Environment Management Programme with 26 components under five major subprograms, including a participatory ecosystem approach.

CBHFRM is one of the projects under the participatory ecosystem approach. It aims to restore and conserve wetlands for poverty reduction in wetland-dependent communities. Several other projects such as the Community-Based Fisheries Management, Management of Aquatic Ecosystem Through Community Husbandry, and Community-Based Wetland Management, have been implemented using a participatory approach. Inspired by the success of these projects, the Government started to follow a bottom-up approach to developing the national environmental arena. This change of mind-set at the decision-making level is an important milestone in developing sustainable management of resources to improve rural livelihoods.

COMMUNITY-BASED HAOR AND FLOODPLAIN RESOURCE MANAGEMENT

CBHFRM is an approach to natural resource management by, for, and with local communities. The objectives include improving the livelihoods and security of local people, empowering them, and enhancing conservation efforts. Sustainable resource management depends on the participation of the local communities, who perform activities only when they are able to perceive tangible benefits. This requires unobstructed access and property rights to resources. Sustainable CBHFRM is based on the indigenous knowledge of local people, their motivation to conserve natural resources, and strong local organization to undertake such initiatives. Under the project's approach, all basic activities have been organized at the field level with the participation of resource users, representatives from union *parishad* (local elected body), and concerned government officials.

However, this approach faces major challenges since more than half the households in the haor study area are landless, while 19% are large-scale farmers. The difference in socioeconomic status between the landless and large-scale farmer groups is considerable, which reflects directly on different dimensions of their life (capacity, rights, status, and opportunities). The capacity and social rights of the poor and the rich are on different scales. The wealthy and influential people of the community oppress and suppress the voices of the poor. Consequently, all benefits deriving from the ecosystem, agriculture, social and health investments, infrastructure, or any other development favor the upper class of society. The wealthy enjoy most of the communal and government lands

in rural Bangladesh. Rules and regulations for the management of common properties, therefore, are biased in favor of the wealthy.

IUCN Bangladesh, in association with the Bangladesh Center for Advanced Studies, Center for Natural Resource Studies, and Nature Conservation Management, has been implementing the CBHFRM projects in five sites of the haor and floodplain areas of Bangladesh since 1998.

The haor sites are

- Pagnar and Sanuar–Dakuar Haors, Sunamganj district; and
- Hakaluki Haor, Moulvibazaar, and Sylhet districts.

The floodplain sites are

- Padma–Jamuna Floodplain site, Manikganj;
- Madhumati Floodplain site, Gopalganj; and
- Brahmaputra Floodplain sites, Mymensingh and Gazipur.

A community-based approach has been used to restore and conserve wetland resources. Community participation has been ensured from the beginning of the development of action plans and implementation of project activities. Community-based organizations have been established in each village to administer environmental activities. Communities have been motivated to improve their livelihood while conserving natural resources. During project implementation, the emphasis was on raising awareness on environmental issues; building the capacity of grassroots environmental managers; empowering women; and generating alternative employment with a view to supporting the main conservation efforts such as afforestation and reforestation, rehabilitation of wetland habitats, and biodiversity conservation.

PARTICIPATORY ACTION PLAN DEVELOPMENT

Before designing a prescription for any development project, a proper diagnosis of the problems is essential. People who live with these problems can identify them, their causes, effects, and probable solutions most appropriately. In a problem identification and action plan development workshop, a list of issues related to the project's scope and goals is made, and their root causes and consequences are discussed exhaustively with the participants and stakeholder groups. The perspectives of community people regarding difficulties related to their socioeconomic, political, and ecological conditions are also carefully analyzed. Based on the information gathered in this way, stakeholders become aware of the impacts of

Map 12



resource use patterns, livelihood strategies, and economic activities on the local environment. They also learn about the sustainable resource management schemes and environmental conservation options available to them, since priority issues and probable solutions are determined through this analysis. An action plan to remedy the diagnosed problems then is designed for restoring, conserving, and sustainably managing their ecosystem.

Generally, the development of participatory action plans is the starting point of people's involvement in the conservation process. A participatory approach creates debate, conflict, and ideally, consensus in the community. Under the CBHFRM project, participants from landless, marginal, small-, medium-, and large-scale farmers, and women have been participating and designing action plans to regenerate their resources. Individuals from concerned government departments and the Union Council, as well as elected public representatives, also participated to express their respective concerns during the exercises.

Implementation of the plan, access and benefit sharing, management planning, finance mobilization, and sustainability issues also have been designed through community facilitation. Local communities previously excluded from development initiatives are now considered important stakeholders in the planning process. The critical part is staging an inclusive participatory platform for discussing the issues. Special concerns—such as women's participation in every aspect of wetland management, including decision making—are discussed openly by involving all stakeholders to help dispel prejudices prevailing countrywide. The community-based approach to the grassroots communities has created an opportunity to prove the sustainability and success of community planning, and eliminate external assistance.

PROJECT IMPLEMENTATION

Communities within the jurisdiction of a project have been brought together to develop institutional mechanisms for environmental management and ensure sustainability of the project. The development of institutional links between local level organizations (village committees) and concerned government departments or ministries helps gain access to existing facilities within the government structure. In the haor and floodplain project areas, 113 village committees have been formed to conserve and manage the wetland resources. With gradual rejuvenation of

biological and social resources enhancing livelihood security for wetland households, a process of sustainable management of the resources is being initiated with cooperation from the Government.

HUMAN RESOURCE DEVELOPMENT AND GENDER EQUITY

Bangladesh has a population of 140 million. The overall literacy rate is 40%, though it is as low as 15–20% in certain remote pockets of the country. Females, who make up about half the population, are neglected in terms of education and employment. Through this project, initiatives have been taken to organize training programs for rural men and women. More than 2,500 men and women have been trained in natural resource management, leadership development, and income-generating activities, such as (i) rearing ducks and poultry, (ii) fattening cattle, (iii) developing aquaculture, and (iv) producing handicrafts and pottery. People also have been made aware of the environmental concerns that might lead to the degradation of wetlands. Environmental awareness covered illegal hunting of wildlife and birds, illegal felling, use of harmful fishing gear, draining of water from water bodies for fishing, and massive encroachment on wetlands to extend dwellings and agrarian activities. Attempts have been made to dispel disparities between men and women, and to enhance the knowledge of youths on the future management of their environment.

ECOSYSTEM IMPROVEMENTS: REGENERATION OF SWAMP FOREST

Although communities are now aware of the consequences of forest degradation, they usually are unable to mobilize the resources necessary to reverse this phenomenon. Nevertheless, people have initiated activities aimed at conserving and managing swamp forests in Pagnar and Sanuar–Dakuar haors of Sunamganj District in an effort to preserve the haor zone. The community first identified the lands in Pagnar, Sanuar–Dakuar, and Hakaluki haors fit for growing the aquatic plant species hijal and karooh. Then land tenure in the haor region, which always has been a critical issue, had to be resolved. The Government owns many kandas, which are exploited by vested groups. However, there is also community-owned land, locally known as *ejmali* property. Traditionally, community people have common equal rights over the *ejmali* lands, while local influential people control the Government lands (*khas*) for their own use. Under the community-based haor resource management

project, about 450,000 saplings of karoch and hijal were planted, after ensuring access and benefit sharing of the regenerated forest resources and conservation perspectives, and resolving land tenure issues.

POVERTY REDUCTION AND LIVELIHOOD IMPROVEMENTS

The communities also made a plan for the management of reforested swamps. The planting of aquatic species created work opportunities in the haor and floodplain sites. Women have been trained to raise aquatic tree saplings. They raised thousands of saplings and sold them to the project for planting, thereby generating income for themselves. In the Pagnar and Sanuar–Dakuar haors, at least 50 women took up this enterprise as an opportunity to improve their livelihood. In addition, poorer women of the community are hired to irrigate the newly planted saplings during the peak dry months (March–April), while poor men guard the plants. These activities also help reduce poverty in the project area.

POVERTY REDUCTION AND SWAMP FOREST IMPROVEMENTS

A haor forest is not only a biodiversity habitat; it also provides products such as food, forage, housing materials, and fuel, for its human residents. In addition to these direct economic benefits, a haor forest abates the impact of waves, reducing the vulnerability of haor people to wave action that tends to erode their scanty homestead lands during the monsoon. This saves money for the inhabitants of a haor, who would otherwise have to incur considerable expense to protect their homesteads. For the regenerated forest, a benefit-sharing plan has been drawn up, taking into consideration the conservation and sustainability perspectives. The benefits from the forest will be distributed among the villagers as follows:

- 60% of the benefits from the sale of branches from pollarded trees will be distributed equally among all households of the village;
- 25% will go to building a reserve fund for the village committee to be used for social or pro-poor development; and
- 15% will be reserved for the landowner, or union parishad (local government institution).

Restoration of the swamp forest would also enhance the condition of the haor ecosystem, which would increase fishery and forest resources. The villagers of Pagnar and Sanuar–Dakuar haors are expected

to earn about \$260,000 per year from the regenerated forest of about 350,000 trees and other NTFPs after 5–7 years of successful plantation activities.

ECOSYSTEM IMPROVEMENTS: WETLAND REHABILITATION

Subsistence fishing plays an important role in the nutritional health of the country's rural population. However, declining access and fish stocks have caused many problems for subsistence fisherfolk. To address this, interventions, such as the establishment of fish conservation areas, the rehabilitation of migratory fish routes, and awareness building regarding biodiversity conservation, have been implemented under the CBHFRM project in the five project sites. Fish sanctuaries and the rehabilitation of migratory fish routes in the project area evidently have increased fish stocks, and some critically endangered species have reappeared. A continuous awareness campaign against using harmful fishing gear and catching hatchlings and brooding fish also contributed to restoring fish stocks in the habitats.

LIVELIHOOD BENEFITS FOR THE POOR FROM WETLAND REHABILITATION

A study conducted under the CBHFRM project reported that the landless were more dependent on wetland fishing than medium- or large-scale farmers for fishing in the wetlands. Men, women, and children all fish in the wetlands. A study in Shingharaji beel in Tangail found that roughly 40% fished for their subsistence needs, about 35% were part-time professional fisherfolk, and 25% were full-time professional fisherfolk. Survey data showed that females constitute 7.4% of the fisherfolk; most of them are under 15 years old and fish for home consumption. In contrast, two thirds of the adult fisherfolk sell at least a portion of their catch. Thus, the wetlands of Bangladesh allow the poor to meet their daily protein requirements and vulnerable fishers to generate an income.

Fish catches in the haor and floodplain sites now indicate that conservation measures have increased fish populations and diversity in the sanctuary, as well as within the peripheries of rehabilitated habitats. Surveys showed that catches in a fish sanctuary in Pagnar haor have increased threefold compared to those in a control area. Diversity has increased; 29 species of fish were found in the sanctuary, compared to 21 in the control area.

According to the local people, fishing in the water bodies surrounding their villages is open, regardless

of social class, occupation, influence, or vulnerability. From a conversation with Shashanka Talukdar of Matargaon village of Jamalganj Upazilla, it is evident that fish catches in the Ganger Agar and Maranodi have increased substantially, and some large fish and rare species are being caught.

GENDER BENEFITS

The CBHFRM project has sought to empower female entrepreneurship. Female (and male) groups have been trained in employment-generating activities, namely poultry and duck rearing, handicraft production, cattle fattening, nursery development, etc. During the 5-year project period, 238 training sessions were organized for the women of some 158 haor and floodplain village groups. Once the groups are considered capable of managing the environment fund for income-generation activities, funds are disbursed. About 6,000,000 taka (Tk) (\$100,000) have been disbursed to the members of 158 village groups, five village committees, and one floodplain resource management committee. More than 80% of the groups formed under the haor and floodplain resource management project have used their fund to generate employment, thereby increasing their income. In most cases, women used such funds to rear ducks, poultry, and cattle while men invested in agricultural activities to generate profits. Increasing women's incomes, according to the women's groups, has supplemented families' income. This has enabled higher daily food intake and access to education, as well as obtaining medical treatment and reducing the amount borrowed from private money lenders at exorbitantly high interest rates. Alternative income generation also has enhanced people's capacity to cope with natural disasters or local crises.

Conclusion

The CBHFRM project has been implemented in the field for wetland conservation by, for, and with the local communities. The objectives were to improve the livelihood and security of local people, empower them, and enhance conservation efforts. Holistic interventions have been carried out to enhance people's livelihood assets, including physical, social, biological, financial, and human attainments. In general, natural resource conservation and increased forest cover have been perceived as successful measures for enhancing biodiversity. This, in

turn, enhances the livelihood of the local communities. Replication of this approach in other parts of the country through NGOs, civil society, or government agencies could play a significant role in reducing poverty.

Institutional Reform Linking Poverty and the Environment: Experience from Yunnan Province, People's Republic of China

Robert Spencer, Mark Watson, and Zhou Bo

Introduction

The PRC, the world's most populous and rapidly developing country, is experiencing the challenges of integrated, sustainable development more acutely than most. However, unlike many other developing countries, the Government of the PRC can marshal significant human and technical resources. Therefore, the opportunity to influence the outcome of significant and seemingly minor policy changes should be grasped at every opportunity, at least in the eyes of the major bilateral and multilateral development agencies.

YEDP, an integrated poverty reduction and environmental protection project funded by the United Kingdom's DFID, provides a timely and large-scale case study within a complex institutional and political context. YEDP has tried to address only a fraction of the poverty-environment issues the Government is facing, and only in one discrete area—the relatively remote and mountainous province of Yunnan in southwestern PRC. Nonetheless, valuable lessons can be drawn from YEDP's work, which could have a bearing on the development and implementation of poverty-environment policy in the province and perhaps at the national level of the PRC Government.

This case study also seeks to answer the wider question of whether development agencies have any impact on the development processes of a country, such as the PRC, with such a strong tradition of internal procedure, technical expertise, and bureaucratic complexity. Teasing out this issue might assist development agencies that seek to influence positive change in the PRC development process in the future.

Background to Yunnan and the policy context

YUNNAN PROVINCE: ECOSYSTEMS AND POVERTY

In the PRC, as in most developing countries, many of the poorest live in remote areas where environmental degradation is a primary issue affecting livelihood. A mountainous, agriculturally marginal region in south-western PRC, Yunnan has a unique and complex physical environment and, as with other areas of similar geophysical conditions, an ethnically diverse population. The PRC Government and the international community have focused on Yunnan in recent years due to the province's relative poverty, as well as its exciting natural environment and cultural diversity. Efforts to pioneer integrated development have been established on a foundation of tourism and "green" development.

Yunnan has experienced rapid economic growth and social development since the 1970s. Yet Yunnan remains one of the poorest provinces in the PRC, ranked 26th of 30 in the Human Development Index. Yunnan also accounts for 73 (12%) of the 592 counties designated as poor by the central government, i.e., having per capita incomes below the national poverty line of 825 yuan (CNY) (about \$99.64) per year (Yusong, this volume). Based on the official definition of rural poverty, more than 4 million people in Yunnan have an annual average income below CNY625 (\$75.48). An additional 6 million people do not have a steady supply of food and clothing, or shelter.

Yunnan's poverty and rapid economic development are closely linked to ecological damage and unsustainable exploitation of natural resources. The ecological function and quality of its forests have continued to decline; the quality of land has decreased; water shortages have worsened; and natural disasters such as droughts, floods, and landslides, have intensified.

The same forbidding terrain that has protected some ecosystems from overexploitation and slowed the processes of cultural assimilation has also served as a barrier to economic development. Southwest PRC's upland farmers live far from markets in areas that are ill-suited to high-input intensive agriculture. As such, they were left behind during the surge in the PRC's rural economy during the 1980s (Yusong, this volume). Indeed, Yunnan's 10 million poor, who include various ethnic minorities, dwell primarily in the mountainous areas. Meanwhile, environmentally linked poverty has become the most prevalent type of poverty in the province, despite the Government's

efforts to address environmental issues and the completion of some poverty reduction initiatives. The Yunnan Provincial Government (YPG) aims to reduce the number of people living in absolute poverty by 75% and to rehabilitate 70% of degraded land by 2015.

INSTITUTIONAL CONTEXT OF YUNNAN

Since 2000, YPG has been quick to take advantage of the opportunities presented by the PRC's Western Development Campaign, which calls for the large-scale development of the country's poorer western regions, including Yunnan. This is a response to the lagging performance of these areas relative to the affluent east coast regions. YPG has prepared a development strategy for the province, which emphasizes the need for "a strong green economy." Other key policies—the *10th Five-Year Plan for Ecological Construction and Environmental Protection in Yunnan* and the *Ten-Year Program for Rural Poverty Alleviation in Yunnan 2001–2010*—have been formulated and published. In the case of the former, YPG is revising this policy to take into account recent initiatives, such as PRC's Agenda 21. Nonetheless, the economic activities that have occurred traditionally in Yunnan often have included the unsustainable exploitation of mineral or forest resources. This has taken a serious toll on complex and fragile upland environments, while bringing limited benefits to local communities.

Although strong environment–poverty links in Yunnan are recognized within YPG poverty reduction initiatives, the relationship is still viewed as a simple causality: that the poor cause environmental degradation, which in turn worsens their poverty. Government agencies have formulated supply-led poverty reduction projects based on this downward-spiral concept. Moreover, technical approaches to environmental management have had a strong influence on most YPG initiatives that link environmental protection with poverty reduction, a reflection of the strong environmental determinism that prevails in Beijing.

TRADITIONAL POLICY PRINCIPLES

The above aspirations need to be set within the context of the PRC's traditional policy priorities for the rural and disadvantaged areas. Indeed, this juxtaposition has led DFID and other international development agencies to offer assistance in tackling the stubborn areas of poverty, and reconciling this goal with the need to sustain natural resources and their function in terms of ecological services. As observed

by Pieke (2004), the PRC's agricultural and development policies traditionally have hinged on a few key principles. Until recently, changes in rural and developmental policies could be explained largely by the relative weight given to these principles. More recently, however, several of these principles have been relaxed, or even abandoned, leading to a different mix of objectives and policy options.

National food self-sufficiency. National food sufficiency (chiefly grain) has long been the key concern of the Government. A few years after liberation in 1949, the Government adopted the so-called unified purchasing and marketing system in rural areas. The system of unified state purchases at set prices survives to this day, now as an income guarantee and subsidy for rural households that have few other options but to grow grain for a living.

Land-use rights as the basic welfare right of the rural population. Whereas the urban population has the right to employment or, increasingly, welfare payments, the rural population's stake in the PRC's socialist society continues to be access to land (Pieke, 2004). Before 1984, members of the rural collectives were essentially involuntary shareholders who had the right and the duty to work on the land owned by their collective. With decollectivization, collective ownership of rural land was retained, but individual households were given the exclusive use right over plots of land contracted out to them. Subsequently, the term of these contracts was increased steadily, and currently stands at 30 years. As in the past, however, this is a double-edged sword: cultivating the land assigned to the household is a right as well as an obligation. Until recently, the grain quota system was used to enforce this policy device by guaranteeing agricultural land-use rights and mandatory grain procurement. Since 1998, quotas have been replaced by rural land-use planning, which requires local governments and individual farming households to keep designated agricultural land cultivated even when this no longer makes economic sense.

Separation of rural and urban PRC. Despite the rural roots of the communist revolution, modernization of the country always has focused on the cities. At the same time, the rural areas have had to pay for this urban modernization. The backwardness and overpopulation of rural PRC is perceived as an insoluble problem that stands in the way of the national goal of achieving modernity and socialism. Therefore, the cities were insulated from the perceived negative influence of rural PRC, while a stable supply of arti-

ficially cheap resources drawn from the countryside was ensured. A corollary to the separation of cities and countryside has been the strong resistance to implementing differential rural development policies in different parts of the PRC. The household registration system upholds the separation between the cities and the countryside most visibly. However, it also informs (or used to inform) a broad range of policy instruments, including the taxation system, economic planning system, grain procurement system, land planning, and so forth.

These three fundamental policy choices underlying PRC's rural development policy (Pieke, 2004) have had two specific consequences directly relevant to the work of YEDP.

Poverty reduction. Until recently, acute famine and disaster, or chronic poverty directly threatening people's lives, was addressed principally by waiving the grain procurement quota or by selling state grain back to the affected area. More structural development projects were undertaken as part of the state development plan, though they had to be substantially funded (or co-funded) from local resources (local government revenue, *corvée* labor), and more recently foreign funding agencies. The projects targeted at poverty reduction aimed to make poor rural areas self-sufficient in providing the basic needs of the population. Fundamentally, poverty reduction is predicated on the belief that the problem of poverty should be solved in the areas where poverty occurs, without being a drain on the central budget. Lastly, poverty is still perceived to be a rural problem that ultimately can be solved only by the gradual modernization of PRC society.

Neglect of the environment. The current environmental crisis in the PRC can be broken down into two fundamental components. The first is deforestation and associated nonreversible land erosion caused by the large-scale opening up of marginal lands. The second component is more recent and directly associated with rapid industrialization and rising living standards since 1949 and especially 1978, particularly in the coastal areas. Until recently, the Government has allowed both components of the environmental crisis to accelerate, viewing them as the price that had to be paid for economic growth and the involution of the rural economy, despite a long-standing policy of reforestation. The disastrous floods of the mid-1990s (especially in 1998) and the dust storms in Beijing have prompted the Government to take large-scale environmental degradation seriously.

Characteristically, the consequences of such erosion for the developed (mainly urban) areas triggered this reaction, rather than a concern with the long-standing poverty observed in remote and marginal areas.

CURRENT POLICY

The PRC's national policies for rural areas have changed considerably over the past 15 years, particularly since the 16th Party Congress in 2002. Provincial and other lower-level governments are expected to negotiate and carry out a set of policy objectives that are, in many respects, quite different from in the past. Pieke (2004) concludes that the PRC Government only recently accepted that it must apply a more holistic approach to the associated poverty and environmental degradation in some key areas of the country. However, many poverty policy documents produced by provincial governments still have not recognized or considered sufficiently environmental issues in economic and poverty reduction policy, or identified the role of poverty reduction within environmental policy.

At the same time, centralized policy making has not enabled local stakeholders to participate in making decisions on the management of natural resources, or to have a say in the direction of state-led research. This has led to policies that do not reflect adequately the needs and requirements of the poor, and an absence of locally specific solutions to environment–poverty challenges. Under existing institutional arrangements, YPG departments tend to have stronger vertical links with their own departmental counterparts at higher levels than with other departments at the same level. This has made the development of policies and programs that integrate environmental concerns into other areas of government more difficult.

A new pattern is emerging, however. The provincial governments are being given more latitude in their interpretation and implementation of national policies. Initiatives are also being rolled out from the central level to strengthen the nascent democratic institutions emerging under careful control at the village level. These include greater flexibility in the preparation of village development programs, and the encouragement of community organizations and local responsibility for village-level infrastructure and agricultural resources. These PRC-led initiatives have opened spaces for programs funded by aid agencies, such as YEDP, to enter the development field and seek to influence current and future practice.

Yunnan environment development program

The primary objective of YEDP has been to develop YPG's capacity to design and implement environmentally sustainable, pro-poor development programs. YEDP has attempted to achieve this through continuing policy dialogue and development at the strategic level, coupled with training initiatives and demonstration projects at the field level. This two-pronged approach marks an effort to influence the design and implementation of future policies and programs on environmental protection and poverty reduction. YEDP was designed based on a series of key principles or themes, including participation, integrated working, gender and ethnicity mainstreaming, targeting of resources (to those most in need), equity and efficiency, and sustainable livelihood.

YEDP has focused primarily on assisting three provincial government institutions: Yunnan Environmental Protection Bureau (YEPB), Yunnan Poverty Alleviation Office, and Yunnan Development and Reform Commission. However, given the complex institutional framework for environment–poverty issues in Yunnan and the influence wielded by other YPG stakeholder departments, YEDP inevitably has worked alongside line agencies such as the Agriculture, Forestry, and Water bureaus, during the program.

In addition, YEDP has sought to improve YPG's approach to environmental protection and poverty reduction through two major thrusts of technical support that were set out in the original program design documents: the Yunnan Sustainable Development Action Plan and a series of demonstration or pilot projects.

To set the stage for project interventions, YEDP undertook two major research exercises in 2001–2002 before working on the pilot projects. These studies were largely internal; indeed, the results of this work have not been made widely available until now. The first task was to identify the key policies and institutions that YEDP needed to work with or influence if it was to have any impact on YPG's approach to environmentally linked poverty among Yunnan's poorest. The second study was the typology study, a large-scale field study designed to document (i) the types of environmentally linked poverty in Yunnan Province, (ii) why they exist, and (iii) how policy makers and practitioners might approach them (YEDP, 2001a). The key findings from the typology study are in the next section.

Poverty–environment links in Yunnan

The study undertaken by YEDP identified the following poverty–environment issues:

- **Villagers have a holistic and dynamic conception of well-being and vulnerability in their own communities, which included natural resource issues.** Critical factors defining poverty, as perceived by villagers, included the level of household labor available; the ability of the household to access regular forms of income or employment outside the community; the level of health; poor water quality (as a cause of bad health); the importance of education as a household strategy for broadening livelihood opportunities; the increased burden of work, particularly for women, resulting from resource degradation; and the importance of livestock as a safeguard against crop failure and other shocks (such as natural disasters) that might increase vulnerability.
- **Poverty in Yunnan has a strong gender dimension, with women subject to a disproportionately heavier work burden, partly due to natural resource factors.** Problems were found to be particularly severe for households headed by single females, and households where the labor dependency ratio was high. Women were also more likely to be excluded from agricultural extension services that used a formal medium for knowledge transmission because they received less years of education than men. As the environment degraded, women's work burden often increased as they spent more time on routine and production tasks. Their health could suffer, meaning they lost productive time through sickness. Thus, they became locked in a cycle of impoverishment from which it was increasingly difficult to escape.
- **The state of the natural resource base and the topographical and climatic conditions were key factors in determining vulnerability.** The degree to which land is steeply sloping determined vulnerability to erosion problems, and karst topography meant soil quality is often poor. Lack of forest cover and forestry resources, as well as a lack of water resources, also proved critical.
- **Most village studies described the increase in population pressure as a key factor conditioning poverty.** Increased population reduces per capita landholding and increases the pressure on natural resources, particularly fuelwood, animal fodder, and NTFPs. The juxtaposition of increased population with policy impacts (e.g., the Upland Conversion Policy) that restricted the land available for farming and grazing was a particularly severe pressure compounding environmental degradation and poverty.
- **The implementation of environmental protection measures could increase poverty.** In the context of a poor and degraded natural resource base and an economic situation lacking livelihood development alternatives, the study found that policies were seldom inappropriate for the sectoral problems they sought to address. However, secondary, unforeseen impacts had repercussions across many inter-linked livelihood dimensions. For example, the closure of wastelands for forestry regeneration could impede opportunities for goat and livestock grazing for villagers; frequent shifts in policy could cause and exacerbate poverty; villagers had no opportunity to adopt a long-term strategy for resource management; and policy often shifted between poverty reduction and environmental protection, without developing integrated solutions to facilitate both.
- **Indigenous knowledge conflicts with rural extension policies.** In study areas where minority populations had practiced traditional forms of shifting cultivation, government extension services and policies promoted more modern approaches to farming and land management. However, the introduction of policy instruments to encourage settlement and environmental protection, while traditional forms of cultivation continued, exacerbated and intensified poverty-related problems.
- **Access to land, forestry, and water was often unequal between households.** The introduction of the household responsibility system in agriculture in the early 1980s provided an important spur to agricultural production. While increasing food security, the system also further opened land for cultivation and, consequently, environmental degradation. The initial allocation of land to households was on a 15-year usufruct rights basis, with a 30-year allocation planned subsequently (providing households with a longer time frame more conducive to investment in agriculture). The village studies showed that access to resources was often unequal due to

social and community dynamics; increases in household size, which were not compensated; and marrying-in of females, who then were not entitled to a redistribution of land.

- **Animal husbandry is an important social safety net against food insecurity and unstable market prices for crops.** Animal husbandry plays an important income, subsistence, and social role in rural Yunnan. The closure of forestlands and wastelands to grazing has sharply reduced livestock holdings, consequently increasing vulnerability to poverty. This has also diminished social capital in cultures where livestock is an important indicator of wealth and status. At the same time, the overgrazing of wastelands, and particularly of common lands, was identified as a key driver of environmental degradation, especially in upland areas where the recovery from overgrazing was slow.
- **Market access determined the ability to safeguard against poverty and the rate of exploitation of natural resources.** Proximity to marketing centers was found to give rural farmers an outlet for the sale of surplus produce. However, they were often ill-equipped to access marketing opportunities due to their lack of experience, training, and/or access to the networks in commercial centers that enable exploitation of opportunities. On the other hand, proximity to markets and good market access also could hasten environmental degradation through the commercial overexploitation of resources, such as mushrooms, firewood, and medicinal plants.
- **The ability to access employment and income opportunities outside the rural community was a critical wealth and security indicator.** Although Yunnan is overwhelmingly agricultural, rural livelihood was not identified exclusively as agricultural. Migration, an important coping strategy against poverty, might be temporary, seasonal, or require one member of the household to work permanently in an outside area, sending back remittances.
- **Government-sponsored poverty reduction schemes have been largely unsuccessful, and might not have targeted those most in need.** Data showed that most of the 12 villages surveyed had been the target of significant poverty reduction interventions by the Government. Despite such interventions, these villages remained impoverished.

- **Agro-industrialization and peri-urbanization undermine traditional livelihoods.** Linked to the resettlement schemes in Jiangcheng County in the southwest valley region, significant agro-industrialization and peri-urbanization was taking place. Plans for urbanization through closure of lands appeared to restrict traditional livelihood options (cattle grazing, in particular) in minority communities where livestock husbandry is the major source of income. The development of other types of crop plantations meant that villagers were susceptible to new kinds of commercial pressures over which they had no control, and which they were ill-equipped to influence.

CAUSES OF ENVIRONMENTALLY LINKED POVERTY

Based on the findings of YEDP's study, six key causes, or triggers, of environment–poverty situations emerge:

- limited resource base (quantity of natural resources available),
- access to resources (which groups and who within those groups have access),
- resource degradation and depletion (policies and practices causing environmental loss),
- quality of resources available (e.g., poor soil on karst),
- resource policies (some sector policies exacerbate poverty), and
- resource technologies (such as extension services).

While these triggers might be present to a greater or lesser degree in different locations, some or all were found throughout the areas studied in Yunnan. An environmentally linked poverty situation is never caused by one trigger; the dynamic and changing inter-relationship of triggers locks Yunnan's rural poor into mutually reinforcing cycles of environmental degradation and poverty. Key examples of dynamic downward poverty cycles include

- those driven by the Government's policy shifts and contradictions,
- the juxtaposition of state and traditional agricultural and land management practices,
- the role of women in subsistence household production, and
- the demands of crop promotion and occurrence of natural disasters.

The following section highlights government policies that were identified as having a significant role in exacerbating environmental degradation.

STATE POLICIES THAT WORSEN POVERTY—ENVIRONMENT ISSUES

The results of the fieldwork provided many examples of policy conflicts and indicated the complexity of the policy environment. For example, frequent shifts in policy can cause and exacerbate poverty. Because villagers know that policies frequently change, they are unlikely to take a long-term view of resource management. They simply extract what they can before the next policy shift, which accelerates the likelihood of this shift occurring. Policy planning along sectoral lines appears to favor income creation (tobacco planting, for example) or environmental protection (the subsequent ban on tobacco planting for forestry protection). Seldom are integrated policies introduced to achieve the twin objectives of income enhancement and environmental protection over the long term. In most villages studied, the Government has introduced significant poverty reduction interventions. Yet these villages have remained impoverished.

The links between specific types of environment–poverty situations (i.e., triggers), as identified in the typology study, are not always clear and direct. However, evidence of these links abounds, as the following examples demonstrate:

- Where poverty is linked to the environment via a community's access to resources: this kind of situation has been affected by a lack of local flexibility in implementation, as well as a lack of participation in the design of policies. For example, the closure of grasslands to local communities or a ban on hunting by villagers deprives them of their previous livelihood. This also can apply to the establishment of nature reserves and/or tourist facilities, though usually to a lesser extent.
- Where poverty is linked to the environment via resource degradation or depletion: this kind of situation often has been affected by the imposition of historic state policies (e.g., industrialization), which have resulted in overexploitation of forests and, particularly, water resources.
- Where poverty is linked to the environment via inappropriateness of particular resource technologies: this kind of situation has been affected by the absence of technologies (e.g., in agriculture) designed for, and targeted at, the poorest or particular ethnic communities, localities, etc. It also can occur where inter-agency coordination might have provided some technical input (e.g., irrigation, water), but not

a necessary complement (e.g., crop storage and marketing support).

- Where poverty is linked to the environment via the design and implementation of particular resource policies: this kind of situation has been created directly (if usually unintentionally) through the imposition of a particular policy with no public participation. One example was the 1998 logging ban. It can also occur in resettlement schemes if insufficient support is provided in the resettled areas, or if linked agro-industrial opportunities disappear (e.g., in the case of tobacco and cassava and/or alcohol production).

These examples show that, although state and YPG policies undoubtedly have been very successful in reducing poverty generally in Yunnan Province, public policy might fail to deal with certain types of poverty. In fact, policies can compound the problems for certain groups. This conclusion confirms the design base upon which YEDP was prepared.

YUNNAN SUSTAINABLE DEVELOPMENT ACTION PLAN

Since its inception, YEDP has offered technical advice, training, and capacity support for the preparation of Yunnan's Sustainable Development Action Plan (YSDAP)—a provincial interpretation of the PRC's National Agenda 21 process. Given its policy coordination role, the Yunnan Development and Reform Commission is responsible for preparing this document. However, the components of such a large-scale plan have involved research and documentation by several other major agencies whose work relates to the sustainable development of the province. Thus, YEDP has benefited from supporting and advising a process that is not only required by the Government, but also necessitates a cross-cutting approach and close cooperation between provincial government departments in preparing the document. This natural concurrence of requirements has helped achieve one of YEDP's primary goals in the delivery of this output: strengthened integrated work between government departments in the fields of environmental protection and poverty reduction.

DEMONSTRATIONS: THREE PILOT PROJECTS

The second strand of YEDP's approach embodied in the project documents was to use field demonstrations to influence YPG's approach to finding ways of reducing environmentally linked poverty in rural

areas. As with many development programs that seek to introduce new approaches to government bureaucracies, YEDP aimed to enlighten YPG by designing and implementing pilot projects—practical demonstrations of what a model approach to reducing environmentally linked poverty might be, using officially designated poor villages as case studies.

Thus, YEDP's goal in delivering this second strand of the program was to introduce to YPG institutions novel ways of interacting with their target communities that would enhance two-way involvement in the rural development process. At the same time, YEDP aimed to encourage greater horizontal integration between government bureaus with diverse, but linked, responsibilities. Several dominant themes characterize the YEDP approaches, which will be familiar to those with an understanding and knowledge of current development practices. They are focused around participatory, community-led, pro-poor approaches. Meanwhile, they aim to mainstream concepts such as gender sensitivity and ethnicity awareness, and how these considerations can influence the optimum development solution in a community or household. The three YEDP pilot demonstration projects are in Changning, Nanhua, and Ninglang counties.

PRELIMINARY FINDINGS FROM THE YEDP PILOT PROJECTS

Participatory reviews characterized the monitoring approach to the YEDP's pilot projects. These allowed project staff and clients (stakeholders) to review the pilot project critically, something quite new in this part of the PRC. As one Lugu Lake woman put it: "We have never been comfortable to tell people who give us things that are not working. On this project, we are able to tell you when it works, and when it does not."

After the initial focus on YEDP approaches during design and feasibility, however, some aspects of implementation can revert to business as usual in activity delivery. This was partly because implementation was hurried due to a delay in project commencement. It also reflected a desire to utilize funds efficiently and to meet local targets (i.e., internal PRC targets) that might diverge from the YEDP process-based targets that preoccupy the funding agencies, international technicians, and some higher-level provincial agency staff.

Changing the development delivery approach is extremely difficult. YEDP not only had to change YPG's approach (from top-down to bottom-up), but

also deal with a variety of different partners. In other words, YEDP had to attempt to introduce changed approaches to the whole gamut of partners broadly involved in poverty–environment issues—from veterinary workers to water supply engineers. Integrated work is difficult because (i) each agency has its own discrete mandates, (ii) agencies often compete for financial resources, and (iii) the chain of command and reward systems are associated with the agency rather than with YEDP.

During implementation, it helps to have a key actor who is not tied to a given agency in terms of budgeting and reporting lines. At Changning, for example, the active involvement of the township vice-mayor assisted implementation because he was not tied to an agency with a specific mandate (and associated budgetary constraints or concerns). Choosing a key technical partner agency, especially to lead a pilot demonstration, has been a critical determinant of performance.

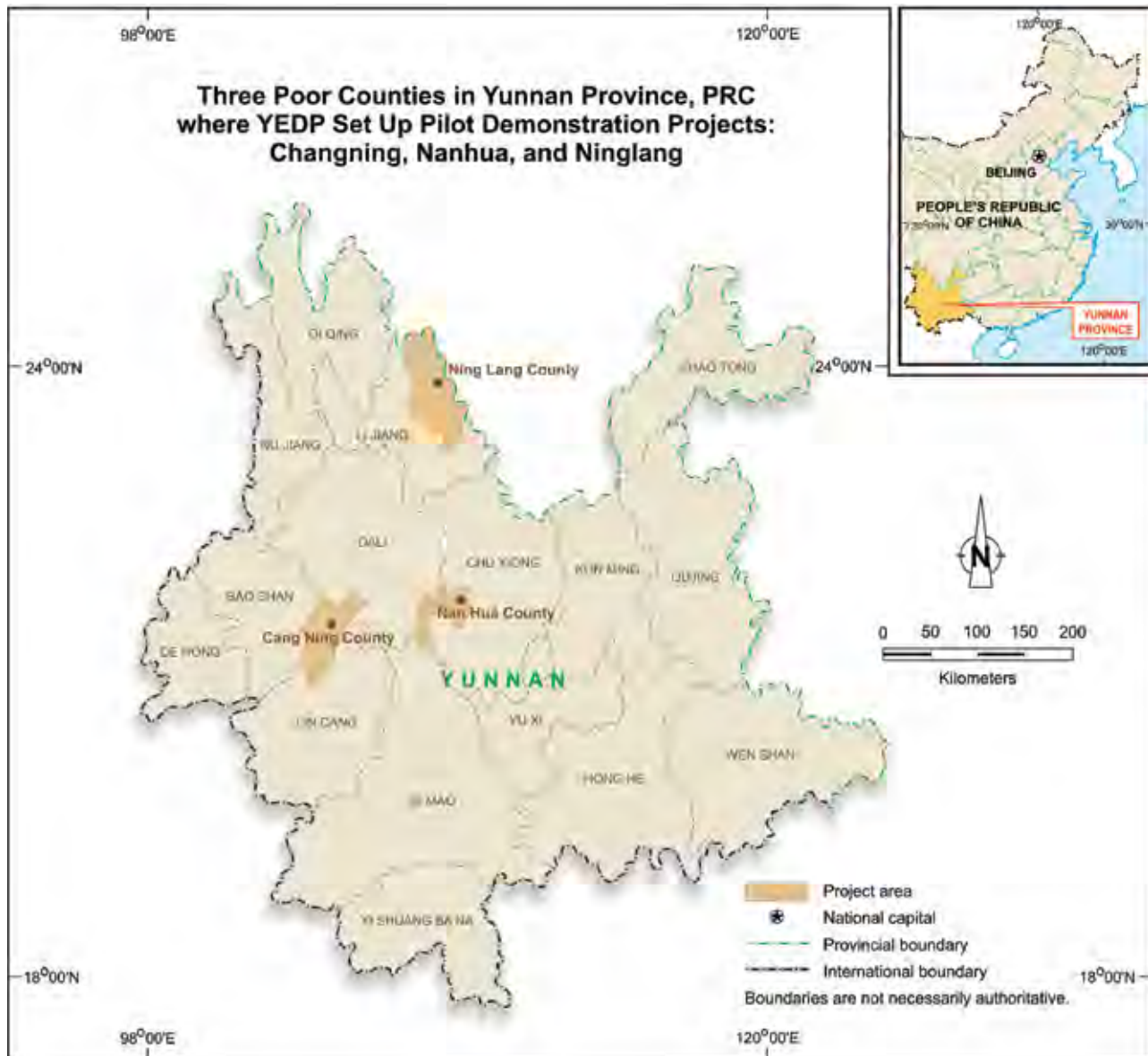
Conclusion and policy recommendations

The final section of this case study summarizes the key lessons learned from the YEDP experience for governments and funding agencies. It also makes recommendations for future policy on environmental protection and poverty reduction, including institutional requirements.

YEDP has influenced the outcomes of the YSDAP process with relative ease, given the central Government's demand for such a strategy. However, its ability to influence and contribute to genuine change in other policy areas has been less significant than envisaged in the YEDP's design. In particular, concepts such as participation, integrated working, and gender mainstreaming are relatively new in Yunnan. As such, their effective institutionalization requires significant effort, adoption of international best practice, and capacity building.

In addition, the notion that YEDP could act as a vehicle for change in YPG was based on a belief that Yunnan had sufficient political will and openness to embrace such change. Despite its ambitious design, YEDP was hampered at the strategic level by (i) overly complex institutional arrangements; (ii) gaps and duplication in responsibility for environment–poverty policy; and (iii) limited understanding and experience of the practical application of sustainable development approaches, participatory methodologies, and community involvement

Map 13



PRC = People's Republic of China, YEDP = Yunnan Environment Development Program.

techniques among officials. This was compounded by a tendency toward silo working (not considering matters beyond their particular remit), and internal competition for program resources between partner agencies, resulting in a lack of coordination. A general reluctance to change within the Government, combined with a misunderstanding of the value YEDP could bring to Yunnan Province, did not help this situation.

In retrospect, the decision to locate YEDP within the Yunnan Environmental Provincial Bureau might appear to have been sound during program design. However, given the importance of addressing environmentally linked poverty and the need to work at stra-

tegic and pilot village levels, an equally strong case could have been made to house YEDP in the Poverty Alleviation Office, in the light of its extensive outreach and supposed coordinating role, or even within the Development and Reform Commission, given its strategic policy coordination role.

Below the provincial level, YEDP exerted a far more tangible and, arguably, more sustainable influence on county and township government institutions. The pilot projects (i) demonstrated the value and use of participatory approaches; (ii) encouraged joint initiatives between government agencies; and (iii) established the practice of targeting resources to those most in need to ensure more efficient program design

and implementation, and more equitable distribution of resources. Perhaps this is a consequence of the less complex local level institutional arrangements, and the pragmatic approach to project implementation adopted by local officials with scarce resources. In this sense, the pilot projects were effective, and affirmed the demonstration concept set down in the DFID project design.

YEDP might be too ambitious in introducing new pro-poor approaches and expecting multiple agencies (that are frequently unfamiliar with the work) to adopt and execute them with other agencies. Clearly, the more complex and remote the institutional relationships, the less likely that the new approaches espoused by YEDP will work.

Lessons learned for development agencies

From the perspective of future program design, development agencies need to recognize the importance of ensuring overall program feasibility right from the start. If YEDP were to be redesigned, a strong case

could be made for a program with a shorter time horizon, more realistic ambitions, greater focus, narrower objectives, and specific targets and goals—all of which should be achievable in the time and budget allowed. Focusing only on the time-sensitive, government-endorsed planning process, such as YSDAP, would have been one such approach.

Alternatively, given the protracted nature of ensuring institutional and policy change in Yunnan Province, a program could be designed over a longer time frame (e.g., 6–8 years) with continuing technical support and a process of stepped change. International expertise could be used in the first 3–4 years to develop local capacity, with local staff and experts gradually enabled to assume full control in the latter stages of project delivery.

Whatever option is selected for future program design, the key point is that such initiatives require fundamental support, as well as a willingness and ability to embrace change from the center to drive the program, given the command-based nature of the PRC Government.

POVERTY, HEALTH, GOVERNANCE, AND ECOSYSTEMS: A SYNTHESIS OF CASE STUDY FINDINGS

Paul Steele, Gonzalo Oviedo, and David McCauley

The case studies reviewed in this report were chosen to shed light on remaining gaps in our knowledge of poverty–health–environment linkages in rural Asia. This final chapter attempts to present a comparative analysis to test, expand, and improve a general framework for understanding how ecosystems and poor people interact as mediated through institutions, which are influenced by processes often characterized by an unequal distribution of political influence. The overarching question examined is: Can poverty be reduced and health outcomes improved by reversing the loss of ecosystems and environmental resources?

As noted in Chapter 1, a series of 22 key questions were posed to the case study authors. The case studies have been presented according to four groupings relating to: (i) poverty, livelihoods, and ecosystems; (ii) poverty, human health, and ecosystems; (iii) pro-poor biodiversity conservation and sustainable use; and (iv) response strategies. This chapter uses these questions and the four categories of case studies as an approach for organizing lessons that may be drawn from a comparative analysis of the case studies.

Poverty, Livelihoods, and Ecosystems

Which poor people depend on ecosystems for their livelihoods?

POOREST HOUSEHOLDS MOST DEPENDENT IN RELATIVE TERMS

The poorest rural households typically depend most on ecosystems as a direct source of subsistence and as a share of their income. The case studies demon-

strate how natural resources are especially important to these households:

- In the Indian state of Tamil Nadu, 90% of poor households were found to depend solely on customary property reservoirs or water tanks for irrigation, while only 66% of nonpoor households depended solely on tank water, with private wells also providing water supply.
- In the Attapeu Province of the Lao PDR, the three sample villages surveyed showed that poorer households depend on collecting aquatic animals, while better-off households do not. These aquatic resources include fish, eels, frogs, crabs, freshwater shrimps, snakes, snails, and turtles.

HIGH RESOURCE DEPENDENCE OF LESS-POOR HOUSEHOLDS IN ABSOLUTE TERMS

In many cases, better-off households consume a larger share of ecosystem resources than the poorest. Despite the high importance of natural resources to the poorest, less poor households often draw disproportionately more benefits from natural resources. Natural resources are more important for the total incomes of the poor but, in many cases, the nonpoor seem to consume a larger share of the resources.

- In South India, the rich dig more wells than the poor to tap groundwater, so they use up a larger share of the groundwater resource.
- In Nepal, richer households benefit more from community forests. They also have more assets, livestock, bigger houses, larger farms, and use more water for irrigation and more leaf litter for fertilizing their fields.

DEPENDENCE OF WOMEN

In poor households, natural resources are especially important for women, and yet women often have

the least access to these resources. In this context, improvements in ecosystem management can be particularly beneficial for women. In the Nepal interventions providing greater access to community forests, the time needed by women to collect fodder leaves was demonstrated to have been reduced to 2.5 hours per day, and the income disparity between male- and female-headed households was reduced. Lease certificates provided to women by community forestry committees contributed to their empowerment.

DEPENDENCE OF MINORITY GROUPS

Natural resources also can be particularly important to marginalized ethnic minorities and other groups. For example, the Sanjiang Plain in Heilongjiang Province, PRC is home to several minorities. Among them, the Hezhe are the smallest minority group in the PRC, with only 4,000–5,000 members. The case study has documented how the Hezhe people are struggling to maintain their own language, culture, and lifestyle based primarily on fishing in the face of changing land-use patterns and other outside influences. The Indian agro-biodiversity case study has shown that, according to the most recent census, Orissa had a population of just over 30 million, of which over 22% are tribal peoples (i.e., disproportionately higher than the India-wide 8% figure). Case studies from Southeast Asia—Attapeu Province in the Lao PDR and the forested regions of Viet Nam—also demonstrate a particularly high dependence of ethnic minorities on the natural resource base. The same factors, which have kept remote ecosystems relatively protected and have contributed to economic marginalization, have sometimes allowed ethnic peoples to preserve their cultures and traditional human–ecosystem interactions.

What dimensions of poverty are most positively affected by ecosystem changes?

Ecosystem changes can affect incomes, but they also can strongly influence non-income dimensions of poverty, which include: (i) lack of capacity through low-health and education status; (ii) lack of opportunity and access to resources and services; (iii) insecurity and vulnerability; and (iv) powerlessness.

This section particularly focuses on the positive ways that changes in ecosystems and resource rights can contribute to poverty reduction. The case studies reviewed also offer examples of how inappropriately

designed or implemented environmental interventions can negatively impact the poor, though these are primarily covered in later sections.

IMPROVING THE CAPACITY OF THE POOR

The case studies include several examples of relationships between the health of poor people and natural resources, particularly the importance of resources for diet and food security. There are also more complex linkages demonstrated between resource-use patterns and health and education, as exemplified by the case study of Deqin County, PRC, where increased access to natural resources reduced the student dropout rate, and increased incomes for women from medicinal plant collection-generated funds used for children's education, health care, and ritual activities.

EXPANDING OPPORTUNITIES AND INCREASING INCOMES

In many of the cases, ecosystem improvements are shown to increase the incomes of the poor. Several case studies document how this was achieved by improving the quality and productivity of the natural resource base, as well as improving access to ecosystems for the sustainable harvest of products. In the case of agro-biodiversity, this also can be achieved through increasing yields. For example in Thalli, near Bangalore, Indian farmers and the markets they serve value a number of traditional cultivars including finger millet. However, grains grown from existing seeds were poor and unstable. The MS Swaminathan Research Foundation helped farmers sort and purify the seeds and improve their planting techniques, and farmers observed a doubling of yields.

The case study from Bangladesh documents how environmental interventions sought to increase incomes as well as funds for collective investment. Under this scheme, 60% of the income from the sale of pollarded branches was equally distributed among all households of the village, with 25% saved for generating a reserve fund for the village committee. The resulting fund was designated for social or pro-poor development purposes.

Several environmental interventions documented in the cases placed a special emphasis on improving women's incomes by creating new livelihood options and strengthening their user rights to natural resources. The Pred Nai community project in Thailand created new income-generating opportunities for women through the processing of crackers from mangroves and the sale of wine. The

Community-based Haor and Floodplain Management Project in Bangladesh created employment for women in agricultural projects.

Ecosystem improvements not only can enhance incomes but they can also save time, which is very valuable to the poor who must provide most of their own services. In Pred Nai, the introduction of management strategies for mangroves led to an increase in the average daily harvest of the grassoid crab from 8–16 kg per collector per day. This is despite an increase in the number of collector households from 6 in 1998 to 30 in 2003. The time taken to collect crabs also decreased, providing even more time for other income-generating activities.

REDUCING INSECURITY AND VULNERABILITY

Several case studies explore the importance of ecosystems to livelihood and dietary security. In Pakistan, changes in ecosystems and climate have significantly affected the poor through both growing cyclical and long-term vulnerability. Poor Punjabi households face two seasonal periods of stress—i.e., during winter, when livestock deaths are more common, as exacerbated by shortages of fodder; and during summer, when human illness is worsened by water and food shortages. Over the long term, the declining availability of water, linked to an increased frequency of droughts, is making poor people even more vulnerable.

Another aspect of vulnerability highlighted by the case studies is the relationship between ecosystem change and increased exposure to natural shocks. This is of increasing significance as climate change adaptation needs become more apparent. For example, in Bangladesh, the deterioration of the Haor swamp forests that previously served as a natural barrier against monsoon floods and typhoon waves, has led to increased vulnerability of the poor and more severe erosion. Poor households have been compelled to increase spending on dikes and other measures to protect their tiny homesteads yearly.

Finally, security can also refer to safety from physical conflicts and violence. Conflicts over natural resources arise when too many people chase a finite amount of resources, which may be exacerbated when one group seeks to take a larger share. This conflict can arise both in situations of resource scarcity and secondly where, despite absolute resource abundance, excess demand leads to overexploitation (e.g., through open access). The Sri Lanka case study of Puttalam Lagoon illustrates these complex relationships. During high tide, a

large number of fishers from all parts of Puttalam come to fish. According to the police, conflicts can be so intense—in the absence of an agreed set of resource rights—that there have been instances of killings over control of fishing territories. This situation is particularly tense during peak seasons for the highly valued prawn harvest.

The civil conflict in Nepal illustrates how competition over natural resources can play a role in exacerbating and financing conflict. Yarsa gumba (*Cordyceps sinensis*) is a valuable medicinal herb with purported aphrodisiac properties that grows wild in the western highlands. It is highly sought in the international market and can be sold for as much as \$2,500/kg. The herb is being smuggled out of Nepal to India and the PRC in large quantities, and the Maoists rebels are reportedly benefiting from this trade. In addition, merchants who transport the herb pay tax to whomever is the controlling force in a particular region, be they Maoist or the Government.

OVERCOMING POWERLESSNESS

These relationships also carry lessons for the design of interventions. When a poor group or set of individuals targeted for assistance lacks any ability to make or influence resource management decisions that directly affect their lives, severe constraints are obviously placed on development and poverty alleviation efforts. In several parts of Pakistan, declining access to natural resources contributes to a growing powerlessness of the poor. For example, in the province of Sindh, landlords can exert a very high degree of control over poorer farmers by their control and unequal distribution of irrigation and drinking water.

Many environmental interventions reported in the case studies illustrate approaches to addressing gender-based power disparities. Several documented environmental projects have attempted to build women's leadership, negotiation, and entrepreneurial skills within mixed groups and for a variety of activities. Participatory plant breeding in India enlisted the participation of women alongside men, focusing on their traditional roles in agriculture (transplanting, weeding, and seed selection). The project highlights the importance of women's contributions, efforts to make work less hazardous to their health, and the encouragement of women as entrepreneurs. The Indian case shows how women were enabled to make more decisions related to their traditional areas of expertise and to interact more with outside markets in the sale of their products.

What types of ecosystems and ecosystem services can contribute to poverty reduction?

TYPES OF ECOSYSTEMS THAT MATTER TO POOR PEOPLE

A significant portion of the research on links between poverty and natural resource systems has focused on forests. In this publication, relationships between forest management and poverty is reviewed in Nepal, Yunnan Province of the PRC, and Viet Nam. An attempt has been made to look more broadly at a fuller range of natural and agricultural ecosystems that matter to the poor, including marine, coastal and inland water ecosystems, deserts, and cultivation systems. Special emphasis has been given to marine, coastal, and inland water ecosystems through the case studies from Sanjiang Plains, PRC; Bangladesh; tank systems in India; Lao PDR; and Puttalam Lagoon, Sri Lanka. This emphasis is for three reasons. Aquatic ecosystems are vital to poor people worldwide, particularly in Asia. Both the consumption and production of aquatic resources by Asia's poor is extremely important to their incomes and other sources of social and economic security—probably more significant in terms of the number of the poor affected than forest-based resources. Second, there is still a surprisingly limited literature on the relationships between aquatic resources management and poor people. Finally, aquatic ecosystems are among the most threatened globally, especially in densely populated Asia. Indeed, the UN Millennium Ecosystem Assessment identifies marine and freshwater ecosystems as those ecosystems have been most significantly altered by human activity—even more, for example, than tropical forests, which have been the subject of considerable research and public debate.

The links between coastal, marine, and inland water ecosystems are epitomized by the situation in Bangladesh, where three mighty rivers—Ganges (Padma), Meghna, and Brahmaputra—flow in volumes that are second only to that of the Amazon Basin. These rivers form wetland ecosystems, including mangrove forests, peat lands, haor, baor, beel, seasonally inundated floodplains, and estuaries. The wetlands support more than 100 million people, and many of its ecosystems are highly biodiverse, including the Sundarbans—the last remaining habitat of the Bengal tiger. Wetland and inland water ecosystems supporting the livelihoods of poor households in the PRC, Lao PDR, Sri Lanka, and Thailand also are covered by case studies in this report.

In terms of terrestrial ecosystems, this volume has given particular attention to agroecosystems, including pasturelands. As in the case of aquatic systems, the importance of livestock and fodder for poor people is under-researched. The case study that most highlights these relationships is from Mongolia, which contains the earth's largest remaining example of an essentially intact temperate grassland ecosystem. Mongolia's pastoralists remain directly dependent upon the fragile and degrading natural resource base. Only 1% of Mongolia's land is considered arable, while about 34% of Mongolia's people are directly dependent on livestock production (most as traditional nomadic pastoralists), with another 26% indirectly so. Forty percent of the 2.7 million citizens live at or below the poverty line.

ECOSYSTEM SERVICES THAT CONTRIBUTE TO POVERTY REDUCTION

The typology of the Millennium Ecosystem Assessment divides ecosystem services into those associated with provisioning, regulating, cultural, and supporting services; this categorization provides a useful perspective on the lessons that may be drawn from the case studies, as explained in Chapter 2:

Provisioning services. Many case studies document the products derived from ecosystems—such as food, fiber, fodder, fuel, and fresh water—by poor households. In Nepal, ecosystem services from fodder were shown to provide a major benefit to poor households when they increased their access to land and forests. As a result, 53% of the households in the case study were able to earn cash income from goats and 20% from buffalo. In older leasehold forestry groups, the earnings from goats increased to 88%, 41% from buffalo, and 16% from the sale of fodder from restored lands. This is an important finding consistent with other research, which shows that fodder is often one of the key services provided by ecosystems to poorer households, and yet it is often overlooked in economic decisions about the use of forests and other resources.

Regulating services. Several case studies, especially those relating to agriculture, show the regulating benefits ecosystems can play. The Tamil Nadu case study demonstrates the role of small-scale tanks and associated constructed wetlands can play in regulating water through aquifer recharge and how this is being undermined by social and environmental change. Several case studies highlight the role of ecosystems in disease regulation, and what

happens when these services are disrupted. For example, the Malaysia case shows how ecosystem changes in Indonesia were linked to the Nipah virus outbreak and subsequent collapse of pig production in Malaysia.

Cultural services. The Indian agro-biodiversity case study highlights how traditional crop varieties are sometimes preferred to higher-yielding varieties because of taste and quality (and thus market price) and how planting is timed to allow their harvesting for festivals and family rituals. The Bangladesh case documents how many people revere and cherish the wetlands, that shape, influence, and mold their existence and culture. Most of their social and recreational activities—such as boat races, swimming competitions, and monsoon folk culture norms—are centered on the wetlands. Likewise, in the Baimaxueshan Reserve of Yunnan Province, PRC, Tibetan Buddhist prayer rites are considered important to the process of improving local natural resource management practices.

Supporting services. Ecosystem services, such as soil formation and nutrient and water recycling, often have direct and long-term impacts on those dependent on natural resources for their livelihood. An example is provided by the case study documenting the high soil quality of the Sanjiang Plain. Mainly wet black clays comprise the only black-soil region in the PRC, characterized by high concentrations of organic matter and nutrients that lead to high ecological and agricultural productivity.

Can sustainable use of natural resources help poor people escape poverty, or does it cause them to remain at subsistence income levels?

ECONOMIC GAINS FROM NATURAL RESOURCE-BASED ACTIVITIES

Several case studies highlighted the potential for economic gain from improved productivity of natural resource systems. It is important to shift attention from short-term economic exploitation to a long-term stream of sustainable benefits from resource management. For example, in Sanjiang Plains, PRC, the wetland environment has the potential to underpin resource-based development. A clear illustration of this is the growing importance of black-bee apiculture in sustaining the livelihood of the poor in Rao He county. In this small rural county alone, over 4,500 people depend

directly on black-bee apiculture for their livelihood—generating a staggering 28% of the district's total agricultural output value.

CHALLENGE OF ENSURING THAT THE POOR RECEIVE ECONOMIC BENEFITS

One of the challenges of increasing economic gains from natural resource-based activities to benefit the poor is that it is often the very low-value nature of the returns from natural resources which allows the poor access to them. When some activities become profitable, those with capital and greater power may displace the poor in exploiting the resource. In Nepal, some forest areas have been provided to forestry user groups to manage as common property. However, while this has benefited rural households, a number of factors—i.e., heterogeneity among group members; asymmetrical power relationships based on gender, caste, and income; and disparities in terms of land resources, capital assets under private ownership, and human capital—have conspired to hinder the equitable distribution of benefits.

DIVERSIFYING AWAY FROM NATURAL RESOURCE DEPENDENCE

There are also examples available in the case studies in which households have sought to escape from a perceived poverty trap of natural resource dependence. In Puttalam Lagoon, Sri Lanka, most of the youth engaged in fishing expressed dissatisfaction and frustration with their economic opportunities, emphasizing that they continued their fishing activities only because they did not have any other livelihood options. This can be expected where a limited resource is in decline because of overexploitation under open access conditions.

A similar attitude was documented in the case of those dependent upon some tank irrigation systems in Tamil Nadu, where farmers there are already starting to vote with their feet by abandoning this type of agriculture. When the physical and institutional structures of tank use have reached the point of no return, farmers move to other economic activities. A significant proportion of tanks in the very poor region in East Ramanathapuram District face uncertainty of rainfall and increase in saline aquifers, which have forced farmers to look for coping strategies away from irrigated agriculture, such as charcoal making using local bushes or out-migration to seek nonfarm employment.

How does escaping from poverty affect biodiversity?

Several case studies review the broader policy and institutional relationships between environmental improvement and poverty alleviation efforts. One case study from Viet Nam challenges the premise that a region or country can simultaneously move toward both environmental improvement and a decline in poverty. Linkages between deforestation, afforestation, and forest protection have varying connections to poverty reduction. It concludes that for poor people to escape from poverty some initial ecosystem damage may be inevitable—based on the example of deforestation. Data from many countries suggest that until per capita incomes reach about \$4,000–6,000, natural forest area tends to decline. The case study finds that conversion of forests into agriculture has been a key factor in enabling population growth and rising average incomes through the establishment of perennial crops on formerly forested lands (e.g., coffee, tea, rubber, and cashew nut). The area of cropland in Viet Nam grew 3.4% per year during the 1990s and reached a total of 12.3 million hectares (ha), although it is not clear exactly how much of this agricultural expansion took place at the expense of forest cover. Viet Nam's forested area fell from 47 million ha or 55% of the total land area in the late 1960s to only 14.4 million ha or 17% of the total land area in the late 1980s—the fastest rate of deforestation in Southeast Asia. Protecting the remaining forests of Viet Nam, and elsewhere, may be important not only for conserving what is left of the country's forest biodiversity but also for reducing the poverty of ethnic minorities who inhabit remaining forested areas—and for whom physical remoteness and other barriers may limit the opportunities for some economic activities.

There are both similarities and differences with the situation in Nepal, where forests are located both in the three quarters of the land covered by mountains and the remaining one quarter of land in the plains, known respectively as Siwalik and Terai. In 1964, forest cover in Nepal was estimated at about 47%, falling to about 27% by 1992—mostly due to the conversion of gentler slopes into agricultural use. However, contrary to fears expressed in the early 1990s, deforestation has halted and even reversed slightly according to national data. Indeed

by 2003, forests stood at about 29% of total land area. One of the reasons for this reforestation is the community forest program, which covers about 1.1 million ha or 26% of the forest area.³⁸

The Viet Nam and Nepal examples show that some initial deforestation associated with agricultural expansion may generate agricultural growth and reduce poverty (though at the cost of reduced forest biodiversity and other ecosystem services). However, beyond a certain level—and depending on the suitability of certain land for agriculture—this relationship no longer holds. These examples illustrate changes both in ecosystem/biodiversity status and in poverty status, and show that there is no universal causal relationship between biodiversity and poverty. What matters is how poor people are able to manage their ecosystem dependencies and what share of the benefits and cost of environmental change accrue to the poor. This ultimately depends on the interaction between ecological, political, and institutional parameters.

Poverty, Health, and Ecosystems

How does natural resource dependence affect poor people's health?

One unique aspect of this analysis has been the explicit attempt to examine relationships between rural ecosystem management and human health. These issues include the dependence of poor rural populations on ecosystems for their nutritional and even medicinal needs as well as emerging concerns over the sources of zoonotic diseases.

A number of case studies document the negative impacts on women's health of their searching for and carrying heavy loads of water, wood, and fodder. In Yunnan Province, PRC and Pakistan, it was found that poor health among rural women resulted from the increasing burden of work resulting from resource degradation, as more time and effort were spent in activities such as collecting water, firewood, and NTFPs (Spencer et al., 2005). Traditionally in Dequin County of Yunnan Province, one family will consume 50–60 kg fuelwood per day for cooking. This means one adult woman should carry around 75 kg fuel wood everyday from the mountain. On the average, this will take 2–3 hours, and it can be done twice a day. The same situation occurs for water and fodder.

³⁸The more recent leasehold forest program covers only about 10,000 ha or 0.2% of the total forest area.

It is therefore common for women to have fertility problems because of the effects of a life spent carrying heavy loads (Yusong, 2005).

On the positive side, medicinal plants collected from the wilds can provide poor people—especially women—with benefits from both sale and consumption. In Viet Nam, medicinal plants are particularly important to ethnic minority communities in the highlands, where 70% of medicinal plants in the Vietnamese market originate. Traders along the entire market chain are largely women. Herbal medicine is important in Viet Nam, where the largely rural population has limited access to modern medicine and the Government has promoted traditional medicine. Demand for herbal medicines has further increased with the reduction of government subsidies for modern health care. However, there is a risk that the increased demand will lead to an overexploitation of medicinal plants (Reichrath, 2005).

How do natural resources contribute to food security and nutrition for poor households?

Natural resources, particularly fish and other aquatic resources, are often a key source of protein for poor households in Asia. The case studies offer several good examples. In Bangladesh, fisheries provide nearly 80% of dietary protein requirement for rural households. In Attapeu, Lao PDR, aquatic biodiversity constitute the main source of animal protein in protein poor local diets and the main coping strategy for dealing with periods of rice shortage. However, no coping strategies for dealing with shortages of aquatic resources were identified. Any degradation of these resources is therefore likely to have very significant impacts on the already fragile health and nutritional status particularly of the poorest. In the evaluation of the Nepal forestry program, those participating were found to have had their food security increased by 16% through increased and more stable incomes from the introduction of sustainable community forestry practices.

What is the link between ecosystem change and diseases, including emerging diseases such as SARS and avian bird flu?

There are complex linkages between ecosystem change and the spread of certain diseases. The links between animal health and human health are grow-

ing as people move into new areas, alter the landscape and intensify agricultural production. Wildlife plays a key role in the emergence of zoonotic diseases, as they constitute a “pool” from which pathogens can emerge as in the case of avian bird flu, and possibly severe acute respiratory syndrome (SARS) and HIV/AIDS (Hammill et al., 2005). This situation may now be further complicated by the impacts of climate change. This section highlights three aspects of the linkages: (i) effect of human disruption of ecosystems; (ii) people and livestock moving into close contact with wildlife; and (iii) implications of trade in wild animals.

DISEASE SPREAD BY HUMAN DISRUPTION OF ECOSYSTEMS

The Malaysian case study on the spread of the Nipah virus shows how often complex relationships can exist between ecosystem change and the increased risk of disease. Over the last 2 decades, the forest habitat of pteropid fruit bats in Southeast Asia, including peninsular Malaysia, has been substantially reduced by deforestation and the establishment of plantations for pulpwood and oil palm. In 1997–1998, deforestation and drought in Indonesia led to forest fires and severe haze that blanketed much of Southeast Asia. In turn, this led to an acute reduction in the availability of flowering and fruiting forest trees for foraging by fruitbats. As a result, the bats encroached into cultivated fruit orchards, that in Malaysia are often located adjacent to piggeries. This led to the transmission of the Nipah virus from bats to pigs. Eventually, up to 100 people died and a million pigs had to be culled at great economic cost.

RISK FROM WILDLIFE CONTACT WITH PEOPLE AND LIVESTOCK

Another link between disease risks and ecosystems may be formed when diseases are spread by the contact of people and livestock with wildlife. This has been a possible cause of several zoonotic disease outbreaks in Asian countries. In Mongolia, for example, the aridity and latitude create high variability of intra- and inter-annual microclimates and associated resource availabilities. Both pastoralists and wildlife respond to this variability by moving opportunistically across long distances to track ephemeral foraging resources, often sharing the same pastures and leading to contacts between wild and domesticated animals. A wide range of animal diseases, such as bovine tuberculosis, brucellosis, and foot-and-mouth disease can be transmitted

among livestock, wildlife, and potentially humans—depending on the disease in question.

DISEASE SPREAD BY TRADE IN WILD ANIMALS

A third potential link between disease and ecosystems is where contact with wild animals is exacerbated by their commercial sale. A possible example is the severe acute respiratory syndrome (SARS). Despite SARS' relatively low death toll of 750 worldwide in 2002–2003, it caused widespread public fear that had a major negative impact on the economy of the PRC and Southeast Asia. Much evidence suggests that SARS originated in animals and was subsequently transmitted to humans through contact with infected species. Similar genetic links were discovered between the SARS corona virus and other corona viruses in the masked palm civet and raccoon dog, which are sold in the animal markets of Guangdong Province, PRC. The World Health Organization and the PRC authorities responded by improving regulation of the wild animal trade.

Poverty and Biodiversity

How does conserving biodiversity reduce poverty?

Biodiversity was defined in the first section of this paper as the variability among living organisms and the ecological complexes of which they are part. While previous sections have highlighted the general relationships between ecosystems and the poor, this section explores how conserving biodiversity may lead to poverty reduction or, alternatively, have negative impacts on the poor.

The case studies include several examples of how the poor may gain from maintaining or restoring high biological diversity in the ecosystems upon which they depend. For example, the Lao PDR case highlights the major contribution to food security—and especially protein intake—made by access to a rich diversity of aquatic species. Although rural people themselves find it difficult to calculate aquatic resource production, they are consistently able to identify a wide range of species upon which they depend. In Attapeu, this included fish, eels, frogs, freshwater shrimps, snakes, snails, and turtles (102 species were identified in one village).

In Pred Nai, Thailand, the situation is different, where local residents have helped restore biodiversity

by replanting mangroves. One of the most valuable local species is the mud crab, especially prized due to its rarity, because so little of its mangrove habitat remains. Villagers interested in increasing mud crab production formed a group to explore habitat restoration as well as aquarium breeding.

In the Indian case study on the significance of agro-biodiversity, some poor households were shown to prefer traditional varieties of rice and other crops to introduced ones due to their greater resilience to climate fluctuations and other factors. The region is subject to cyclonic conditions, long spells of drought, and very high temperature variation within a single cropping season, resulting in a range of crop stresses. Local rice varieties are genetically more resilient and withstand the harsh weather, while introduced high-yielding varieties in nearby areas proved far less resilient.

How can biodiversity conservation efforts negatively affect poor people?

The case studies present several instances where poorly designed and implemented attempts to protect biodiversity have negatively affected the poor. For example, in Yunnan Province, PRC, there have been significant adverse impacts on the poor from the establishment of a protected area combined with the existing logging ban. In an extreme case, it was reported in one village that after the establishment of the nature reserve, every family has had at least one person fined or arrested for timber or fuel wood cutting. Additionally, compensation for wildlife damage to crops or property was only one tenth of the true market value. The case study demonstrates that such negative impacts can be overcome by ensuring that the benefits of conservation are more equitably shared with poor households living in or adjacent to protected areas.

Is poverty causally related to ecosystem decline?

Many of the case studies show how poor people often depend on ecosystems for their incomes, health, security, and a variety of ecosystem services. However, this does not necessarily mean that these dependencies are environmentally sustainable and will not ultimately be detrimental to the ecosystem.

Several case studies analyze environmentally unsustainable dependence of the poor on a specific ecosystem and how the resource management system

can be made sustainable. Some case studies conclude that current dependencies of the poor on the ecosystems are harmful. In the Puttalam Lagoon of Sri Lanka, for example, the use of harmful (and illegal) nets is common under minimal law enforcement conditions. A sizable number of families depend on fishing with push nets and chain nets, as they are of low cost and readily acquired by the poor. While they provide subsistence income, damage to the resource base is high. The case study documents that the poor would prefer to move to less damaging but more expensive fishing methods if they could afford them, but it shows how lack of capital and collateral constrains such changes towards sustainable harvesting methods.

The example of medicinal plants collection in Baimaxueshan Reserve of Yunnan Province, PRC provides another case of how resource extraction practices of the poor can prove harmful. The case study also explains how sustainable management and better incomes were achieved through community action.

It should be borne in mind, however, that unsustainable exploitation by the nonpoor is typically greater than by the poor. This is because the nonpoor generally use a larger absolute amount of natural resources than the poor do.

Response Strategies

Policies and institutions can be used to mediate the links between humans and ecosystems, particularly those that matter to poor people. Policies are taken to mean primarily decisions by governing authorities regarding rights and responsibilities of the state, individuals, communities, and the private sector with regard to resource management. As such, policies are inextricably tied to institutions, which refer to the rules of the game or constraints that shape human–ecosystem interaction. These rules often emerge out of an inequitable society in which some groups and organizations have more power than others. This section presents a range of response strategies to these interactions that emerge from the case studies, still organized according to the key questions posed by the study.

What barriers prevent poor people from managing ecosystems to reduce poverty?

Several key barriers can be identified as facing poor men and particularly women in establishing and main-

taining effective ecosystem management strategies: (i) problems of managing open access ecosystems; (ii) nonpoor people controlling resource access and resource use; (iii) men controlling resource access and resource use over women; and (iv) state policies that penalize resource use by the poor.

PROBLEMS OF MANAGING OPEN-ACCESS ECOSYSTEMS

Many ecosystems are inherently complex to manage as they have open-access characteristics—that is where, it is physically or institutionally difficult or costly to impose property rights that limit their use. Many natural resources are mobile and hence, spread over large areas (water, fish, and wild animals), are not easily visible (underground, underwater, or in remote areas) or are difficult to bring within well-defined borders (fisheries, forest, many pastures). This makes these resources hard to measure, technically complex to manage, and difficult to monitor and control in their use (Saxena, 2005). The result of open access is that often no one “owns” them, and so overuse occurs, leading to reduced incomes among users and a decline (sometimes irreversible) in the resource.³⁹ This applies to many ecosystems covered in this study’s case studies—the aquatic resources and wetlands of the Lao PDR and Sri Lanka, tank systems of India, the rivers of Mongolia, the forestry resources of the PRC, and the pasturelands of Mongolia.

A number of approaches have been developed to deal with the problems of managing such resources, usually centering on bringing resource users together as a group to limit access and extraction within ecologically sustainable levels and to manage the resource collectively (also sometimes known as “common property” management). Examples of this approach may be found in the case studies of Pred Nai, Thailand; Baimaxueshan Nature Reserve, PRC; and the forestry user groups of Nepal. This collective approach requires strong mechanisms to control access and to both prevent outsiders from coming in and to stop group members from breaking or shirking their collective agreements.

CONTROL OF RESOURCE ACCESS AND RESOURCE USE BY THE NONPOOR

Unfortunately, it is very common to find the better-off in rural areas damaging the resources upon which

³⁹ Legally, some resources may be owned by the state, but because of weak enforcement, they are often de facto in open-access status.

the poor depend, for example, by undermining collective management or limiting access of the poor to these resources by controlling the inputs and markets needed to process and sell resource products.

There are many cases where the nonpoor have damaged the natural resource base used by the poor. This can happen by reducing the quantity of the resource base available or negatively affecting its quality. In Mongolia, mining—including gold and platinum—is the largest and fastest growing industry, but present trends raise concerns that few benefits will accrue to local populations who will nonetheless bear many of the deleterious effects on health and environment, including sediment loading, heavy metal poisoning, and drying up of river courses. In South India, many tank systems have developed collective management regimes. However, these regimes are being eroded by richer farmers who sink wells and encroach on the tank feeder channels and catchments. This turns the common property management regime back into an open-access resource. Initially, because of the complex linkages between ground and surface water, private well use can encourage concern with tank maintenance. But once too many wells are sunk, the tank reaches a point of no return and tank maintenance collapses—leaving the poorest farmers in a worse position with neither a private well nor reliable water from the tank.

In many cases, the nonpoor control the natural resources. In Pakistan, two of the key resources for the poor are water and land—but these are often controlled by the nonpoor. In the Pakistan case study, this was highlighted by evidence from a recent participatory poverty assessment (PPA). The concentration of landholdings in the hands of powerful landlords was seen as being directly responsible for restricting the poor's access to resources, increasing their poverty, and making them vulnerable to exploitation and risks. In many areas, the rural labor force is landless and lives on the margins in extreme poverty dependent on the vagaries of local landlords. The prevalent social structures prevent development and democratization and curtail fundamental rights.

In Bangladesh, water bodies for fishing are often as important and productive as land. Some fisheries are so productive that during the dry season, the Ministry of Lands leases out segments of rivers and large water bodies as a *Jalmahal* or fishery water estate. However, instead of collective management, water bodies are generally leased to the highest bidder for a tenure of 3 years. This short

time-frame encourages overfishing and maximizing of profit by the lessees—known as water lords—who charge others to fish. The water lords' profits are sufficient to cover private armed guards to limit access and enforce payment. But poor fishers often cannot afford the fees, and so must choose between working for the lessee for very low wages and migrating to seek other livelihood options. Some poor fishers might still try fishing in the rare, shallow ditches lying outside the leased-out prime fisheries. The 3-year lease arrangement has been detrimental to the fishery resource and has exacerbated poverty by benefiting the better-off and influential.

Even when resources are more evenly distributed or not owned by any one group, the nonpoor can exert their control through greater access to the inputs required for resource use and value added—such as credit, technology, and market linkages. In the open access Puttalam Lagoon in Sri Lanka, poor fishers often transact on a barter system in which the fish catch is negotiated to meet their short- and long-term financial needs. In particular, fishers depend heavily on informal credit to purchase fishing gear. This credit is often provided by the net or boat vendor, or by moneylenders and traders, with the money often paid back in kind as fishing catch. Obviously, the terms of trade become extremely unfavorable to the boatman or the fisher in such arrangements, as they are expected to trade the catch at a price determined by the creditor. This relationship is informal but it allows the creditor to maintain a monopoly over purchasing, storage, and fish marketing.

MEN OFTEN DOMINATE RESOURCE CONTROL AND DECISION MAKING

One widespread example of inequity in control over resources is the greater role of men in resource access and decision making. Even within relatively homogeneous villages of rural Asia, female-headed households generally have fewer user rights and within poor households, men can wield greater power over resource decisions. This is highlighted by the regional case study reviewing gender and natural resources in Asia. Resources managed under customary property regimes hold a particular significance for women. Women tend to be the primary gatherers since they are responsible to supply household needs for food, fuel, fodder, and medicine. At the same time, they are less likely to own private land on which to cultivate these resources. They also tend to be overrepresented among the poor, especially if they are heads of

households; belong to ethnic minorities, indigenous groups, or scheduled caste; and/or live in remote hilly, mountainous, dryland, or coastal areas. Women from these social groups and in these disadvantaged geographic locations are more dependent on natural resources than their wealthier counterparts in more favorable locations and from majority social groups because they lack easy access to alternative livelihood through education, employment, markets, and government services.

POLICIES AND WEAK COORDINATION INHIBIT SUSTAINABLE RESOURCE USE BY THE POOR

Often the ineffectiveness or biases of state policies and institutions undermine ecosystem management that benefits the poor. Lack of government coordination can arise both horizontally (between agencies for different subjects) and vertically (between the center and subnational entities). Due to their complex spatial and temporal boundaries, and multiple uses, ecosystems are invariably controlled by many different central and local agencies. This often leads to a lack of coordination between different natural resource authorities and reduces their ability to achieve effective management.

In the PRC, this lack of coordination is a particularly prevalent issue and is highlighted by all three Chinese case studies. Fragmentation in the management of the Sanjiang wetland is typical of wetland protection and management. Although the State Environmental Protection Agency has a clear national mandate for ecological conservation, sectoral ministries—notably those covering water resources and forestry—are also increasingly responsible for conservation. The Sanjiang Plain is controlled by a variety of agencies at different levels of government. Some of these administrative units operate under the provincial government, while others are located at lower levels of government. Land-use patterns in the Sanjiang Plains are determined by decisions taken at the center, with little regard for development of the region. Local government in the Sanjiang Plains depends on financial transfers from the center, but these transfers are unpredictable—reinforcing short-termism in local government and a focus on unsustainable economic growth. Finally, poor provinces often lack financial support from central government to undertake key environmental protection functions.

In South India, tanks are under the control of either *panchayat* or the irrigation department of the state government, while the fishery is controlled by

the panchayats and the fishery department of the state government. The local panchayats, and both the revenue and forest departments of the state government, have stakes in tank forestry. The case study documents extremely weak coordination among these departments that not only causes underutilization of the productive potential of tanks (fishery, forestry, silt, and grasses) but also undermines their power to protect these usufructs from misuse.

Viet Nam's institutional arrangements for the forestry sector also exhibit a lack of coordination that undermines pro-poor resource management. Responsibility for poverty and forestry tends to be compartmentalized. The Ministry of Labor, Invalids, and Social Affairs has lead responsibility for poverty alleviation and gives virtually no attention to forestry issues. Conversely, the Forest Department of the Ministry for Agriculture and Development has responsibility for forests but gives almost no explicit attention to poverty alleviation. Coordination and information exchange between the central and provincial levels are also limited. On the positive side, steps are now being taken toward increased integration of poverty reduction goals into sectoral plans and across ministries at the national level through the government-led poverty strategy.

Government agencies are often influenced by the nonpoor (through what is referred to as “elite capture”) who then benefit disproportionately from resources management at the expense of the poor. For example, in Mongolia's mining sector, with a weak regulatory structure and lax taxation laws, exploitation of minerals largely benefits Mongolia's wealthiest citizens and foreign nationals affiliated with mining corporations. Residents in the mining areas generally receive low-paying jobs and a decreased quality of life due to pollution and loss of traditional jobs. During the last decade, gold has been exploited in the most accessible areas. However, recent mining activities have expanded into pristine and even protected areas. The Ministry of Nature and Environment has recently produced proposals to degazette over 10% of Mongolia's existing protected areas to allow greater access by the mining sector.

In Viet Nam, the Government has also implemented policies that have negatively affected resource access by poorer ethnic minorities. In the 1950s, when the war against the French had begun, the Government of Viet Nam restricted timber and NTFPs exploitation by local people to assure that forest resources could be used to support the war

effort. Ethnic minorities are said to have suffered as a consequence of this prohibition. More recently, the Government launched the 5-Million Hectare Reforestation Programme, in which the national Government has set its sights on reforesting vast areas that are said to be “empty lands.” Often, these are lands where ethnic minority people have maintained an elaborate and largely sustainable system of resource use based on swidden agriculture and the collection of forest products.

Not just poor households but entire poor regions can lose from policies that favor wealthy, more politically powerful regions. For example, in the Sanjiang Plains, the political and economic structures work to transfer the benefits or economic rents out of the region from exploitation of the rich natural environment, without adequate compensation to local residents. These transfers represent significant losses in terms of what could be reinvested to develop the potential of the region.

How do population growth and economic growth contribute to environmental problems that face the poor?

In addition to political and institutional constraints, environmental change is influenced by rapidly changing demographic and economic process. These are especially dramatic in Asia which has the world’s fastest growing economies and highest rate of urbanization. This places huge pressures on the natural resource base as highlighted by the case studies and can be seen in the loss of pasturelands in Mongolia, of forests in Viet Nam, and of wetlands in Bangladesh and the PRC. In northern Tamil Nadu, pollution of tank water and tank bed soil is a common phenomenon in many tanks located near cities and tannery-intensive villages.

The pressure on ecosystems from other economic activities is particularly strong in the PRC, whose economy is the fastest growing in the world. As a country, the PRC faces formidable resource constraints, having to feed a fifth of the world’s population with only 7% of its farmland, and available per capita water resources are of only one quarter of the world’s average. National food security is therefore always a paramount concern. The soils of the Sanjiang Plains are highly fertile and, as a result, the region has long been designated as a national base for grain production. Consequently, over the past 4 decades, central and provincial governments as well as donors

have invested heavily in the development of agriculture in the Sanjiang Plains. The area of croplands reached 4.02 million ha by 1997 from merely 820,000 ha in 1949. About 2.46 million ha of the original wetlands have been converted into monocrop agriculture. The environmental costs of this growth are such that they are now receiving increased political attention from both national and provincial leadership, and efforts are being made to rationalize land use and restore certain wetlands.

Rapid development in the PRC is also having environmental repercussions on many of her Asian neighbors. For example, with a population nearly 500 times that of Mongolia, the PRC threatens to overwhelm Mongolia’s own efforts to determine its economic and environmental future. For instance, illegal international trade threatens a number of species in Mongolia and evidence suggests that this threat is growing and spreading to new species. For example, the Mongolian saiga antelope is a distinct subspecies found in the southwestern part of the country. But the population of this subspecies catastrophically declined from 2000 to 2005, from over 5,000 to less than 800 individuals. The driver in this collapse is the lucrative Chinese medicinal market for saiga horn and the inability of Mongolian authorities to control this illegal trade. Mongolia is also struggling with its own rapid economic transformation from a relatively strong Soviet-dominated economy with strict controls on a free-market economy. This transition—combined with a faltering economy, increased reliance on trade with the PRC, porous borders, and little revenue and will for enforcement—has led to rapid declines in a range of wildlife species.

Indirect influences of population growth are also alluded to in several case studies. In the case study covering Yunnan Province, PRC, villagers described how increased population reduces per capita landholding and places pressure on natural resources, particularly fuelwood, animal fodder, and non-timber forest products. The Tamil Nadu case in South India suggests that population pressure is one of the more important factors hastening the process of tank degradation through increased pressure on the resource in the form of encroachments into catchments and feeder channels. In Nepal, a growing population and harsh economic conditions in the mountains—combined with the eradication of malaria and infrastructure development in the Terai—led to large-scale migration from the mountain regions to the Terai zone. This has resulted in greatly increased deforesta-

tion in the Terai, while the mountainous areas have generally experienced decreased pressures and reforestation. Migration and increased population densities have also played a significant role in the increased risk of transmission of zoonotic pathogens, such as SARS and avian influenza as described by the case study on this phenomenon. In Southeast Asia, rapidly growing and more concentrated human and farm populations are bringing people and animals into closer contact. Moreover, many industrial farms are located beside or within rapidly growing cities especially in Asia, which has the fastest-developing livestock sector in the world, fuelled by the steady increase in meat consumption in the region.

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

As previous examples have illustrated, increasing the environmental rights of the poor is an inherently political act, and it requires a process of change. The case studies suggest that this change process needs to alter the power relationships that govern access to resources between different groups and individuals. Only by understanding and addressing these dynamics of change and identifying the agents of change is lasting poverty reduction possible. However, these changes are not straightforward as they require challenging powerful vested interests. The sections below illustrate some ways through which changes were achieved including action initiated by the poor and local groups themselves, forming alliances with civil society and donor agencies and engaging government, and scaling up from the local level.

ACTION INITIATED BY THE POOR AND LOCAL GROUPS

The case studies illustrate the importance of action initiated by the poor and local groups. In Pred Nai, Thailand, a mangrove forest was placed under a logging concession in 1941. By 1985, villagers became concerned because logging concessionaires overharvested the mangrove and prohibited villagers from harvesting crabs, shellfish, fish, and other products in the concession areas. Other local interests converted degraded mangrove areas into shrimp farms and built a gate to block seawater, which further damaged the mangrove ecosystem. In 1986, the villagers formed a group to stop logging and shrimp farming. Their efforts were successful, and commercial logging was

halted in 1987 and the company ousted from the mangrove—although it was only legally terminated in 2000. However, as the case study concludes:

Community-based initiatives in general, and Pred Nai in particular, should not be romanticized. Within Pred Nai, differences of opinion and conflict have arisen regarding mangrove management, including a debate about conservation versus sustainable use. What is important is that the community members have managed the conflicts themselves through negotiation and dialogue.

Tamil Nadu has several examples of local level institutions led by poor farmers which have effectively solved the open-access problems of managing tank irrigation. Feeder channels were maintained, water diverted from rivers, common irrigators appointed for water distribution, and sedimentation removed. In a few tanks, such as Parambur tank in Pudukkottai District and Kedar tank in Villuppuram District, the tank institutions are able to minimize local political differences. They have devised clear rules and strategies for exploiting and sharing tank user rights. During tank water scarcity, institutional arrangements such as acreage restriction, rotational water supply, and prohibiting well owners from using tank water are some of the strategies followed.

FORMING ALLIANCES WITH CIVIL SOCIETY AND DONOR AGENCIES

External agencies such as civil society groups and donors can act as important allies for advocacy, technical support, and funds. However, these agencies need to play a careful role to avoid undermining the process. Some examples include:

- In Pred Nai, Thailand, the villagers requested support for design of a management plan from the Bangkok-based Regional Community Forestry Training Centre for Asia and the Pacific, which proved beneficial.
- The WWF PRC program worked with the villages near the Baimaxueshan Nature Reserve to improve protected area management.
- International assistance agencies in Nepal helped the Forest Department and forest dependent households to introduce leasehold and community forestry.
- Development assistance agencies in Pakistan played a catalytic role in ensuring that environmental issues identified by the poor were not forgotten in debates over the poverty reduction strategy.

- IUCN in Bangladesh and the Lao PDR became involved in providing technical support to people dependent on aquatic livelihoods.

ENGAGING GOVERNMENT AND SCALING UP FROM THE LOCAL LEVEL

The environmental literature includes a growing body of pro-poor environmental microprojects and interventions—“islands of success.” The challenge is to adapt, spread, and upscale these approaches so that they reach many more potential applications and become self-sustaining as demonstrated in some of the case studies.⁴⁰

ENGAGING WITH GOVERNMENT AND POLITICIANS

One approach for scaling up is to engage senior level decision makers and politicians. Comanagement in Baimaxueshan Nature Reserve in Western PRC faced the challenge that a pilot site is in essence an island for experimentation—and it remains just that unless its successes are repeated in other areas. This problem is acute in Yunnan Province. The achievements in villages within the Baimaxueshan Reserve are commendable, but over 166 different nature reserves now exist in Yunnan Province alone, with more being established every year. Oddly, it seems that although many officials—for example, in the Yunnan Forestry Office—are now aware of and understand the issues raised for local people when a nature reserve is established, this does not always transfer to implementation. To try to address this, WWF-PRC assisted the 2003 Yunnan annual provincial conservation meeting to focus on the topic of comanagement. The meeting was held at the reserve in Deqin County to provide hands-on experience. To engage national decision-makers, WWF-PRC held an international conference in Beijing on experiences and policy implications of comanagement of natural resources in the country. The discussion on comanagement issues inspired very valuable ideas for future legislation to establish the PRC’s first Reserve Law.

The most appropriate level of government for interventions to engage with has to be decided on a case-by-case basis. In several case studies, local governments proved most amenable to change. The DFID-funded Yunnan Environment and Development Project, for example, has been able to exert the most

tangible influence on county and township government institutions. This may be partly due to the less complex institutional arrangements at the local level and the pragmatic approach adopted by local government officials. In Pred Nai, Thailand, the interventions taken benefited from the strong support of the provincial governor.

IMPORTANCE OF PUBLICITY AND INFORMATION

Pred Nai’s efforts also have been helped by effectively generating publicity. The group was awarded a national award by the Forestry Department in 2002 and an international award by the Equator Initiative in 2004. However, attempts at the national level to ally with other such initiatives to support the passage of a Community Forestry Bill have faced strong resistance.

A slightly different example of the role of information and publicity comes from Pakistan where donors and civil society groups use PPAs to work with the federal government to challenge the dominant view that poor people damage and degrade the environment. The findings of the assessments surprised many in both the environment and development communities when they showed that the poor highly prioritized environmental conditions.

FORMING NETWORKS

In Nepal, scaling up has been achieved through the Federation of Community Forest Users of Nepal (FECOFUN) which was formed in 1998 to lobby for the promotion of community forestry in Nepal. It has district and zonal units, which work for the benefit of forest user groups and community forests. About 70% of forest user groups are members of this federation. FECOFUN participates in national community forestry debates and runs programs to empower user groups. Other federations such as Nepal Forest Users group and Himalayan Grassroot Women Natural Resources Management Association have been formed to cater to the various needs of user groups in Nepal. In Thailand, Pred Nai residents realized they could not increase crab harvests without working with neighboring villages. A mangrove network developed with other villages and became the Community Coastal Resource Management Network of Trat Province.

⁴⁰ See the website www.povertyenvironment.net for examples.

CRISIS LEADING TO ACTION BY THE NONPOOR

In addition to the poor initiating action, often with the support of civil society and external agencies, national governments may be catalyzed to take action due to a crisis. This has been one of the key driving forces in the PRC where the disastrous floods of the 1990s, especially 1998, as well as dust storms in Beijing have served as wake-up calls. It was concern over the impacts of these disasters on the cities, rather than the need to address long-standing poverty in rural areas, that led to the change of attitude of the government toward the environment. Likewise, it was the crisis over SARS that led to greater control of the wildlife trade in the PRC.

What political and institutional changes are required to achieve pro-poor environmental outcomes? Can these be supported?

The case studies presented have highlighted the role of political and institutional relationships—now often referred to as “governance” issues. As the case study of Baimaxueshan, PRC concludes:

Poverty is... a social relationship of competition among individuals, social groups, and the Government in the pursuit of wealth and political power. This definition has significant policy and operational implications because it requires not only economic growth to overcome poverty, but also a transformation of the social relations at the root of poverty.

This section reviews the extent to which environmental activities have stimulated broader governance changes contributing to the transformation of social relations, which are at the root of poverty. Three main developments precipitated by environmental interventions are highlighted: (i) poor people learning to organize for change; (ii) legal redress and civil society groups to challenge the state; and (iii) promoting gender equity.

POOR PEOPLE LEARNING TO ORGANIZE FOR CHANGE

One of the challenges for pro-poor ecosystem improvements, as with many forms of pro-poor change, is the problems poor people face in organizing to overcome the many constraints that face them. In several documented cases, external groups, such as NGOs, have facilitated this social mobilization. However, there are also examples such as in Pred Nai where villagers

drew upon the strengths of local traditions and village elders. For example, the Pred Nai mangrove activities involved support from a respected monk. There are also examples where ecosystem decline can be the catalyst for the poor to organize themselves more broadly. Again, this happened in Pred Nai, where local structures were developed for managing the resources.

LEGAL REDRESS AND CIVIL SOCIETY GROUPS TO CHALLENGE STATE POLICIES

After initial organization, groups representing the poor may need to develop more formal mechanisms to challenge state policies—for example, through legal means or forming NGOs to lobby and advocate change. In some settings, natural resource issues provide the impetus for these important governance developments. For example, in Mongolia, poor households acted against mining interests that had caused major damages to the headwaters of the Onggi River. In an unprecedented response, 3,000 rural citizens—many of them nomadic herder families—created one of the country’s first locally driven environmental NGOs: the Onggi River Movement (ORM) supporting restoration of the River. They successfully halted operations of three gold mines harming the river and Red Lake. In a Mongolian first, ORM filed court cases against the companies involved, which in turn has been a key factor in increasing national awareness about this and other environmental matters.

PROMOTING GENDER EQUITY

The case studies also include several examples of how ecosystem interventions can lead to broader empowerment of women and support for gender equity. For example, in Nepal, 2,213 leasehold forestry groups formed with 5–10 poor households in each group. The decision-making capacity of women is reported to have substantially improved through the activities of these groups, based on a comparison of the decision-making characteristics of the households before and after leasehold forestry formation. Before the leasehold forestry groups were established, only 10% of the women could decide on forest management approaches for themselves, while 30% made joint decisions, and 60% depended on a male member. Five years later, 25% of women could decide for themselves, while 55% made joint decisions, and only 20% depended on a male household member for help. This indicates the wider potential for gender empowerment through greater resource decision making by women.

How can pro-poor environmental management be supported by development agencies?

Several key implications for the organization and delivery of development assistance programs emerge from analysis of these 16 case studies in the context of the wider literature on this subject. Most economic development policies and poverty reduction programs pay scant attention to the relationships among poverty, health, and the environment. The cases have amply demonstrated the nuanced range of linkages between natural resource systems and the rural poor—including their health—showing the importance of attention to these relationships, whether the primary interest is poverty alleviation or environmental management.

The cases also identify opportunities to promote pro-poor environmental change as well as examples of where external assistance agencies have played positive roles in such efforts. Development funding agencies in Nepal, for example, played a key role in supporting the country's community forestry program with strong social as well as environmental benefits. In this case, external assistance helped build local institutions and enhance the capacity of forest officials and users for management and sustainable use of forest resources. Today, these approaches to forest management in Nepal are so well established that they can continue with much less support from these agencies.

However, care must be taken to avoid inappropriate interventions that undermine national and local efforts at pro-poor environmental management. This is amply illustrated by the externally supported tank modernization in South India. External assistance could make little headway in reversing the process of tank degradation, despite 1,300 tanks out of 39,000 tanks in the state of Tamil Nadu being "modernized" with an outlay of about Rs5 billion over 20 years. More than 75% of this was funded by external funding agencies. There was remarkable uniformity imposed on this modernization process, in spite of the vast differences in the problems faced by tank irrigators across different agro-climatic and socioeconomic localities. In most targeted tanks, the institutions as well as the infrastructure created have collapsed. These projects failed to view the tanks from the standpoint of the households whose livelihood strategies depended upon them. Modernization of physical infrastructure was overemphasized, while little attention was given to ensuring the active participation of

farmers in decision making. There also was a nearly complete neglect of secondary stakeholders (such as fisherfolk, agricultural labor households, pastoralists, and nonagricultural households) who could have been included in forming an alliance against vested interests and encroachers and built a broader community of tank users. Such lessons would seem to have significant implications for a variety of infrastructure-driven development projects in rural areas.

Another recurring lesson from the cases is that local context matters. The key consideration often is the need for a clear identification of the underlying sources of pressure driving environmental change. This means also that there is a need to avoid simplistic crisis narratives concerning environmental degradation, despite the attraction they hold for mobilizing funds and the support of senior managers and stakeholders.

A consistent message also is that politics matters, and one of the toughest lessons for the traditional development practitioner is the need to deal directly with often difficult political issues affecting the ability of poor communities to gain the benefits of improved resources management. The political status quo may sometimes need to be changed for an intervention to be successful. In such cases, if an approach for achieving necessary policy and/or institutional change cannot be built into the intervention strategy, then the program or project should probably not be undertaken. Indeed, there is the possibility of counterproductive actions in the absence of an adequate understanding of the political forces at work, lest an external intervention strengthen anti-poor processes rather than to promote pro-poor change.

Such understanding does not come easily. International organizations and their staff find themselves in very different contexts than the rural poor whose problems they often seek to resolve. They sometimes face conflicting incentives within their own organizations and resistance from domestic political elites that may constrain attempts to address some of the underlying political challenges identified in this synthesis and accompanying case studies, including:

- *Institutional inertia and institutional focus* – There is a temptation for all organizations to be focused on sustaining their existence. This can be particularly challenging for development assistance agencies, which, by definition, are trying to put themselves out of job. Second, there sometimes is too much attention given to taking credit for

gains achieved (and results-based management processes can reinforce such biases), even though successful programs almost inevitably involve numerous players and influences.

- *Funding imperatives* – Financial expenditures are often seen as the most important measure of success, which tends to encourage a hardware approach to problems rather than the sometimes more complicated process-oriented approaches.
- *Rapid time frame* – The rapid time frame for project preparation, and especially supervision of implementation, limits the ability to conduct proper analysis and longer-term engagement with poor households that are the targets of interventions. Further, the staff of development assistance organizations lead very different lifestyles to poor households, which acts as a constraint to really understanding the ground realities that poor people face.

Conclusion

This publication has highlighted a diversity of challenges and opportunities for pro-poor environmental management in Asia. The case studies have demonstrated the many challenges, and the structural and

often political nature of the problems. On top of these factors are massive economic and demographic forces as Asian economies grow and urbanize. The complexity and deep-rooted nature of these challenges can help explain why, in many cases, natural resources are being managed unsustainably across Asia.

However, the conclusion of these case studies should not be pessimistic. For too long, natural resource issues have been approached superficially as an issue of awareness raising, capacity building, technical know-how, or improved technology. These approaches may be useful in some cases, but they often fail to address the underlying causes of environmental decline. Not surprisingly environmental projects with these approaches have a mixed record of success.

The case studies identify possible ways forward. Many cases point to the positive results possible when a more complex, multifaceted, and politically nuanced approach is adopted. By building on these successes, and with increased understanding of how environmental change is part of larger economic and political changes, it is possible to be hopeful and proactive. This approach may appear more complex and demanding, requiring greater attention to local context and institutional dynamics, but the case studies suggest that it is ultimately more likely to succeed.

APPENDIX: SUMMARY OF CASE STUDIES

Poverty, Livelihoods, and Ecosystems

1. Enhancing sustainable livelihoods in Puttalam Lagoon, Sri Lanka

Examines the socioeconomic characteristics of selected communities around Puttalam Lagoon on the north-western coast of Sri Lanka and demonstrates that income levels and livelihood strategies of poor households have an impact on the natural resource base, leading to food insecurity.

2. Poverty–environment links in the wetlands of Sanjiang Plain, People’s Republic of China (PRC)

Presents a peculiar case of poverty persisting in a relatively rich environment, which has abundant natural resources and biodiversity, and low population density. The case uncovers how policy decisions motivated by national concerns and dominated by the economic development drive and institutional failures, including market failures, created a mutually reinforcing cycle of poverty and environmental degradation.

3. Poverty and natural resource degradation: irrigation tanks in South India

Analyzes the nexus between poverty, livelihood options, and tank management. It challenges the existing notions regarding the factors leading to tank degradation, tank rehabilitation, and the handing over of tank management; and attempts to provide a modest agenda for future tank rehabilitation programs.

4. Community-based forest management in Nepal: reversing environmental degradation and improving livelihoods

Reviews the community forestry (CF) and leasehold forestry (LF) systems in terms of reversing forest degradation, and their contribution to poverty reduction. The study also revisits the theory of degradation and land-use change dynamics and their causes by investigating the (i) role of different stakeholders in the implementation of CF and LF policy; (ii) evolving livelihood strategies of forest-dependent communities; (iii) forest and protected area management in times of conflict; (iv) impacts of CF and LF policy; and (v) legislation aimed at improving livelihoods and empowering women.

Poverty, Health, and Ecosystems

5. Severe acute respiratory syndrome (SARS) and avian influenza: exploring the role of conservation and veterinary health in addressing zoonotic diseases in Asia

Examines the causes and impacts of and responses to two recent zoonotic disease outbreaks—avian influenza and SARS—in the Asia and Pacific region. The case demonstrates the close connections between animal and human health, how these connections can lead to zoonotic disease outbreaks that disproportionately affect the poor, and why this calls for new and more integrated approaches to dealing with public health issues.

6. Deforestation and the Nipah virus in Malaysia

Presents data suggesting that increasing deforestation led to an acute reduction in the availability of flowering and fruiting forest trees for foraging by fruit bats. This culminated in the unprecedented encroachment of fruit

bats into cultivated fruit orchards in 1997–1998. These anthropogenic events, in conjunction with the location of piggeries within orchards and the design of pigsties, allowed the transmission of the Nipah virus from its reservoir host to domestic pigs and, ultimately, to humans.

7. *Aquatic resources, food security, and nutrition in the Lao People's Democratic Republic: a case study from Attapeu Province*

Provides a better understanding of how people living in rice production areas use aquatic resources and the importance of these resources in improving food security and nutrition. The study was motivated by a concern that the production and value of aquatic resources are not often recognized fully, which results in missed opportunities for improving rural livelihoods through the wise management of aquatic resources. This case study is intended to contribute to a broad discussion on appropriate food security strategies for the Lao PDR.

Poverty and Biodiversity

8. *Improving poverty reduction and conservation outcomes in the grassland ecosystem of Mongolia*

Presents how a broad scale of human impacts on nature jeopardizes the life-support systems on which the poorest disproportionately depend, threatening to eliminate future, more sustainable options for natural resource management. The study also discusses poverty reduction in the context of the economic and environmental needs of the people inhabiting the temperate grassland system of Mongolia.

9. *Poverty reduction, forests, and conservation in Viet Nam: understanding the tradeoffs*

Assesses the possibilities of improving rural livelihood while reversing the loss of forest resources in Viet Nam. Continuing some forest conversions, combined with forest protection and restoration, can contribute to maintaining and improving livelihood. The challenge, however, is in distinguishing between the two uses of resources and by managing them optimally.

10. *Poverty reduction, increased conservation, and environmental protection through participatory breeding: a case study from India*

Analyzes the food situation in a tribal and rural area in India and identifies people-friendly and environmentally sound options for improving the yields of rice plant varieties preferred by farmers.

11. *From field to policy: linking livelihood, health, and conservation in Baimaxueshan Nature Reserve, People's Republic of China*

Presents the success of community-based natural resource management within the Baimaxueshan Nature Reserve in Yunnan Province and shows how the sustainable use of natural resources has had a positive impact on rural livelihood, while improving women's health through sound and equitable environmental management networking, policy dialogue on local rights, and institutionalizing the process.

Response Strategies

12. *Do decision makers hear and respond to what the poor say about poverty and the environment? Recent experience from Pakistan*

Analyzes two parallel processes that may have been instrumental in putting the poverty–environment agenda on the policy map of Pakistan—International Union for Conservation of Nature (IUCN) Pakistan-led advocacy on Pakistan's Poverty Reduction Strategy and the United Kingdom's Department for International Development-sponsored Pakistan participatory poverty assessment. The study shows how participatory processes have been useful in highlighting and addressing poverty–health–environment links across scales and sectors.

13. *Overcoming gender inequities in access to natural resources in Asia*

Focuses on gender differences in access to natural resources under various property and management regimes in Asia, and gender differentials in bargaining power over these resources. The study concludes that community-based natural resources management and comanagement has the potential not only to address some practical needs of women and include them in community decision making, but also to enhance their bargaining power over the long term.

14. *Community mangrove management in Pred Nai Village, Thailand*

Describes forest management activities undertaken in a mangrove forest by the Pred Nai Community Forestry Group. The case presents an example of how community members can empower themselves through local initiative and organization and how community action can help improve livelihood and reduce poverty.

15. *Wetland resource management in Bangladesh to improve livelihoods and sustain natural resources*

Discusses the importance of wetlands in the livelihood and health of the poor in Bangladesh, supporting up to 100 million people. The study also reviews the attempts to address the challenges that face wetland resource management in the country.

16. *Institutional reform linking poverty and the environment: experience from Yunnan Province, People's Republic of China*

Examines the lessons to be drawn from the Yunnan Environment Development Program, an integrated poverty reduction and environmental protection project in PRC, and recommends future policy on environmental protection and poverty reduction, including institutional requirements.

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Chapter 3

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Poverty, Health, and Ecosystems: Experience from Asia

The publication is the result of an analysis funded under the Asian Development Bank's (ADB's) Poverty and Environment Program, financed by ADB and the Governments of Norway and Sweden. The Program aims to accelerate learning about poverty–environment relationships by collecting and generating new knowledge on effective approaches to environmental management and poverty reduction. The publication, a joint undertaking of ADB and the International Union for Conservation of Nature, is meant to increase knowledge on the complex relationships between poverty, health, and ecosystems in Asia and the Pacific. It also serves as a vehicle for improving collaboration between the conservation and development communities to generate tools that both can use to more effectively address these issues.

Sixteen case studies are presented that document relationships in Asia between poverty, health, and natural resources management and analyze lessons that can be drawn from this experience for improved environmental management and poverty reduction efforts. The case studies present experience with relationships between: (i) poverty, livelihoods, and reversing the degradation of environmental resources; (ii) conservation of natural systems and their sustainable resource use for poverty reduction and better health outcomes; and (iii) improving human health, particularly of the poor, by reversing the loss of environmental resources. The studies also examine social and political factors affecting these relationships and ways to overcome governance constraints to sound environmental management and poverty reduction, especially through creating multistakeholder coalitions and alliances, protecting rights to resources, and promoting gender equity.

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