

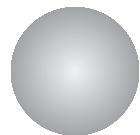


POVERTY ENVIRONMENT NEXUS

Sustainable approaches to poverty reduction
in Cambodia, Lao PDR and Vietnam



THE WORLD BANK



D R A F T C O N F E R E N C E E D I T I O N



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June 2006



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Environment and Social Development Department
East Asia and Pacific Region
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Abbreviations and Acronyms

ADB	Asian Development Bank
ADI	Acute Diarrheal Illness
ARI	Acute Respiratory Illness
BOD	Biological Oxygen Demand
CAS	Country Assistance Strategy
CCB-NREM	Commune and Community Based Natural Resource and Environment Management
CEMMA	Committee for Ethnic Minorities and Mountainous Areas (Vietnam)
COD	Chemical Oxygen Demand
CPI	Committee for Planning and Investment (Lao PDR)
CPR	Common Property Resources
CPRG	Comprehensive Poverty Reduction and Growth Strategy (Lao PDR)
CSES	Cambodia Socio-Economic Survey
CV	Craft Village
DANIDA	Danish International Development Agency
DECRG	Development Research Group (of the World Bank)
DFID	UK Department for International Development
DHS	Demographic and Health Survey
DoSTE	Department of Science and Technology Education (Vietnam)
EASES	Environment and Social Sector Unit of the East Asia and Pacific Region (of the World Bank)
ERI	Environmental Research Institute (Lao PDR)
FA	Forest Administration (Cambodia)
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
GNI	Gross National Income
GPS	Global Positioning System
GSO	General Statistical Office (Vietnam)
HH	Household

IBRD	International Bank for Reconstruction and Development
ICEM	International Council for Educational Media
IDA	International Development Association
IDS	Institute for Development Studies
IFPRI	International Food Policy Research Institute
IFSR	Independent Forest Sector Review (Cambodia)
INEST	Institute of Environmental Science and Technology (Vietnam)
IPM	Integrated Pest Management
ISO	International Organization for Standardization
IT	Information Technology
JICA	Japan International Cooperation Agency
KEI	Korea Environment Institute
KIET	Korean Institute for Industrial Economics and Trade
LECS	Lao Expenditure and Consumption Survey (Lao PDR)
LTC	Land Tenure Certificate
MAF	Ministry of Agriculture and Forestry (Lao PDR)
MARD	Ministry of Agriculture and Rural Development (Vietnam)
MCTPC	Ministry of Communication, Transport, Post and Construction
MDG	Millennium Development Goals
MoC	Ministry of Construction (Vietnam)
MOH	Ministry of Health (Cambodia, Lao PDR, Vietnam)
MoI	Ministry of Industry (Vietnam)
MoNRE	Ministry of Natural Resources and Environment (Vietnam)
MoST	Ministry of Science and Technology (Vietnam)
MPI	Ministry of Planning and Investment
MRC	Mekong River Commission
MRD	Mekong River Delta
NAFRI	National Agriculture and Forestry Research Institute (Lao PDR)
NDSP	National Strategic Development Plan (Cambodia)
NEAP	National Environmental Action Plan (Lao PDR)
NGO	Non-Governmental Organization
NGPES	National Growth and Poverty Eradication Strategy (Lao PDR)
NPEP	National Poverty Eradication Program (Lao PDR)
NPRS	National Poverty Reduction Strategy (Cambodia)
NSC	National Statistic Center (Lao PDR)
NSDP	National Strategic Development Plan (Cambodia)
NSEDP	National Socio-Economic Development Plan (Lao PDR, Vietnam)
NTFP	Non-timber Forest Products
PEN	Poverty and Environment Nexus
PPA	Participatory Poverty Assessment
PRSP	Poverty Reduction Strategy Paper
RCEE	Research Center for Energy and Environment (Vietnam)
RRD	Red River Delta

SEDEC	Socio-Economic Development Center (Vietnam)
SFE	State Forest Enterprise
SIDA	Swedish International Development Cooperation Agency
SME	Small and Medium Enterprise
SPE	Seriously Polluting Establishment
STEA	Science, Technology and Environment Agency (Lao PDR)
TECOS	Consultancy Service and Technology Development Company for Natural Resources and Environment (affiliated with MONRE)
TVIE	Township and Village Industrial Enterprise
UNDP	United Nations Development Program
UNICEF	United Nations Children's Fund
UNPF	United Nations Population Fund
URI	Urban Research Institute (Lao PDR)
UXO	Unexploded Ordinance
VDG	Vietnam Development Goals
VEPA	Vietnam Environmental Protection Agency
VND	Vietnamese Currency (Dong)
VNHS	Vietnam National Health Survey
VNLS	Vietnam National Living Standard Survey
WASA	Water Supply Authority (Lao PDR)
WBG	World Bank Group'
WFP	World Food Program
WHO	World Health Organization
WSS	Water Supply and Sanitation



Foreword to the Conference Edition

This is a draft edition of the Poverty Environment Nexus (PEN) report for Cambodia, Lao PDR and Vietnam, which will be presented at the sub-regional PEN conference in Vientiane, Lao DPR on June 21–22, 2006.

The purpose of this conference edition is to present the findings from the studies that have been undertaken in each country over the last three years as well as to obtain relevant comments and feedback from the conference participants that could be included in the final edition of the report.

We realize that the material presented in this report requires time to study and digest. Some of the linkages between poverty and environment are complex and difficult to capture. You, as the reader of this report, are, therefore, encouraged to give yourself sufficient time to begin to discern the main storylines.

The material presented in this report is based upon comprehensive case studies as well as national analytical work performed in each country. We have omitted this background material from this conference edition to avoid overwhelming the readers. This work will be included, however, in a CD-ROM attachment in the final published version.

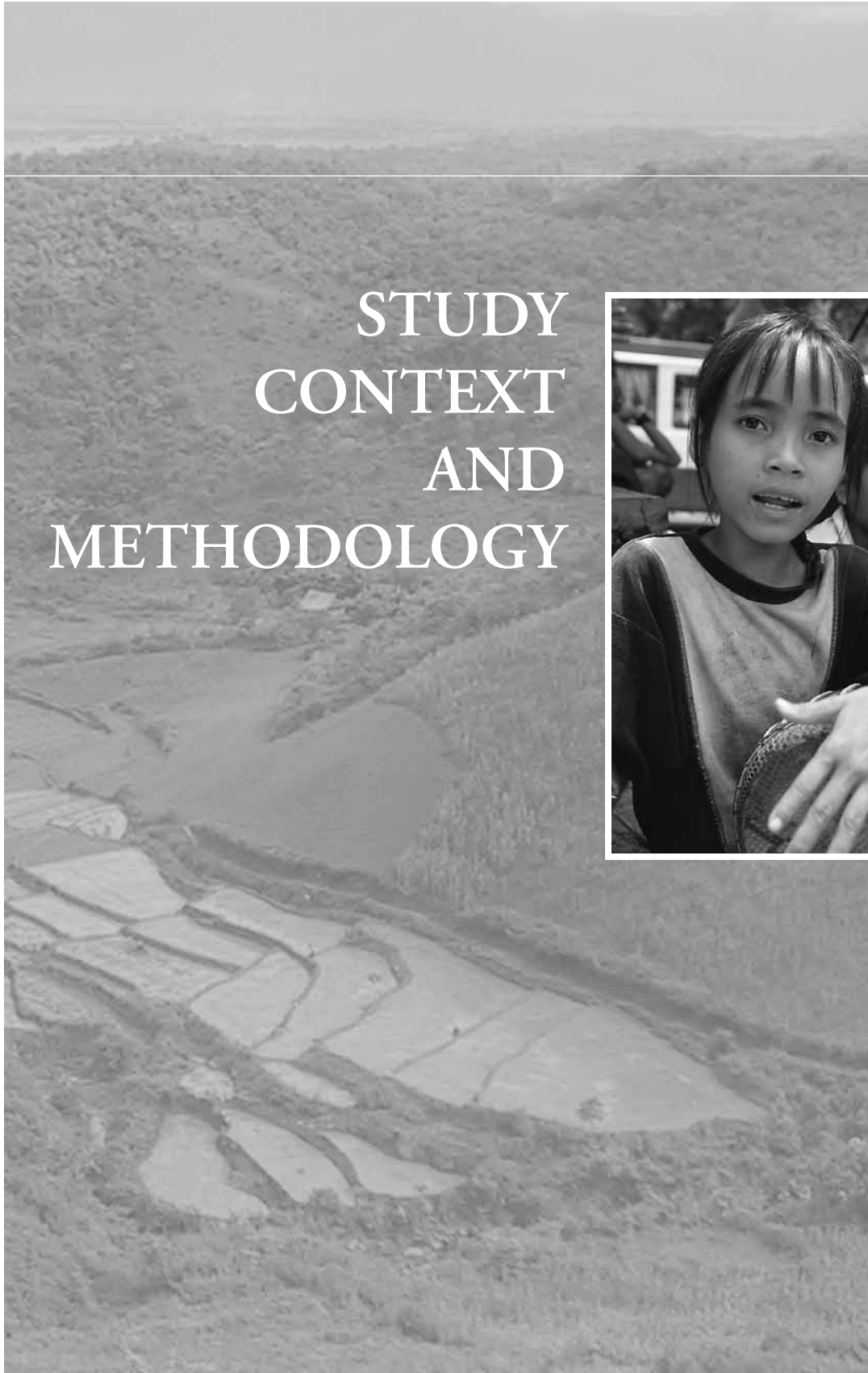
As the team of authors is still working on the overall conclusions and recommendations from the report, we have decided to postpone the inclusion of a comprehensive summary to the report until its final publication.

Wish you good reading of this edition and looking forward to receiving your comments.

PEN Report Authors
June 2006



STUDY
CONTEXT
AND
METHODOLOGY





Introduction

DEVELOPMENT OF THE PEN STUDY

Past World Bank PEN Work in the Sub-region

In order to understand the extent and significance of the PEN in the lower Mekong sub-region and to expand the dialogue between the World Bank and the three countries on the issue, the World Bank launched the first phase of the PEN study in 2001.

Based upon secondary data sources, the study examined seven main environmental indicators¹ for mainly province-level correlations between environment (deforestation, fragile lands, indoor air pollution, lack of access to water, lack of access to sanitation, outdoor air pollution, and number of diarrhea cases) and poverty and found that the nexus is differs between countries.

According to the study findings, the nexus in Cambodia is confined primarily to 'brown' issues such as indoor air pollution, water contamination and lack of adequate sanitation, in Lao PDR it spans across all seven environmental issues, whereas in Vietnam, the study results were somewhat eclectic, suggesting a possible existence of a nexus for fragile soils and indoor air pollution, but relatively weak correlations for the remaining indicators (see Figure I.1).

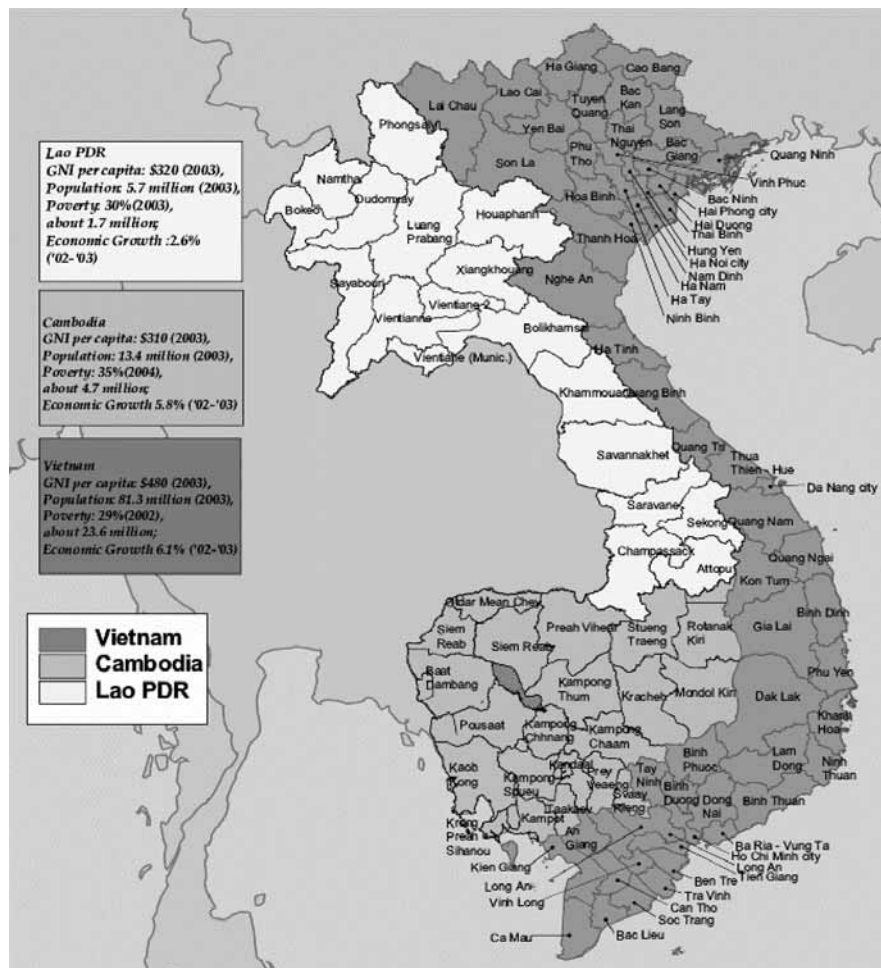
Data availability, particularly to the lack of district-level and more micro-level data, such

as village and commune data, however, constrained the study. Moreover, the study found that the PEN structures are often masked at more aggregated levels and may be revealed only through study at more local levels. These findings and challenges were taken into consideration in the shaping of the second phase of the PEN study that is summarized in this report.

Motivation and Objectives for the Study

This second phase of the PEN study is designed to address several of the unsolved issues faced by the first phase and within the existing PEN literature on Cambodia, Lao PDR and Vietnam. Since the earlier study found that the nexus may often be identified at disaggregated, or local, levels, the analysis in the second phase of the study was conducted both at the regional, provincial and district levels for the national studies (macro-levels) and on the district, village, commune, and household levels in the (case-) studies (micro-level). This combination of macro and micro approaches results in more substantive findings, which are elaborated in detail in the individual country chapters. The intention is that these elaborations may then lead to a better scope for defining policy interventions.

MAP I.1 Provinces and Socio-Economic Indicators for the PEN Study in the Sub-region



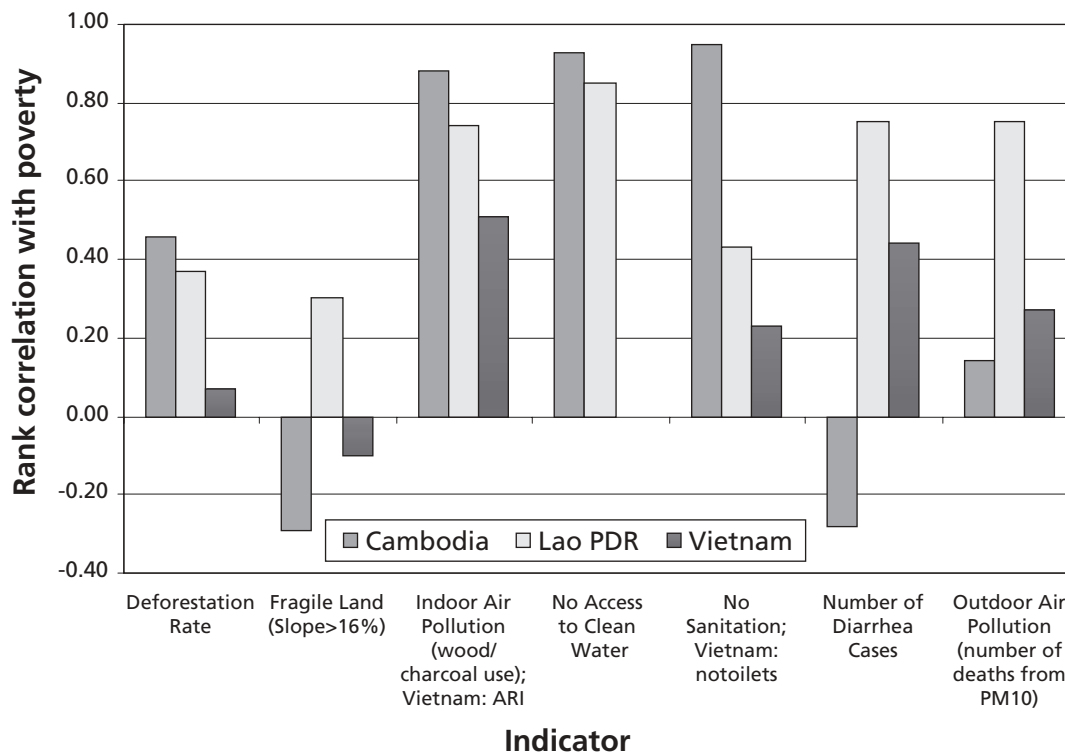
Sources: World Development Report 2005; Poverty Assessment Papers for Cambodia, Lao PDR and Vietnam

The study seeks to reflect the geographic diversity of the poverty and environmental challenges, so it is sufficiently large in both geographic and sectoral scope (see discussion in the individual country chapters 2–4). It is also designed to be policy- and response-driven, so it not only seeks to identify referred PEN hot-spots, where the poverty-environment dynamics is particularly strong, but also to provide basis for mainstreaming the PEN findings into poverty reduction programs in the three coun-

tries. The gradual conversion of the joint strategies for environmental protection and poverty reduction into actual operations is the main long-term development objective of this analytical work.

In summary, the study had three main objectives: (i) further identify and elaborate upon PENs in the three countries, (ii) review policy options vis-à-vis these identified PENs and (iii) establish links to ongoing PEN project initiatives in the sub-region (see Table I.1).

FIGURE I.1 Correlations Between Poverty and Different Environmental Indicators Found from Previous PEN Work in Cambodia, Lao PDR and Vietnam

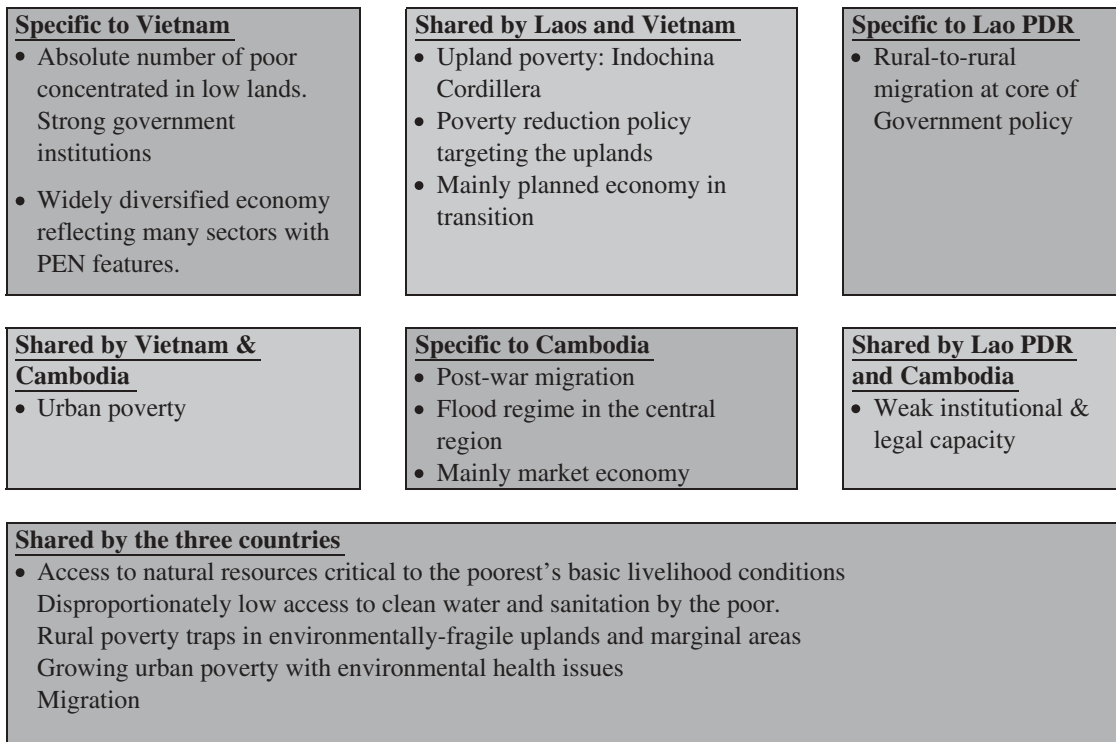


Regional and Country Context

Cambodia, Lao PDR and Vietnam face many common challenges in their quest for economic development and poverty reduction (see figure I.2). An important shared feature is that poverty and environment issues in Lao PDR, Cambodia and Vietnam fall into one of two broad categories: environmental health and natural resource use. This feature is not specific only to these countries, as there is a body of research on poverty and environment linkages that gives this finding global significance.² However, it is a particularly relevant classification, as the national policy frameworks in the three countries already incorporate both the issues of clean water and sanitation and of sustainable use of natural resources into development and poverty reduction strategies.

Based upon both the specific and general environmental and poverty features in the sub-region, several poverty—environment initiatives have been generated by donors over the last years (see table I.1). While most of them originally addressed poverty—natural resource management issues, newer initiatives have also increasingly addressed poverty—environmental health issues. Some of these newer studies have also had multi-sectoral PEN approaches. However, this study may be among the first that tries to address poverty environmental issues throughout the natural resource management and environmental health subjects at both the national and sub-regional levels. As such, this study strives to make a contribution towards a comprehensive understanding of the complexity of poverty—environment linkages in the sub-region.

FIGURE 1.2 General Features of Environment and Poverty in the Lower Mekong Sub-region



What Laos, Cambodia and Vietnam also have in common is fast-growing economies that allow for rapid overall poverty reduction, but also “poverty traps” remaining in the rural sector. These poorer areas are often, although not always, environmentally sensitive areas. High economic growth rates occur jointly with the growth of urban centers³. Urban poverty rates are still low in Vietnam and Laos and decreasing in Cambodia (in geographically comparable areas of Phnom Penh, poverty dropped from 11.4 percent to 4.6 percent between 1993/94 and 2004), but the issue of low-income groups is expected to become substantial in the future. The urban poor population is already facing specific environmental health issues in Vietnam, and so are the populations employed in heavy industries, but, in general, the national policy frameworks appear to devote insufficient attention to this growing issue.

In spite of the many common geo-political and socio-economic circumstances, however, it is important to acknowledge that Cambodia, Lao PDR and Vietnam also confront unique challenges in combating poverty and environmental problems. Their distinctive natural endowments and institutional and policy responses in their economic development, including the transition from socialism to more market-oriented economies, have resulted in relatively distinct development paths, and consequently distinct priorities for environmental management and poverty reduction. The following subsections deal with the specific national contexts of the three countries, which will contribute to a better understanding of the differences in scope, approaches and coverage of poverty and environment linkage areas between the three countries.

TABLE I.1 Relevant PEN Studies in the Lower Mekong Sub-region, 2005 (to be completed)

Donor	Initiative title	Study & methodologies	Sector focus	Country focus	Key issues addressed	Implementation
International Organizations WB	"Poverty Environment Nexus in Cambodia, Lao PDR and Vietnam"	Case studies; mapping PEN correlations; workshops	Forestry, agriculture, industry, pollution management	Mekong Sub-region (Cambodia, Lao PDR, Vietnam)	Linkages between poverty and access to natural resources; forest resource management; access to water and sanitation; pesticide use; and industrial pollution	2003–2006
ADB/CIFOR	"Mapping the Link Between Poverty and Forest Dependence in the Mekong Region for Improved Pro-poor Policies and Projects"	Case studies; mapping forest/poverty correlations; workshops	Forestry	Mekong Sub-region (Cambodia, Lao PDR, Vietnam)	Forest & poverty linkages; forest dependence; innovative approaches to poverty alleviation through forestry	2004–2005
ADB			Poverty and air pollution	Ho Chi Minh City, Vietnam	How to address poor people disproportionately affected by Air Pollution	2005–2007
UNDP/DFID	"Harmonizing Poverty Reduction and Environmental Goals in Policy and Planning for Sustainable Development"	Case studies; economy models; analyzing, modeling and piloting best practices	Forestry, agriculture, industry, energy, pollution management	Vietnam	Forestry and aquaculture; water supply and sanitation; (rural) renewable energy, sustainable energy use	2005–2009
Bilateral Agreements DANIDA	"Mapping of Monitoring Efforts on Poverty and Natural Resources Environmental Management"					
SIDA						

*ADB—Asian Development Bank; CIFOR—Center for International Forestry Research; DANIDA—Danish International Development Assistance; DFID—Department for International Development (UK); UNDP—United Nations Development Program

Cambodia

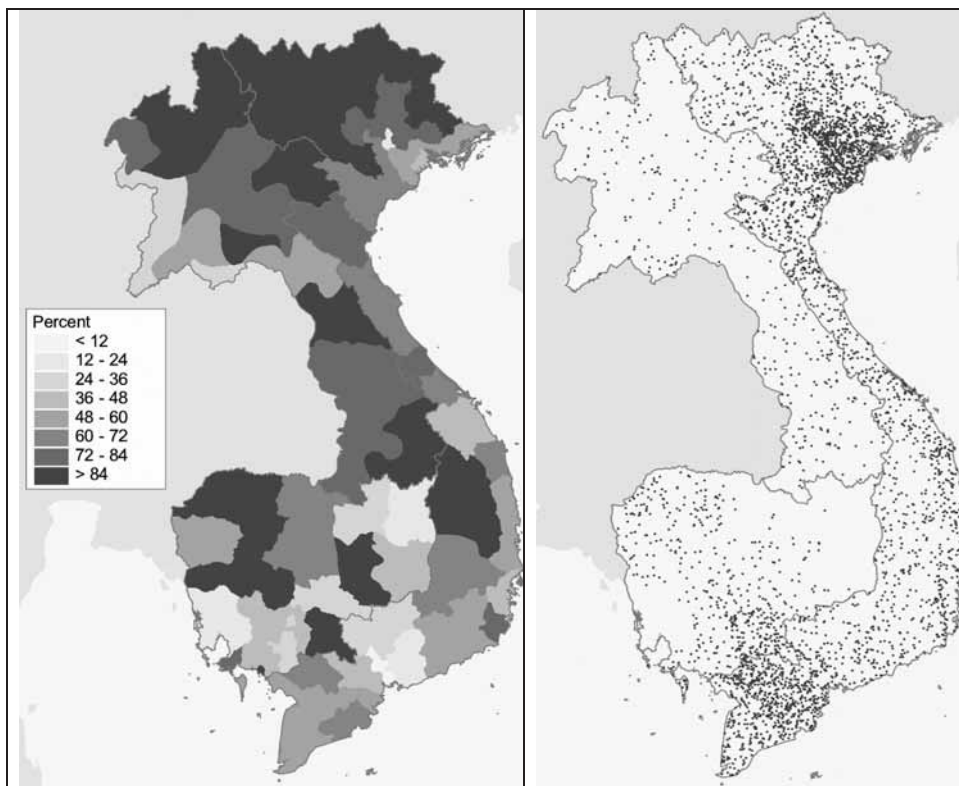
Economic and social context

Cambodia is a small country in Southeast Asia encompassing a territory of about 181,000 km² and a population of 13.6 million in 2004. The country's economic development in the past thirty years has occurred against a backdrop of political instability. The rule of the Khmer Rouge from 1975 to 1979 and the persistent civil strife following the regime's decline have had lasting consequences on the country's economic infrastructure and its human and natural capital. Even though the country is now enjoying peace and greater political stability, it is still struggling to overcome its long legacy of conflict.

The 1990s witnessed a major recovery for the Cambodian economy. Vigorous economic growth of about 7.1 percent per year has resulted in declining poverty rates and increasing real per capita consumption. According to the latest World Bank's Poverty Assessment draft report, poverty incidence in Cambodia declined from 47 percent in 1993–94 to 35 percent in 2004 in geographically comparable areas, and the real per capita household consumption rose about 32 percent from 1993 to 2004. This economic growth has also resulted in improvements in many socio-economic indicators, such as school enrollment, housing quality, etc.⁴

However, poverty reduction and consumption increases were not uniform across the

MAP 1.2 Poverty and Population Density in the Sub-region



Source: East Asia Poverty Reduction and Economic Management, World Bank

country. Rural areas experienced significantly slower growth rates, even though they started off with the lowest average real consumption in 1993/94. This has resulted in a growing income disparity between the rural and urban areas. The Gini coefficient, which measures income inequality, is estimated to have risen from 0.35 to 0.40.

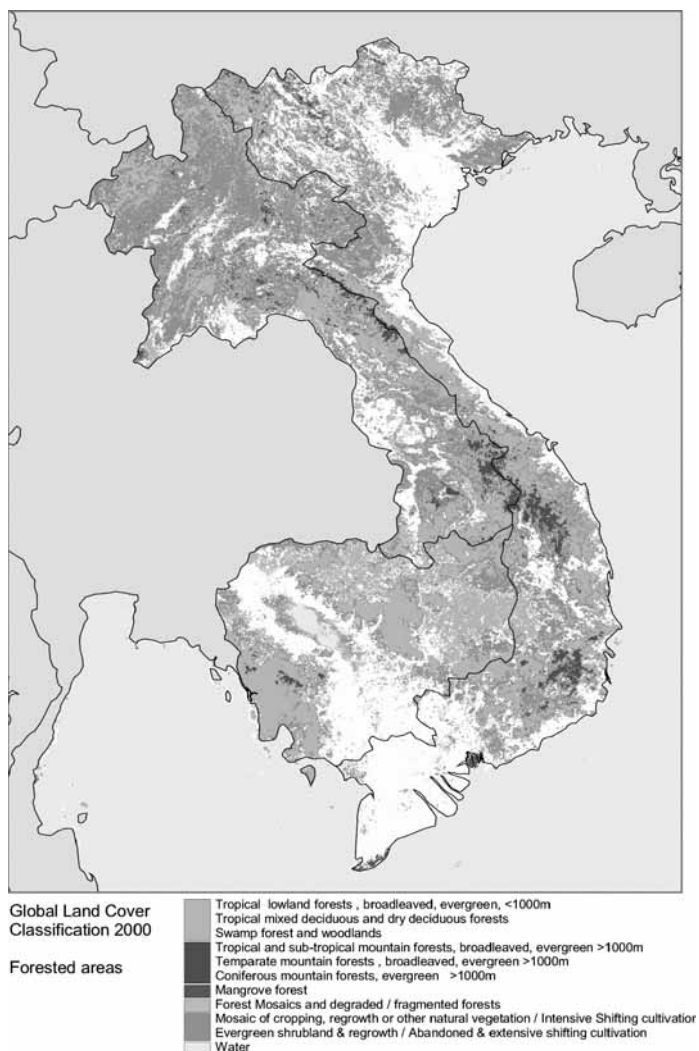
Urban manufacturing, construction, and tourism have been the primary engines of growth in the past decade, and they have concentrated predominantly in Siem Reap and Phnom Penh. Since studies have also shown that the poor have benefited little from remittances,⁵ it is not surprising that this growth has not trickled down more towards the rural areas. Only about 13 percent of all households received such support, and it consisted only of about 8–10 percent of the total household consumption.

The lack of strong development in rural areas is also attributable to the slow growth in agricultural production. Cambodia's crop yields, labor productivity, and land productivity have been and still are among the lowest in Asia. Agricultural production is both dependent upon and significantly impacted by the floods that are a unique feature of the Lower Mekong and Tonle Sap region. Drought occurrence in the country is also common. Vulnerability to natural disasters is, thus, another critical issue in poverty reduction efforts in Cambodia.

Environmental trends

The loss of forest cover, estimated at a rate of 70,000 to 100,000 ha per year, is one of the most alarming environmental trends in Cambodia. The country's forests comprise more than 50 percent of the country's territory and are, therefore, a major source of capital for the Cambodian economy and an important livelihood resource for the poor (see Map I.3). In addition to timber, which is the primary source of fuel for cooking and heat (fuelwood and charcoal comprise about 80 percent of the total energy supply), forests provide the poor with non-timber forest prod-

MAP I.3 Forest Cover in the Sub-region



Source: Global Land Cover 2000 database

ucts (NTFPs), which are used for subsistence and income generation.

Cambodia's poor plateau areas have large areas of fragile lands that are very susceptible to infertility. Their sandy soils have little organic content and limited water retention capacity. Therefore, degradation resulting from inappropriate land use, land clearings, and natural disasters further exacerbates the existing problem of infertile lands

and maintains very low agricultural yields. As the agricultural sector currently accounts about 75–80 percent of the country’s population and accounts for about 40 percent of the national GDP, such pressure on agricultural land resources may have severe impacts on the overall agro-based national economy.

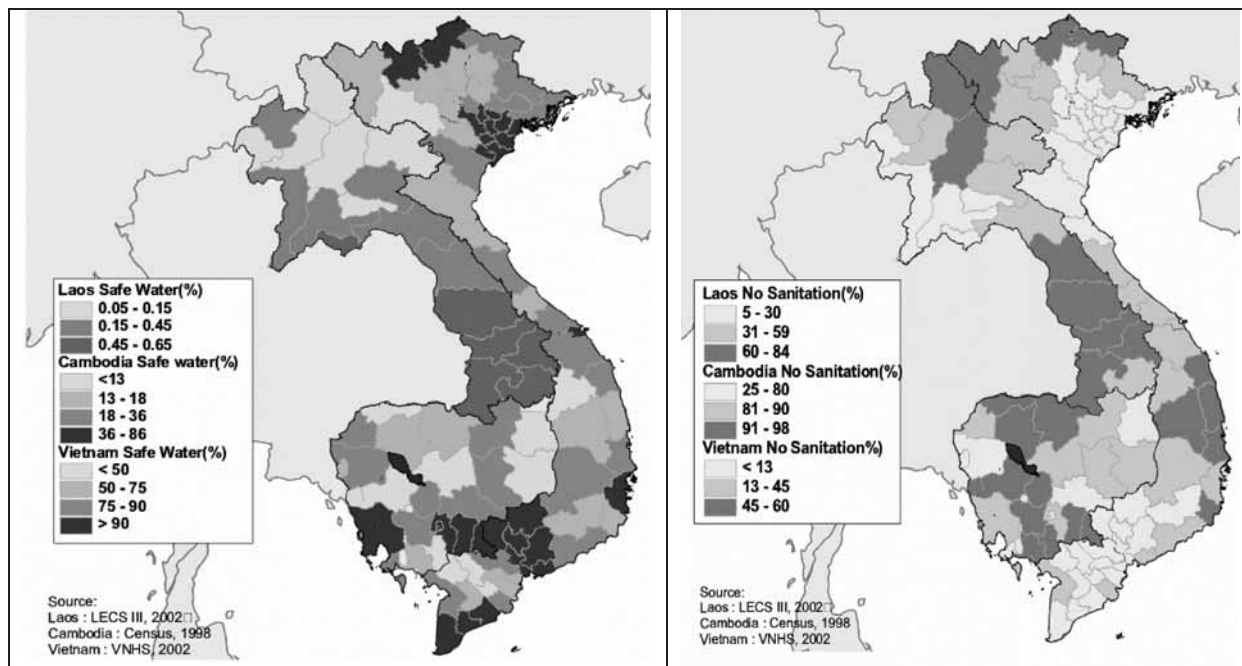
Cambodia is very rich in water resources, most important of which are the Mekong and Tonle Sap Rivers and Tonle Sap Lake. Even though these resources are critical to the country’s continued economic growth, they are increasingly stressed by human activity. Increasing demand for water combined with pollution from agricultural runoff, industrial effluents, domestic sewage and solid waste, are severely threatening the quantity and quality of water supply. Groundwater is similarly impacted. A declining water table is an issue in many areas.

Access to safe drinking water and sanitation is very limited. Only 17.7 percent of the total population has access to sanitation⁶ (see Map I.4). Limited capital prevents the establishment of infrastructures like sanitation and sewage systems, and, if available, limited management prevents most poor people from access and connections. Diarrhea and cholera have become endemic diseases in the country.

Air quality has been declining in Phnom Penh and other urban centers. Steady increases in sulfur dioxide and nitrogen dioxide have been observed along with increasing incidence of respiratory problems in children. The primary pollution sources are industrial emissions from fossil fuels, growing transportation fleet and waste incineration.

Growing solid and hazardous waste is also a major issue. Urbanization, lack of integrated solid

MAP I.4 Access to Clean Water in the Sub-region



waste management system, absence of toxic and hazardous waste disposal facilities and improper management are the main culprits for these troubling trends.

Lao PDR

Economic and social context

Lao PDR is a small, sparsely populated, landlocked country with extensive natural resources. It covers an area of 236,800 km², and its population of about 5.7 million people is growing rapidly. Similarly to Cambodia and Vietnam, the country's economic development in the past decades represents to some extent recovery from the destruction of past conflicts. Lao PDR suffered significant economic losses from the Indochina Wars, particularly the heavy US bombing of the Ho Chi Minh trail. The consequences of the bombings are still visible today. Unexploded ordinances (UXOs), for example, represent a major issue in the eastern and southern part of the country in particular and were covered by the PEN study.

Lao PDR still has limited infrastructure, such as roads, water, electricity and telecommunications. However, it is well-endowed with natural resources, including forests, minerals and water resources.

Much of the country's economic and social character has been defined by its topography (see Map I.5). The upland areas, covering a large proportion of the northern part of the country and border areas in the southern part, are characterized by low potential for sustainable production of annual crops, lack of access to roads (about 30 percent of the villages are not accessible during the wet season, and only 20 percent can be reached by truck at any time of the year),⁷ high poverty incidence and disproportionately high ethnic minority population. The lowlands, on the other hand (especially around the capital Vientiane), have benefited greatly from their developed transportation infrastructure and their proximity to markets.

With the market-oriented reforms of the 1990s, they saw increased economic growth and significant poverty reduction.

On average, the country has achieved important strides in its fight against poverty. Growth has averaged 6 percent per year between 1991 and 2003 and the incidence of poverty has fallen from 46 percent in 1992 to 33 percent in 2003. However, as mentioned above, these benefits have not reached the poorest, most marginalized populations. Many of these communities rely on agriculture as their main source of income, even though their land may not be fit for cultivation. Shifting cultivation remains an important land use system, and its application appears to have both its pros and cons as well as different views about its possible impact on the environment and poverty. As a matter of fact, most shifting cultivation today is rotational agriculture and appears sustainable in districts where rural population densities remain (e.g. below 20 inhabitants/km²). However many districts are already beyond those levels, and land use systems pose issues of sustainability in terms of environment, household incomes, or both.

Environmental trends

The loss of forest resources is one of the main environmental problems that affect Lao PDR. In the 1940s forest cover was estimated at about 70 percent of the total land area, while today that figure has decreased to about 40 percent, which is, in fact, a comparatively high rate (see Map I.3). A related and significant environmental challenge is the depletion of NTFPs, which, like in Cambodia, are a widespread and significant income source in rural areas, including for the poor. The habitat loss for many animal and plant species is a particularly worrisome trend, considering that Lao PDR is one of the most biodiversity-rich countries in Southeast Asia. Loss of topsoil due to erosion is another important issue potentially affecting all sloped land.

Even though Lao PDR has a large per capita volume of renewable water resources, the quality of both surface and groundwater is declining. In addition, access to clean water and sanitation is a major problem. In rural areas, access to clean water is about 60 percent, whereas access to sanitation is estimated at about 36 percent (see Map I.4). There is a high incidence of diarrhea, dysentery and other waterborne diseases. Municipal solid waste is increasing rapidly, and disposal and pollution issues will feature prominently on the government's environmental agenda.

Vietnam

Economic and social context

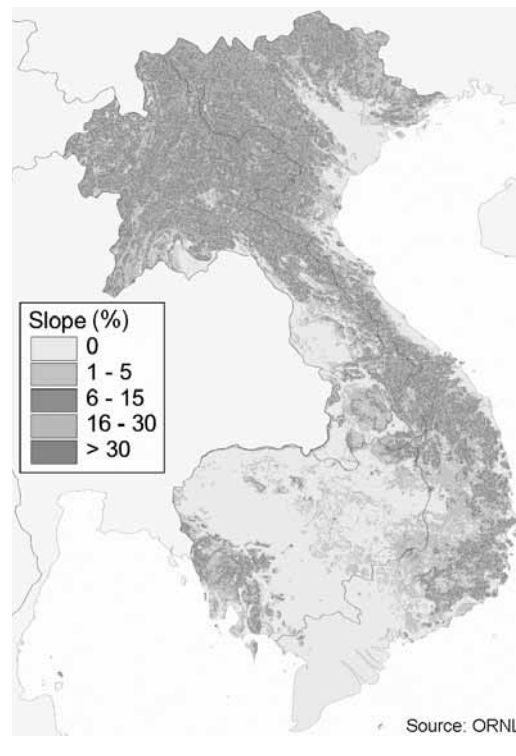
Vietnam is the largest and most populous country in the Mekong sub-region. Its 82.2 million people live on an area of about 331,700 km², which includes lowlands in the Mekong River delta in the South and the Red River delta in the North, and a large proportion of uplands. As in Lao PDR, the different topographical features of the country influence its social and economic context (see Map I.5).

Even though Vietnam has also suffered significantly from its legacy of conflict, including its involvement in all Indochina Wars, it has been moving much faster on the path of economic recovery and consequently has the most developed and diversified economy in the sub-region.

With the second-fastest growing economy in the world after China and estimated growth rates of about 7 percent per year, Vietnam has managed to achieve impressive poverty reduction. A decade ago, nearly 60 percent of the population lived below the poverty line. Today that figure has declined to less than 30 percent. Almost a third of the population—the equivalent of more than 20 million people—was lifted out of poverty in less than a decade.

Progress has also been made in many social indicators. The Vietnam Development Goals

MAP I.5 Land Elevation in the Sub-region



(VDGs), which are the localized version of the Millennium Development Goals (MDGs), demonstrate consistent improvements in school enrollment, infant mortality rates, etc.

While poverty continues to decline, however, the pace of reduction has slowed, and there are increasing disparities between urban and rural areas. In rural areas, unemployment and underemployment are high, compelling many young people to join the work force. Moreover, poverty reduction has been significantly lower among ethnic minorities compared to the rest of the population.

The sustained economic expansion has primarily been driven by the agricultural sector (the Mekong and Red River deltas are among the most productive and intensively cultivated areas in Asia), including the expansion of cash crops

particularly coffee and sugar cane. However, the country has also built up a relatively strong industrial base, which has created opportunities for many low-skilled workers in the cities.

Environmental trends

Unlike in Cambodia and Lao PDR, forest cover in Vietnam has been increasing in the past decade, a trend that is taking place together with a partial shift of the forestry sector towards environmental objectives instead of production objectives, with intensification of farming systems and with land tenure on sloped land (see map I.3). At the same time, however, forest quality has continued to decline. Closed-canopy forest has dropped from almost 100 percent of forested areas a century ago to about 13 percent today.

Unsustainable use of fragile lands in Vietnam is a major environmental threat, and steep slopes in upland areas make soils more susceptible to erosion when pressure from agricultural uses increases. Salinization in the Mekong delta affects the quality of drinking water in the area. Groundwater contamination resulting from the salt-water intrusion impacts drinking and industrial water as well as ecosystems and agricultural production.

As in Cambodia and Lao PDR, access to clean water is a major problem, even though the country is well-endowed with water resources (see map I.4). In 2000, only 52.2 percent of the population had access to safe water. With water demand increasing rapidly due to growing urbanization and industrial demand, access to clean water can become an even more critical issue in the future.

Industrial pollution affects water and air quality, and thus has serious health implications for the population that may disproportionately affect the poor. Pollution primarily affects surface waters. Many of Vietnam's rivers that flow through urban and industrial areas are heavily polluted. Biochemical-oxygen demand (BOD) and Ammonia-Nitrogen levels, which indicate

the extent of organic pollution in the rivers, exceed national water quality standards by several times. Lakes, small streams, and canals are also severely polluted.

Urban air pollution is increasing due to a growing motor vehicle fleet, and growing industrial emissions. Fossil fuel consumption by power plants, which generate about 60 percent of the country's energy needs, emits high levels of polluting gases such as sulphur dioxide, carbon monoxide, nitrogen oxides and fine particulates. Other industrial sectors, such as metallurgy and the chemical and cement industries, also generate significant levels of pollution.

PEN STUDY DEVELOPMENT AND SUBJECTS

Study Selection and Implementation

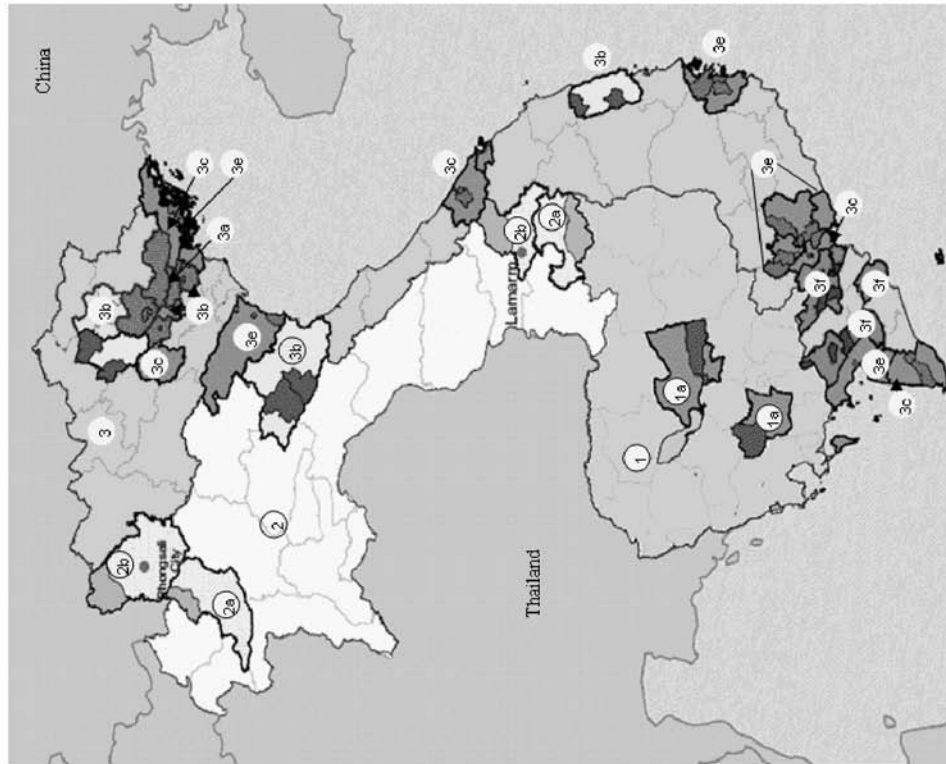
The study selection process included not only the selection of poverty and environment linkage areas to be examined, but also the appropriate geographic locations for each study. The location of the studies was chosen in order to satisfy two major objectives.

First, the PEN study sought to cover sufficient geographic area so as to adequately represent the geographic diversity in each country (map I.6). For example, studies were located in upland, lowland and piedmont areas (Figure I.3), as well as in the northern, and southern areas in Lao PDR and northern, central and southern areas in Vietnam, which have many geographic, social (including ethnic), economic and political diversified features.

Second, the study locations also sought to explore the contrast between high- and low-income provinces and between other high- and low-income administrative units within the provinces. In Lao PDR, the geographical focus of the PEN studies was determined to a significant extent by the Laotian government's selection inputs, which reflected its own poverty priority locations (ex. 47 poverty priority districts).

MAP 1.6 Access to Clean Water in the Sub-region

PEN Study Locations in the Subregion



(1) Cambodia:
(1a) Access to natural resources for Poor versus non poor
 Provinces: Kampong Speu and Kampong Thum
 Districts: Santuk (3 villages) and Aoral(3 villages)

Lao PDR(2):
 A package of 5 PEN sector studies:
(2a) NTFP & cultivation methods & poverty
 Provinces: Oudomxay and Attopu
 Districts: Namoi and Phouwong
(2b) Road access & poverty
 Provinces: Phongsaly and Sekong
 Districts: Nhot Ou and Kalkum
(2b) UXO contamination & poverty
 Provinces: Sekong
 Districts: Kalkum
(2a) and (2b) WSS & poverty in rural areas
 Provinces: Phongsaly, Oudomxay, Sekong and Attopu
 Districts and cities: Nhot Ou, Phongsaly city, Namoi, Kalkum, Lamam city, Phouwong
(2b) WSS & poverty in 2 urban areas
 Provinces: Phongsaly and Sekong
 Cities: Phongsaly city and Lamam city

(3) Vietnam:
(3a) Cau river Basin Integrated PEN Study
 Provinces(No. of dists.): Bao Lang(10), Bao Cam(6), Bao Ninh(6), Hai Phong(12), Thai Nguyen(9) and Vinh Phuc(6)

(3) Vietnam:
(3b) Land Administration – Poverty Case Study
 Provinces(no. of dists.): Binh Dinh(2), Tuyen Quang(2), Nghe An(2)
 Districts: An Lao, Tay Son, Na Hang, Ham Yen, Tuong Duong, Con Cuong.

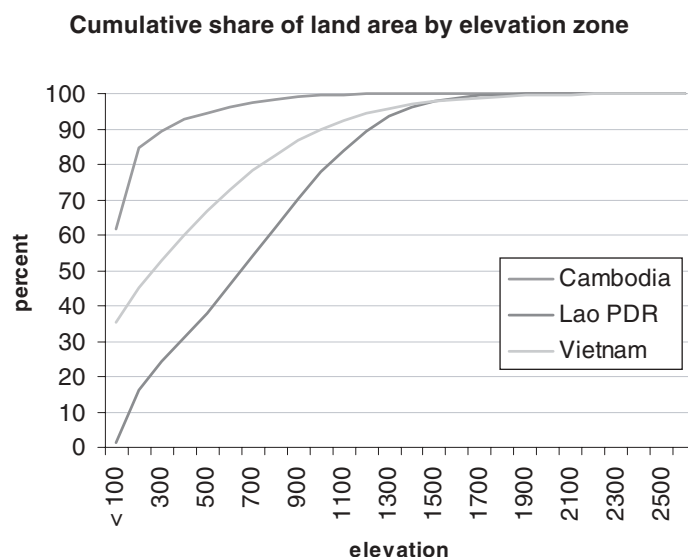
(3) Vietnam:
Industrial pollution & Poverty Case Study
A. Case Studies
(3c) Industrial City Hotspots provinces (no. of dists.): Quang Ninh(2), Thuan The Huen(2), Da Nang City(4), HCM city(4) and Ca Mau(2)
(3d) Craft Villages provinces (no. of dists.): Ha Tay(1), Ha Noi City(4), Bac Ninh(1), Hung Yen(7) and Thai Binh(7)
(3e) Other Studied Provinces(dists): Ba Ria Vung Ta, Binh Duong(3), Dong Nai(4), Hai duong(2), Hai Phong city(6), Khanh Hoa(3), Kien Giang(1), Phu To(4), Thanh Hoa(3), Vinh Phuc(3)

(3) Vietnam:
(3f) Pesticide use – Poverty in 6 provinces in the Mekong River Delta
 Provinces(no. of dists.): Long An(2), An Giang(2), Tien Giang(2), Can Tho(1), Ha Giang(1) and Tra Vinh(2)
 Districts: Tan Thanh, Thu Thau, An Phu, Chau Thanh, Cai Lay, Cho Gao, Thot Not, M Thanh, Tieu Can and Tra Ou

(3) Vietnam
Water, Sanitation & Health Survey
 based on national health survey reflecting all provinces in the country

FIGURE I.3 Elevation Distribution in Cambodia, Lao PDR and Vietnam

	Cambodia	Lao PDR	Vietnam
< 100	61.5	1.4	35.5
101–500	33.1	36.5	31.3
501–1000	4.9	40.0	23.2
1001–1500	0.5	20.0	7.9
1501–2000	0.0	1.9	1.7
> 2000	0.0	0.1	0.4



Source: East Asia Update—Strong Fundamentals to the Fore—Regional Overview, April 2004, East Asia and Pacific Region, The World Bank.

In addition, in both Lao PDR and Vietnam, considerations were also made about addressing parts of the country that had not necessarily been approached by international agencies (donors) before. In fact, it was recognized early on that the poorest parts of the countries had not necessarily been the main recipients of donor assistance.⁸

The choice of the poverty-environment linkage areas covered by the studies was subject to a wider range of criteria. The environmental priority issues identified in the countries' development and poverty reduction strategic plans provided critical guidance in the selection of the PEN studies. In addition, a set of selection criteria were developed in the dialogue with the governments, which identified sectors affecting the highest number of poor people (table I.2). Other selection criteria included: i) the severity of environmental impact (on income, health, vulnerability), whether the impact was alleviated by national economic growth, the local institutional and financial capacity to deal with the problem; and

ii) the cost effectiveness (including administrative cost) of interventions.

Therefore, the final decision about study areas drew a balance between analytical research objectives as well as policy objectives by the host countries.

After careful consideration of the selection criteria in a dialogue with multi-ministerial representatives in each country, the following environment and poverty linkage areas were chosen for the studies:

In Cambodia, the study examined the linkages between poverty and access to natural resources, including agricultural land, forest products, grazing land, fisheries and drinking water.

In Lao PDR, the PEN studies examined linkages between forest resource management (NTFP, roads and UXOs) and poverty, and between water supply and sanitation (rural WSS and urban WSS) and poverty.

The PEN studies in Vietnam included: land administration, environment and poverty; Cau

TABLE I.2 Estimated Population Affected by Environmental/Health Indicators

Environment & Health indicator:	Cambodia		Lao PDR		Vietnam	
	Estimated Number of People Affected	% of poor population	Estimated Number of People Affected	% of poor population	Estimated Number of People Affected	% of poor population
Decline in Forest resources*	66 percent	70 percent	More data needed	More data needed	More data needed	More data needed
Use of fragile land	More data needed	More data needed	< 20percent	< 45 percent	More data needed	More data needed
Fuelwood/indoor air pollution	90 percent	99 percent	95 percent	98 percent	80 percent	> 90 percent
Lack of water supply**	16 percent	22 percent	20 percent	30 percent	15–20 percent	25–30 percent
Lack of sanitation	60 percent	80 percent	40 percent	70 percent	10–12 percent	30–35 percent
Households always boiling drinking water	60 percent	35 percent			80 percent	60 percent
Drought***	12 percent	16 percent	0.2 percent	1.7 percent	More data needed	More data needed
Flooding***	24 percent	23 percent	5 percent	1 percent	1.3 percent	1.1 percent
UXO/Minefield contamination****	19 percent	28 percent	20 percent	28 percent		

* Cambodia: From 2005 survey on communes reporting status and trends in natural resources, combined with CSES 2004 consumption survey data. ** This is use of open, unprotected water sources (river, ponds and streams) in Cambodia and Lao PDR), and open, unprotected water sources and dug wells with nearby pollution sources in Vietnam. ***The data are not comparable across countries due to substantial differences in definitions. **** Estimated by combining data from household consumption surveys and UXO/minefield surveys. Cambodia: Minefield and Cluster bomb contamination from 2002 survey. Lao PDR: UXO contamination from 1997 survey.

River basin, poverty and environment; pesticide use and poverty, industrial pollution and poverty; and water supply and sanitation and poverty. The more diversified PEN study structure for Vietnam is a result of this country's more diversified economy and the consequent greater variety of environmental issues with poverty implications.

Policy Orientation

The expert team utilized the national five-year plans, national poverty eradication strategies and poverty reduction strategy papers, which are jointly prepared by the national governments and the World Bank, as an important framework for the development and implementation of the PEN study. They served not only as indicators of government priorities for interventions in poverty and environment issues, but also as ways to assess where the biggest gaps and shortcomings are in targeting and addressing poverty-environment issues, in order to ensure that the outcomes of the PEN study could be utilized to fill those gaps (see Table I.3).

These documents demonstrate that there is some recognition within the governments of Cambodia, Lao PDR and Vietnam of the potential for jointly addressing poverty and environment issues. However, there are many issues that deserve greater attention and more immediate interventions, and the PEN study seeks, among other things, to highlight those issues and bring them forward on the governments' agendas.

Moreover, the PEN work has already provided some valuable inputs into these documents. The most substantive contributions were made towards the Lao PDR National Poverty Eradication Program and the Lao PDR Poverty Assessment. In both of these documents, a separate section (NPEP) and a chapter (PA) were devoted to findings from the PEN study. In Vietnam, PEN approaches were also incorporated in the Ministry of Planning and Investment work related to the Five Year Plan. Lastly, the Poverty Assessment in Vietnam used the initially-developed PEN approach of grouping

the population in quintiles (strata) to distinguish between the different levels of access to water, sanitation and health coverage.

Inclusive Approach and Country Ownership

High country ownership was one of the most important considerations in the design process for this study. The World Bank staff worked closely with local experts and government officials from the initiation of the study to its completion in order to ensure sufficient input from the local counterparts as well as shaping of the study and its outcomes to fit the government's objectives for poverty reduction.

The local counterparts were involved significantly into the selection of the study locations and were responsible for implementation of local surveys.¹⁰ They remained involved throughout the completion of the study through continued dialogue and data sharing with the World Bank staff as well as through consultation workshops and conferences that provided opportunities for knowledge-sharing and enhancing the understanding of how the PEN findings fit into the governments' poverty reduction agendas.

Partnership and Cooperation

The focus on country ownership provided basis for continuous dialogue and cooperation between the World Bank staff and the counterparts in Cambodia, Lao PDR and Vietnam throughout the completion of the study. Cooperation was established with numerous government institutions and local non-governmental organizations (NGOs).

In Cambodia, the authors worked closely with the National Institute of Statistics in obtaining data from the Population Census. In Lao P.D.R, important poverty data was supplied by the National Statistics Center. In Vietnam, the district-level data were assembled by MoSTE, GSO and the Ministry of Health.

TABLE I.3 Poverty-Environment Issues in Relevant Analytical and Planning Documents⁹

Relevant country documents	Key report statements/targets		
	Cambodia	Lao PDR	Vietnam
Five-Year Plans	<p>National Strategic Development Plan 2006–2010</p> <p>Main poverty-environment targets: increase access to safe water to 45% in rural and 85% in urban population; increase access to sanitation to 22 percent of rural and 67 percent of urban population; increase forest cover to 60 percent of the total area; and reduce fuel wood dependency in households from about 85.5 percent to about 61 percent of total population.</p>	<p>Five-Year Socio-Economic Development Plan 2006–2010</p> <p>Key environment-poverty targets: increase in forest cover to 53–55%; increase in the provision of clean water to rural areas to about 65% of rural population; reduction in mortality rates of children under 5 to less than 30%; elimination of shifting cultivation by 2009–2010; assignment of land and forested areas to 3782 villages and 268,245 households between 2006 and 2010</p>	<p>Five-Year Socio-Economic Development Plan 2006–2010</p> <p>Main poverty-environment targets: increasing forest cover by 43%; increasing protected areas (esp. wetlands) by 11.2%; increasing access to clean water to 95% of urban and 75% of rural population; improving residential and industrial solid waste collection to 80–90%; improving industrial wastewater treatment and treatment of hazardous waste.</p>
Poverty Reduction Strategy Papers	<p>National Poverty Reduction Strategy</p> <p>"Increasing opportunities for the poor is the key element in protecting environment since natural resources are eroded when the poor do not have alternative means. Natural resource degradation is in part due to exploitation by the rural poor, who are seeking to satisfy their basic needs. Reducing rural poverty is therefore essential to achieving sustainable development in Cambodia."</p>	<p>National Poverty Eradication Programme</p> <p>"Poverty eradication activities should not degrade [the] quality and quantity of the environmental resources that the poor depend on, and (ii) Improving environmental conditions can lead to sustainable poverty eradication. Targeted poverty/environment linkage areas: deforestation and agricultural land; use of fragile land; water resources and environmental health; biodiversity; natural disaster vulnerability."</p>	<p>The Comprehensive Poverty Reduction and Growth Strategy</p> <p>"Harmoniously combine socio-economic development with environmental protection and improvement and ensure that all people are able to live in a healthy environment. Actively integrate environment issues in plans, programs, and projects and make it a criterion for evaluating development measures. Integrate fully the environment and natural resource issues into the master plan for socio-economic development in provinces, districts, and ensure that the development is sustainable and does not cause degradation in natural resources."</p>

Country Assistance Strategies

The second objective of the Cambodia CAS's first pillar is to improve natural resource management. Through lending and AAA, the Bank expects to achieve the following outcomes:

- improved provincial land use management;
- accelerated land distribution & increased number of secure land titles;
- transparency in generation of public & commercial benefits from forests;
- expansion of community forestry;
- improved policies & institutions for protected areas management.

Under the first objective of the CAS, the Bank's long-term and higher order outcomes for Lao PDR include:

- improving governance and environmental management of natural assets;
- strengthening the collection and use of revenues from natural resources to help reduce poverty;
- maintaining productive forest cover as part of rural livelihoods;
- reducing deforestation rates;
- improving rural livelihoods.

The draft version of the latest CAS for Vietnam addresses both natural resource management and environmental health issues. Primary focus areas in NRM include forestry land, community-based land management, and the conversion of agricultural land; allocation of land titles, particularly in uplands; biodiversity conservation. World Bank projects in environmental health in urban areas will focus on waste water and waste management (PCB and hazardous waste management, other industrial pollution) and carbon finance.

Poverty Assessments

"The Poverty Assessment highlights trends in poverty in the past decade with some specific focus on education, health, and agriculture and rural development. However, a separate chapter devoted to poverty-environment linkages—similar to the one prepared in the Lao PDR Poverty Assessment—has not been included. The intention of Chapter 2 of this report is to provide such information"

The latest poverty assessment for Lao PDR highlights the strong poverty reduction in the country in the past decade, but also recognizes numerous poverty-related areas, where more work is needed. It highlights the strong geographic features of poverty in the country, the disproportionately higher poverty among ethnic minorities as well as the slow progress in improving many social indicators. The report states that poverty is linked to environmental conditions and dedicates a chapter to the environment, which is mostly based on findings from this PEN study. The NRM section of the chapter covers forest resources, land resources, UXOs and natural disasters. The environmental health section focuses on access to clean water and sanitation as well as indoor air pollution.

The Vietnam Development Report 2004, which focused on poverty, does not highlight environmental issues as contributors to poverty, but does discuss environmental health issues, such as access to clean water and sanitation, as important aspects of poverty and inequality in the country. The newest update on the Poverty Update in Vietnam (from 2006) shows further reductions in poverty, even if they are still relatively unequally distributed between the different regions. The statistics show a reduction in the urban-rural ethnic divide, but the ethnic minority population lags farther and farther behind in poverty reduction. Ethnic minorities comprise 39% of the total number of poor.

Cambodia's Ministry of Environment and the Ministry of Planning in Lao are expected to play a key role in the mainstreaming the PEN findings in their respective National Poverty Reduction Strategy (NPRS) processes. In Lao PDR, the Science Technology and Environment Agency (STEA) and the Committee for Planning and Cooperation (CPC) will be the key partners in integrating the PEN results in the National Poverty Eradication Program (NPEP). The recently set up Ministry of Natural Resources and Environment (MoNRE) and the Ministry of Planning and Investment in Vietnam will provide support in incorporating the PEN findings in the CPRGs.

To sustain the dialogue and cooperation throughout the process of completion of the study and to share findings and knowledge from the three countries' PEN work, the World Bank and its partners organized a series of sub-regional workshops (see table I.3).

In completing the study, the World Bank staff also worked closely with international organizations such as the World Food Program (WFP), the Mekong River Commission (MRC), the World Health Organization (WHO), the United Nations Population Fund (UNPF), the United Nations Children's Fund (UNICEF), and the United Nations Development Program UNDP).

IV. Structure of the Report

The paper is organized as follows. Part I consists of one chapter that provides a detailed description of the methodology and data sources applied to the PEN studies in each country. Part

II consists of the three country chapters, which present the findings from the studies in each country. The sub-regional findings and conclusions are presented in Part III of the paper.

The separate studies reflecting findings from each of the study areas (map I.6), national PEN analyses and additional supporting material is provided in the CD-ROM attachment.

Endnote/Reference:

To follow:

1. The study itself included 5 environmental indicators as access to water, sanitation and health impacts were clustered into one indicator.
2. Examples are the jointly DFID, EC, UNDP and World Bank-prepared "*Linking Poverty Reduction and Environmental Management—Policy challenges and Opportunities—A contribution to the World Summit on Sustainable Development Process*," the World Development Report 2003 "*Sustainable Development in a Dynamic World Transforming Institutions, Growth, and Quality of Life*," and Poverty—Environment material issued in the World Bank Environmental Economics Series.
3. There are 4 large urban centers in the sub-region: Hanoi, Ho Chi Minh City, Phnom Penh and Vientiane.
4. Cambodia Poverty Assessment Draft Report.
5. Cambodia: Poverty Assessment, presentation of preliminary findings, October 13, 2005.
6. The World Bank's Cambodia Environmental Monitor for 2003.
7. NSC-Lao PDR 1999 (Social Atlas of the Lower Mekong Basin).
8. This fact appears also to be the case for Cambodia—refer to draft Poverty Assessment.
9. The PEN study contributed to the following documents: Lao PDR PRSP and Poverty Assessment and Vietnam's Five-Year Plan and Poverty Assessment. The Vietnam PRSP was prepared prior to the PEN study's completion.
10. Refer to comprehensive reports for local surveys in the CD-ROM attached to the report.

Study Framework and Methodology

INTRODUCTION

There is broad agreement in the development literature that there is a close link between poverty—and human welfare more generally—and environmental quality. The existence of such a link is intuitively credible, given that degradation of natural systems adversely affects the livelihoods of people who depend on these resources for agriculture, forestry, and fisheries. Similarly, environmental degradation in the form of air, land, and water pollution is often higher in marginal settlements in undesirable areas. These tend to be areas with a high concentration of poor residents. Contaminated air and water leads to health problems, which in turn reduce the ability to pursue income-earning or livelihood-enhancing activities.

The strength and direction of the relationships between poverty and environmental conditions continue to be ill-defined. It has been difficult to confirm the existence and nature of these links in empirical studies. In a review of forestry and poverty, Angelsen and Wunder (2003) call such relationships a “controversial link.” At a macro level, some researchers believe that in early stages of development some environmental degradation is unavoidable—a necessary trade-off that will be reversed with increasing wealth. The implication is that countries should accept increased pollution and environmental degradation as the price to pay

for faster growth and poverty reduction. Greater wealth will then enable a society to restore environmental quality later. Empirical evidence to support the existence of these dynamics and thus the benefits of such strategies has been mixed (Ansuategi and others 1998; Dasgupta and others 2002; Perman and Stern 2003).

In fact, much of the work on the poverty-environment nexus shows that the dual development objectives of maintaining environmental quality and increasing living standards do not have to be contradictory, even at earlier stages of development. The full costs of environmental degradation include loss of productivity and increased demands on social systems due to the environmental health burden. A potential long-term stream of future benefits from sustainably managed natural resources remains unrealized when such resources are irreparably damaged.

Typically, poor people, especially in rural areas, depend directly on the natural resource base and therefore carry the largest burden from pollution and degradation of natural resources (Ekbohm and Bojo 1999). Deterioration or destruction of natural resources tends to be triggered by demand or profit-seeking from wealthier people through large-scale logging, depletion of water resources, soil degradation, land degradation due to overgrazing, or pollution from agro-chemicals. The poor often fail to obtain a fair share of the bene-

fits of rapid industrialization and natural resource exploitation. Where the poor contribute to land degradation, it is often due to population pressure that forces overexploitation of a shrinking resource base, frequently in already marginal areas. In many areas, rising populations are due to voluntary or prescribed in-migration rather than natural growth of population. Such situations often coincide with a breakdown of traditional resource management systems that helped maintain an environmental balance. While development in the form of higher living standards in the long run can help reduce direct pressure on natural systems, the short-run objective is to find new regimes that regulate access to resources for sustainable use or effective protection. Such systems need to be developed by or evolve in close collaboration with local communities. It is the quality of this response that determines whether population growth and economic dynamics lead to further degradation or whether the outcome combines improved living standards with better natural resource management.

In the context of the World Bank poverty reduction and environmental strategies, a main objective is therefore to ensure that poverty alleviation activities should not damage the environment on which poor people depend, as this would essentially trade off gains in one area for losses in another (World Bank 2005a). More pro-actively, poverty reduction strategies should also aim at improving environmental conditions that can help reduce poverty (Bojö and others 2001; 2004). In this context, the Southeast Asia PEN study aims to contribute to the debate by providing empirical evidence on relevant linkages in a variety of environmental sub-sectors and geographic settings. The overall goal is to help identify strategies and interventions that improve people's lives and maintain environmental quality.

This chapter is composed of three main sections. First, it provides a brief review of poverty concepts and main environmental issues in Southeast Asia. The second section describes conceptual and methodological issues pertinent to poverty-

environment analysis—especially as these relate to geographic aspects. Some of the common elements in the PEN methodology used in the national and regional analyses are highlighted in the final section. The country chapters contain additional information on data collection and implementation issues that are specific to each of the case studies.

Poverty and Environment Concepts

Poverty

Poverty is a multi-dimensional concept and there is continuing debate about how poverty should be defined and measured. A comprehensive overview of poverty concepts is provided in the World Bank's World Development Report on *Attacking Poverty* (2001a). This report stresses that poverty is not just a matter of material deprivation, but also relates to broader notions of risk, vulnerability, social inclusion and opportunities. Poverty encompasses all forms of deprivation that prevent a person from achieving their aspirations. This wider range of poverty dimensions also has policy implications as it acknowledges the mutually beneficial interactions from interventions in a broad set of welfare dimensions. In practice, it is the nature of the problem that is studied that will determine which welfare measure is most appropriate. This section will briefly review a number of poverty concepts that are relevant for applied policy research on poverty-environment linkages.

The concept of poverty that most closely matches most people's notions is *absolute poverty*—the ability of people to satisfy their basic needs in terms of nutritional intake, shelter, basic amenities, and the ability to take advantage of opportunities such as education. Living standards are determined as the consumption expenditure equivalent of market and non-market goods that are required to satisfy these basic needs. This level is called the *poverty line*. Poor households are those whose consumption falls under the level that is considered sufficient to maintain

basic needs. The degree to which the household is falling short is called the *poverty gap*, the sum of which for the entire population is an estimate of the monetary resources required to lift everyone out of poverty. A further commonly used measure, the squared poverty gap or *poverty severity*, gives extra weight to people who are far below the poverty line. This measure therefore better incorporates inequality among the poor and within the population as a whole. Consumption expressed in monetary terms provides perhaps the most objective way of comparing living standards, and methods for data collection and analysis are well developed (Ravallion 1994; Deaton 1997). Most comprehensive poverty assessments employ this approach, often in combination with other methods. Alternative indicators can provide more direct information on welfare outcomes. For instance, nutritional status as indicated by stunting or wasting is used in Demographic and Health Surveys and in food security assessments. Similarly, one could define education poverty on the basis of literacy rates or test score achievements.

In contrast to absolute measures of poverty, *relative poverty* focuses on inequality across a population in the distribution of consumption, assets, education, or any other welfare measure. This is relevant for targeting interventions to the population groups at the bottom of the welfare distribution. But it is also relevant in its own right, because severe inequality is considered detrimental to the overall development prospects of a country (World Bank 2005).

Where detailed poverty data are unavailable, policy researchers sometimes use a simple asset-based indicator of human welfare. This may be an index of ownership or availability of certain goods or services such as a vehicle, good quality housing, agricultural land holdings, or connection to utilities (Filmer and Pritchett 2001). In the absence of detailed consumption data, these asset-based indicators can reflect the nature of the problems faced by the communities, especially in rural areas. An asset index can also be

more easily designed to match a particular issue under study. The problem with service access, asset, or wealth indexes is that there is no universal methodology for creating them. For instance, individual components of the index could be weighted by perceived importance or simply added up. This can create a high degree of subjectivity and limits interpretation and comparability.

Broader concepts of poverty have been proposed to more closely address the issue of opportunity. Rather than looking at income or consumption itself, the sustainable livelihoods approach, for instance, focuses on the types of resources that determine a household's standard of living. These are summarized by five types of capital: natural, social, human, physical, and financial.¹ In this framework, the environment is seen as the sum of the resource stock accessible to households; that is, its natural capital. Other forms of capital come into play by substituting or modifying the relationship with the environment. These livelihood concepts have the advantage that they explicitly consider access to assets such as resource stocks in determining poverty levels. But they are often more difficult to operationalize than standard poverty measures, since the components do not always correspond to easily measurable and comparable indicators. As such, they are most useful as a conceptual model that can guide more informal and qualitative poverty analyses, like those in several of the PEN case studies.

A further aspect of well-being is vulnerability, which captures the risk of being poor or falling into poverty at some point in the future. Vulnerability strongly affects choices and options, for instance with respect to food production or investment in productive activities. For example, farmers close to the subsistence minimum are rarely able to risk adoption of unproven but potentially superior new varieties or techniques. Coping capacity in the presence of fluctuating incomes also affects the subjective perception of a person's well-being. The ability to deal with

sudden shocks and the existence of safety nets provide a feeling of security, which influences people's actions. These concepts are highly relevant to the analysis of human welfare, but in practice they are difficult to measure systematically. Likewise, vulnerability is also relevant when applied to issues such as health. Poorer persons with less access to healthcare will be more vulnerable to environmental and other health problems than people who have access to safety nets or other coping mechanisms.

The various PEN studies described in the following chapters employ poverty concepts that are most appropriate in the specific context. The regional analysis in Phase I largely followed the poverty definitions used in national poverty assessments. The core indicator is typically the proportion of individuals or households that fall short of consumption expenditures that support a food intake of more than 2,000 calories per person, plus minimum non-food expenditures. This indicator is called the poverty headcount index and the threshold level, the poverty line, is defined somewhat differently in each country.² The national analyses in the second phase of the PEN study used the same concepts where data were available, but augmented the set of indicators with specific outcome measures such as health status. A key component of the spatial analysis of PEN issues at the regional and national level were the available *poverty maps* that show welfare indicators at a fine level of geographic disaggregation.

A typical living standard survey collects comprehensive information about a relatively small, but nationally representative sample of residents—usually several thousand households. This allows estimation of statistically reliable poverty rates and other indicators for a small number of regions or, at best, at the province level. World Bank researchers and others have recently developed a methodology to combine the rich detail of welfare surveys with information from population and household censuses (Hentschel and others 2000). A census collects a limited set of indica-

tors, but covers all households in the country. By combining these two data sources using statistical techniques, reliable estimates of poverty and inequality can be derived for much smaller administrative units than the province—such as districts or even communes. Such “poverty maps” have become an invaluable tool for visualization and analysis of poverty patterns and for targeting of interventions.

The first phase of the PEN study made use of poverty maps that were created for Vietnam (Inter-Ministerial Poverty Mapping Task Force 2003), Cambodia (MoP and WFP 2002) and Lao PDR (WFP 2001). The more recent analyses took advantage of revised poverty maps and new data. These are based on large sample national household surveys and the latest available census information.³ Both surveys and censuses are complex and expensive undertakings. National statistical and census offices therefore carry out such enumerations only every few years (10 years in the case of censuses). Some of the data available for the three countries are therefore seven to eight years old. While the broad patterns are unlikely to change, much of the region is experiencing rapid economic growth that triggers dynamic migration patterns and poverty reduction in some regions. Wherever possible, the PEN study therefore augmented available statistical and census data sets with other information from smaller surveys, district records, or field data collection.

Table 1 summarizes different sources of socioeconomic data that may be suitable for poverty-environment studies. Each has advantages and disadvantages, but all are useful for policy analysis, although researchers and decision makers need to be aware of the limitations in using any of these data sources.

Environment

The three countries included in this study face the challenge of pursuing economic growth to generate adequate living standards for a rapidly grow-

TABLE 1.1 Socioeconomic Data Sources

Data source	Pros	Cons
Population and household census	Can provide reliable data for very small areas; sometimes includes information on household assets that reflects welfare status.	Typically only available every 10 years; small number of basic indicators; often, only aggregate data are published (province or district level); often a long lag between census-taking and dissemination.
Comprehensive, multi-topic household survey (LECS, CSES, VNLSS, DHS)	Often the main source of reliable data on poverty and other aspects of household welfare; usually collects a very comprehensive set of individual, household, and community-level indicators.	Sample sizes are too small to yield geographically detailed indicators.
Short, sector-specific surveys (e.g., village survey)	Fairly low cost and quick turnaround; can be used for monitoring through repeated surveys (e.g., annual).	Often not designed to meet statistical requirements (sampling, etc.); small sample sizes; focused on limited number of issues, making more comprehensive analysis difficult; do not typically cover large areas or entire country.
Facility and service provider surveys	Provides information on the supply-side of service delivery that can otherwise be difficult to monitor (e.g., health, education); can be combined with user surveys at facility.	Frequently include quantitative indicators only (e.g., number of doctors), which do not necessarily reflect quality of service; user surveys at facilities leave out people who do not have access for geographic, social, or economic reasons.
Participatory data collection and rapid appraisal (focus group interviews)	Involves citizens; low cost; provides rich contextual information.	Difficult to maintain data quality and objectivity; not possible to extrapolate to other parts of the country or to country as a whole.
Transactions data (e.g., birth/death register, cadastre, etc.)	Information base is always up-to-date; serves many administrative functions.	Limited number of indicators; complex and expensive to maintain electronically.

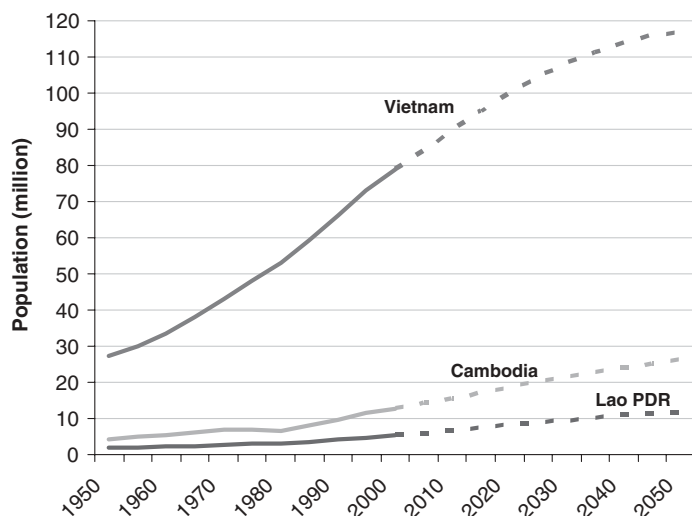
ing population. This process requires a large expansion of public services—such as water supply and health care—and puts increasing strains on natural resources. The PEN study distinguishes broadly between environmental conditions that directly affect human health and quality of life versus those related to the maintenance of natural resources that support fundamental biological systems and rural livelihoods.

Environmental Health and Quality of Life

Environmental health, according to the World Health Organization,

“comprises those aspects of human health, including quality of life, that are determined by physical, chemical, biological, social, and psychosocial factors in the environment. It also

FIGURE 1.1 Historical and Projected Population Growth in Lao PDR, Cambodia and Vietnam



Source: UN World Population Prospects 2004, medium variant, UN Population Division, New York.

refers to the theory and practice of assessing, correcting, controlling, and preventing those factors in the environment that can potentially affect adversely the health of present and future generations.” (World Health Organization; draft definition developed at a WHO consultation in Sofia, Bulgaria, 1993).

In the context of the PEN study, the most important aspects of environmental health are the effects of inadequate water supply and sanitation in rural and urban areas; air and water pollution from industrial activities in cities, towns, and villages; indoor air pollution, especially in the upland areas of Lao PDR and Cambodia; and pesticide use in agriculture.

Water-related problems enter the poverty-environment nexus through basic public health issues. Lack of access to clean water among the poor is one of the primary health problems, largely through coliform bacteria in drinking water that cause diarrhea. Lack of proper sanitation affects hygiene conditions, increases the risk

of disease, and contaminates drinking water; if untreated sewage is released into streams, it can also affect natural systems. The impact on infants and small children is particularly severe, but illness among adults also contributes to a large social and economic burden due to infectious diseases from inadequate water supply, sanitation, and hygiene. Although many countries have made progress in extending safe drinking water supplies to an increasing share of their population, coverage in many rural areas is still low. In part, this is because the population is widely scattered and the cost of supplying infrastructure is high, although other issues such as a lack of voice among rural populations are equally important factors to consider. In towns and cities, problems are often localized in low-income neighborhoods, where residents may not be able to afford connection fees.

Water supply is also threatened by direct industrial and municipal pollution of freshwater resources. Facing limited regulations and enforcement, many factories release toxic waste directly into streams and rivers, a problem particularly acute in the densely populated booming industrial centers in Vietnam. Such pollution originates from large, formal industrial plants, but also from smaller cottage industries, many of which are located in smaller towns or villages. Effluent pollution problems are not limited to manufacturing. In the agricultural sector, farmers have greatly increased production, in part with the help of agro-chemicals such as fertilizers and pesticides. The use of agricultural inputs is not strongly controlled; inappropriate application of chemicals, some of which are banned elsewhere but imported illegally, pollute land and water, and pose a significant health risk to farm workers who apply them.

Air pollution is largely a problem in urban areas where industrial firms and power plants often operate with higher pollution intensities (pollution per unit of output) than modern plants that employ state-of-the-art technology. Accelerating motorization and the popularity of motorcycles with two-stroke engines also leads

to high concentrations of particulates that are the main cause of pollution-related respiratory problems. Whether air pollution affects the poor more severely than the non-poor depends on the type and location of pollution sources. While vehicle emissions affect everyone in a city equally, industrial plants tend to be located in undesirable parts of a city that also have low-income neighborhoods. Low-skilled industrial workers also tend to be located in more urban areas and may face a high occupational health risk due to pollution. Other types of pollution such as untreated effluents are also a bigger problem in poor neighborhoods.

In contrast to outdoor air pollution, indoor air pollution is a significant health problem in rural areas, where traditional cooking methods with wood or charcoal in poorly ventilated houses generate high particulate concentrations. Especially in the cooler upland regions of Vietnam and Lao PDR, indoor air pollution is thought to have considerable effects on the health of women and children and may be most severe in poor households. Much of the evidence in this area is from indirect health studies of the incidence of respiratory disease, since systematic pollution monitoring programs and large-scale epidemiological studies have been scarce.

Natural Resource Management

Natural resource management issues have great relevance in the subregion. All three countries contain forest areas with high economic and ecological value. About 40 percent of the land area of Lao PDR, for instance, is covered by forests. Estimates of the forest sector's contribution to GDP vary between 4.5 percent—if only official commercial benefits are included—to 7 to 10 percent if the contribution of forest resources to subsistence households and illegal logging operations are added (World Bank 2001). Commercial timber extraction is capital- and skill-intensive, requires large economies of scale, and relies on specialized marketing channels.⁴ The poor rarely

benefit from logging beyond occasional employment opportunities, local economic stimulus from timber operations, and possible pro-poor government programs funded through logging proceeds. The habitat destruction from large-scale logging, however, can damage the natural resource base on which poor farmers, hunters, and gatherers depend.

Logging operations are often poorly regulated, and illegal logging of high-value timber is a severe problem in the region. Much of the demand comes from neighboring countries, especially after the logging ban in China in 1998 led traders there to look elsewhere in the region for timber supplies. Overall, deforestation processes in the region reflect the problems globally. The drivers include a range of mutually reinforcing factors such as economic and institutional conditions, national policies and enforcements, and proximate and remote influences that encourage agricultural expansion, wood extraction, and infrastructure extension (Geist and Lambin 2002).

Remaining forest areas in Southeast Asia contain an extraordinary degree of biodiversity, particularly in the remaining montane forest regions. One way for the poor to benefit from this species richness is through non-timber forest products (NTFPs). NTFPs can be important for the poor as a livelihood strategy and safety net. A meta analysis of empirical studies worldwide showed that forest environmental income provides an average of 22 percent of household income, about half of which is cash income (Vedeld and others 2004). But few such products have the potential for sustainable scaling up of collection and commercialization, and therefore have limited potential for supporting socioeconomic advancement. Consequently, NTFPs are often a symptom of poverty rather than a solution. Yet, especially in Lao PDR, NTFP dependence by the rural poor may be higher than in many other countries.

Some forest products—such as sticlac, cardamom, bamboo, benzoin, rattan, and pine resin—are legally harvested NTFPs with commercialization potential (WFP 2004). A more

sinister form of NTFP utilization is the illegal trade in threatened plant and animal species. Trade in wildlife that originates in or passes through Vietnam, for instance, is well documented (Song 2003; World Bank 2005c). Most of the demand is from urban areas in the region and from China. The sources are mostly the protected areas of Vietnam, Lao PDR, Cambodia, and Myanmar, where the last remaining populations of many threatened species live. With rising living standards in the region, demand for wild animal and plant products will increase further. This is likely to lead to the extinction of many unique species. This kind of trade is difficult to stop given the scarce resources of wildlife agencies and the vast profit margins available to traders.

In the upland areas of Lao PDR and Vietnam and the lower lying regions of Cambodia, forests provide vital ecological services to rural communities as well as to downstream towns and cities. Ecological services such as regulation of hydrological functions, carbon storage, and preservation of genetic diversity are forest functions for which compensation or benefit-sharing schemes could be designed. Direct payment schemes for such services have been tested in various parts of the world, but it is no trivial matter to implement ecological service payment systems that benefit the poor (Pagiola and others 2005; Landell-Mills and Porras 2002). Still, successful experiences with payments for environmental service schemes especially in Latin America may hold promise for similar projects in Southeast Asia. Indirect benefits from ecological endowments such as tourism are increasingly important in the economies of the three countries. Future expansion of those revenues is threatened by large-scale deterioration of the most valuable regional ecosystems.

Perhaps the most important role that forests play in providing livelihoods for the poor is as a land reserve that can be converted to agricultural uses on a temporary (rotating or shifting cultivation) or permanent basis (Angelsen and Wunder 2003). For the poor, this may often be the most economically beneficial use of previously forested

land, but can also contribute to large-scale removal of forest cover and negative impacts on other beneficiaries of forest resources and on environmental functions. Due to its high labor requirements and low productivity, shifting cultivation is often done by poor farmers. It is a sustainable use of forest areas when sufficient fallow periods follow land conversion (Fox and others 2000). But various factors may lead to reduction of fallow periods to unsustainable levels. Population growth—often through in-migration rather than natural growth—increases the number of farmers dependent on a given land area, and large-scale logging or setting aside of forest areas for other uses further contribute to a shrinking resource base available to the poor for forest-based agriculture. With shorter rotation cycles, fragile soils—especially in steep upland areas—lose their ability to support traditional agricultural practices. Where fallow periods are too short for systems to recover, sustainable shifting cultivation turns into unsustainable slash-and-burn agriculture that may lead to complete depletion of soil fertility (Casetella and Quang 2002; Palm and others 2005). This process can be reversed, but requires considerable investment in restoration of plant nutrients, improved land management, or planting of trees. Such long-term investments will make sense to farmers only if they have sufficiently secure tenure to their land.

Intensified permanent agriculture—using modern farming techniques adapted to the terrain and climate—can be successful in providing a livelihood base to farmers. But in areas of rapid population growth, rural strategies based on introduction of modern technologies alone are unlikely to be successful in absorbing surplus labor without simultaneous expansion of cropping areas in previously forested regions. However, scaling up of technology transfer and extension services, combined with provision of education and other social services, infrastructure and effective regulation, can have important spillovers for job creation in the rural non-farm sector, where most of the future rural employment growth needs to

BOX 1.1 Sources of Environmental Information

Poverty-environment linkages are varied and complex. Consequently, the range of environmental indicators that need to be evaluated to study various aspects of the nexus is also very broad. Some relevant information can be extracted from socioeconomic data sources (reviewed earlier in this chapter). Examples are health outcomes that may have environmental causes or household behavior with respect to the use of natural resources. For many other aspects, however, information needs to be collected using specialized tools.

Remote sensing—capturing images of features on the ground from space-based systems or airplanes—is one of the most useful tools for collecting natural resources data for large areas at regular intervals. Optical remote sensing systems such as Landsat or Spot have been invaluable in national or regional assessments of land cover, including forests, wetlands, and agricultural areas (see **Figure XX**). Some of these systems have been in operation for several decades, so archived images can provide historic views for change analysis. Remotely sensed data is usually the method of choice for forest cover inventories and monitoring because they provide data collected using a consistent methodology for large areas. This circumvents the problem of subjective evaluation in compiling ground-reported information from local observers. Other remote sensing platforms generate more specialized information, such as topography (elevation and slope) from radar- or laser-based systems, climatic and atmospheric data, and even particulate pollution concentration. Lately, commercially available high resolution (60cm–1m) satellite data have become available. These products can be interpreted visually, reducing the need for complex image analysis procedures that are required for the coarser resolution data (15m–1km). However, the cost of covering large areas and the time required for visual interpretation mean that high-resolution images have so far not been used extensively in natural resources applications.

Not all environmental information can be captured remotely. Obtaining high-quality information on water and air pollution, flood levels, rainfall, or temperature requires a network of ground-based monitoring stations. Those recording stations can be permanent or mobile. Best known are weather stations that report continuously and yield long-term climatic averages. Unfortunately, for many environmental indicators permanent monitoring networks are very sparse and recording periods are often interrupted. An example is the scarcity of river gauge data that severely hampers the analysis of flooding that might be linked to land use changes upstream. With prices falling for many kinds of monitoring devices, targeted data collection campaigns are increasingly feasible. For instance, Dasgupta and others (2004) deployed air pollution monitoring devices in a large number of households for 24-hour periods to study indoor air pollution exposure in Bangladesh. Such data also add context and substantive evidence to the analysis of household survey data on health outcomes, especially if it includes medical information such as lung capacity measurement. The benefits from combining different, multidisciplinary data sets in analyzing human-environment interactions are clearly very large.

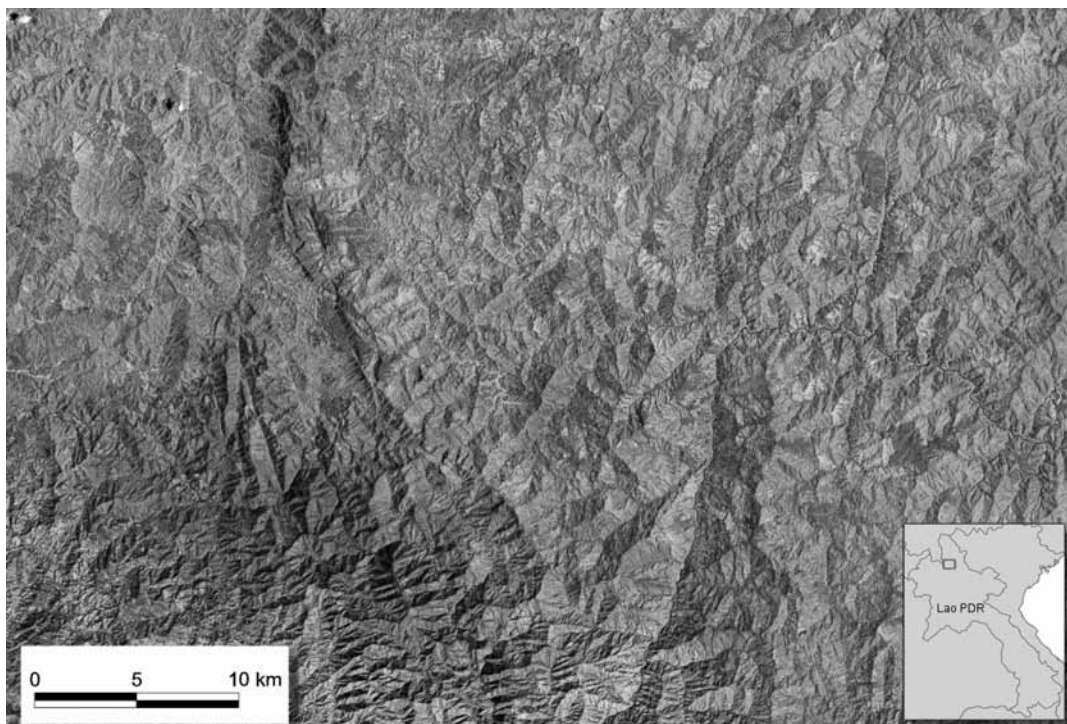
Collection of environmental data is most useful if it is part of a long-term information management strategy and if the outputs are widely disseminated to policy makers, researchers, and the public. Since ecological processes do not follow political boundaries, comprehensive regional approaches should play an essential role in improving natural resource management. Examples are the Brazilian initiatives on rainforest monitoring, which are based on remote sensing and include public disclosure of real-time information on forest cover changes. An institutional template for such efforts in Southeast Asia is the Mekong River Commission, but any effort focused on terrestrial ecosystems should also include the parts of mainland Southeast Asia that are not part of the Mekong watershed.

occur (Müller and Zeller 2002; Cuong and others 2003).

GEOGRAPHIC SCALE AND SCOPE OF THE PEN ANALYSES

Natural resources are distributed unequally within a country. Similarly, industrial activity is

usually concentrated in urban centers and within parts of larger cities, so the burden of air, land, and water pollution will also vary by geographic location. Countries also often show large variations in living standards, even when adjusting for cost-of-living differences. Apart from this geographic heterogeneity, the three countries also display great complexity in the nature and severity of

FIGURE 1.2 Land Cover in Northern Lao PDR

Source: NASA Landsat Geocover 2000. Vegetation in green, bare soil/agriculture in red/purple.

environmental and social problems. While there are many similarities, such as the natural resource management issues affecting the poor in the uplands of Vietnam and Lao PDR, each country also has its specific set of problems. The booming cities of Vietnam face pollution problems that have not reached the much smaller urban centers of Lao PDR. Indoor air pollution is a problem in the uplands of these two countries, but less so in Cambodia where lower elevations and different cultural preferences mean that most cooking is done outside. The PEN study accounts for these complexities by considering a very broad (though by no means exhaustive) range of poverty-environment issues. It also accounts for geographic heterogeneity explicitly by analyzing problems at multiple scales and by employing spatially referenced data whenever possible.

Multi-Scale Analysis— from Regional to Local

The study applies a multi-scale approach combining analysis of aggregate data at national and regional levels with very detailed case studies that reach down to the village and individual household level. The first phase of the project took a regional perspective by analyzing similar variables for the three countries, typically at the level of provinces (Dasgupta and others 2005). What emerged was that for many environmental and welfare-related questions, the province level provides insufficient detail to yield useful answers. Within-province variation is often greater than that between provinces. In the second phase, national-level analysis, data were collected and analyzed for all parts of the coun-

try, and therefore relied as much as possible on district-level information. Finally, core contributions of the PEN study are the topic- and place-specific case studies that support the local analysis. Here, information is typically collected at the subdistrict, village, and household level.

Any specific poverty-environment issue should be analyzed at the scale that is most relevant to the characteristics of the topic. For instance, air pollution from cement mills may only be dangerous in the urban area where the facility is located, while acid rain may affect natural systems far away from the pollution source. In the Cau River Basin case study in Vietnam, pollution from riverside industrial facilities has an impact downstream, so a focus only on the immediate pollution source would miss the wider context of the nexus. Other applications—for instance, using province-level poverty data—provide many insights into the spatial distribution of welfare levels when looking at the country as a whole. Investigation of specific regional linkages between human welfare and environmental processes, however, requires “zooming in” to the district level or below in order to capture variations in patterns. For instance, most behavioral aspects of poverty-environment interactions need to be assessed at the household level whenever possible. An example is hygiene behavior, which often varies between economic or ethnic groups and has strong relations to health outcomes in areas of poor access to water and sanitation. However, when looking at water supply issues, the most suitable level of analysis may be the community or village as the basis for provision of networked services, or even the district where infrastructure investment targeting decisions are made.

In practice, a major barrier to multi-scale analysis is the availability of data of sufficient quality. Apart from census information, most socioeconomic indicators are derived from sample surveys, which are usually not reliable at the

district or subdistrict level. Similarly, forestry information is sometimes collected using satellite remote sensing with a resolution of 500m or 1km. This is too coarse to detect deforestation due to shifting cultivation or selective logging. Even where reliable data by administrative units are available, the analyst often faces challenges in interpreting the information (see box 1).

Use of Spatial Data to Account for Geographic Heterogeneity

In addition to looking at PEN issues across multiple scales, the PEN study relied as much as possible on geographically referenced information. It consists of statistical information and derived indicators that can be linked, for instance, to a digital map of administrative units, as well as inherently spatial data such as digital forest cover, slope, or elevation maps. These maps are used to display the geographic distribution of the data, combine or overlay different maps to generate “spatial cross-tabulations,” and to extract new variables that are used in descriptive and statistical analysis.

For instance, among the most dominant geographic patterns in the subregion are large differences between the lowland and upland areas, especially in Lao PDR and Vietnam. More than 60 percent of the Lao PDR land area is above 500 meters, and more than 20 percent above 1,000 meters. For Vietnam, the corresponding figures are 30 percent and 10 percent. Lowland areas along the major river systems in the region—the Mekong and the Red River—were traditionally more suitable for agriculture and have long sustained higher population densities than the often steeply sloped upland areas. Higher elevation areas, in contrast, contain much of the remaining forest cover and a high degree of biodiversity. The nature of the poverty-environment nexus is therefore very different in the two areas. With the exception of the plantation agriculture in the Central Highlands in Vietnam, most intensive commercial agriculture is in the lowlands, where issues such as overuse of pesticides are thus most severe.

BOX 1.2 Working with Data Recorded by Administrative Units

Many socioeconomic indicators and some environmental data are available for administrative units such as districts or provinces. Analyzing such data geographically or statistically often poses major challenges. The most common of these is when data are only available at fairly coarse levels of aggregation. Data at the province or district level may hide considerable heterogeneity that is visible at the subdistrict level (see Fig XX below). For instance, relatively rich provinces might contain pockets of poverty that require urgent policy intervention.

Two related problems that are frequently encountered are that the units do not match the phenomenon being studied and that boundary changes over time make it difficult to perform change analysis. The first of these problems can occur in poverty-environment studies when administrative units were drawn with no consideration of underlying geographic features such as river basins, areas with rural versus urban characteristics, or the distribution of ethnic groups. Depending on how these reporting units are drawn, the summary values of socioeconomic or biophysical indicators may change significantly. In principle, just by re-aggregating existing data, one may find completely different results in correlation studies. The larger the units, the bigger this problem will be. A related issue is that different levels of administration may have very different influence on policies relevant to the topic studied. An example is Cambodia, where elections have been held only at national and commune level. The intermediate province and district levels therefore have much less relevance for policy implementation. Consequently, the PEN study found that research at the district level in Lao PDR provides useful insights into poverty-environment interactions, while such patterns are nonexistent at the province level. For Vietnam, both levels are useful, while for Cambodia it is necessary to go to the subdistrict level to analyze these topics.

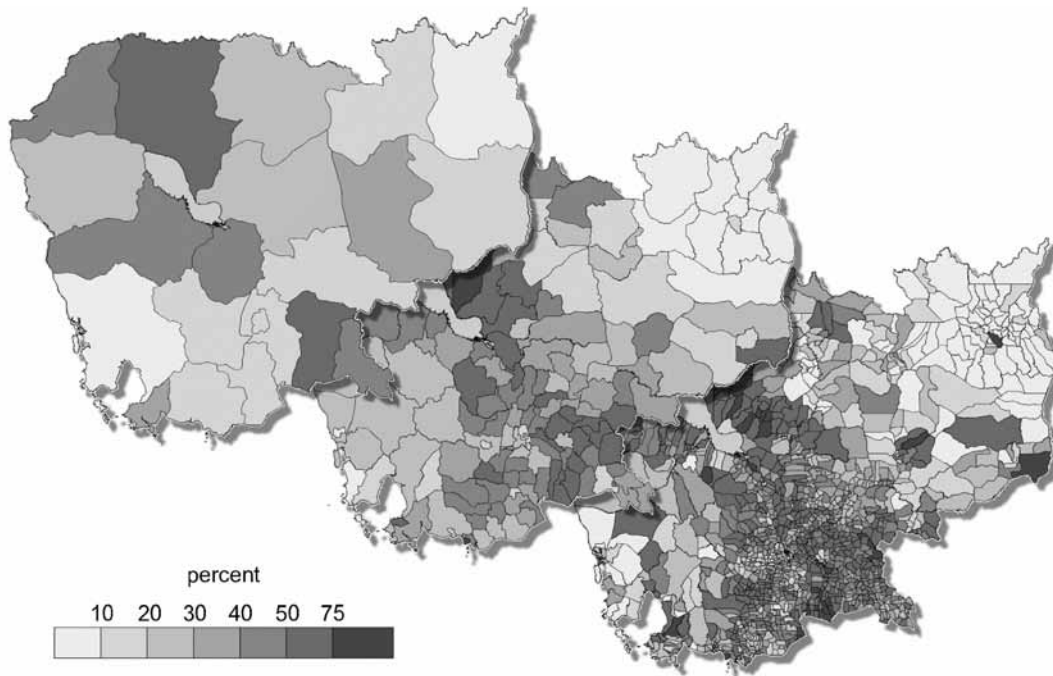
The second problem occurs when boundaries change significantly. This tends to happen before each major data collection effort, such as a census. It has also been observed as a consequence of decentralization, where units might be created largely as a way to increase the number of political appointees that might benefit from newfound decision-making power (Fitrani and others 2005). Analysis of possible causal relationships requires observations of changes over time, where changes in one variable during a certain period of time have an impact on changes in another variable during a subsequent period. But often it is impossible to reconcile data sets collected in different periods. To address both problems, an important task for data collection agencies is to maintain and disseminate information at the lowest possible level of aggregation that does not compromise data confidentiality concerns—for example, at the enumeration area level, which will include a few hundred households. This allows for aggregation of indicators to any set of units that are appropriate for the problem being studied. Increasingly, census and statistical agencies in many countries are moving in this direction.

Similarly, severe industrial pollution is mostly concentrated in the densely populated urban areas of Hanoi and Ho Chi Minh City. In the uplands, on the other hand, forest-related issues are very significant. This includes maintenance of ecological functions, the use of non-timber forest products, and intensification of traditionally sustainable forms of mountain agriculture such as shifting cultivation.

The contrast between the natural resource management issues in the uplands and pollution-related environmental problems in the lowlands is mirrored by a distinct difference in the nature of poverty between the two regions. With very few

exceptions, poverty is most severe in the upland areas, where the districts with the highest proportion of poor are located. These areas, however, have low population densities, so the absolute number of poor is relatively small. Lowland areas have seen the fastest decline in poverty rates. But their much higher population size means that they continue to contain by far the largest share of the poor, especially in Vietnam. Fig. 4

The upland-lowland dichotomy is also relevant in the context of public infrastructure provision. Provision of networked infrastructure such as electricity and water, but also roads, is much more costly in sparsely settled rural areas. In the case of

FIGURE 1.3 Poverty Rates for Provinces, Districts, and Communes

Data source: MoP and WFP (2002)

the upland regions, the terrain also contributes to high costs in relation to the size of the population served, and local governments may have less capacity for effective management of investment programs. In more densely settled urban or high-intensity agricultural areas, in contrast, there are large economies of scale in service provision, which is reflected in much higher coverage rates.

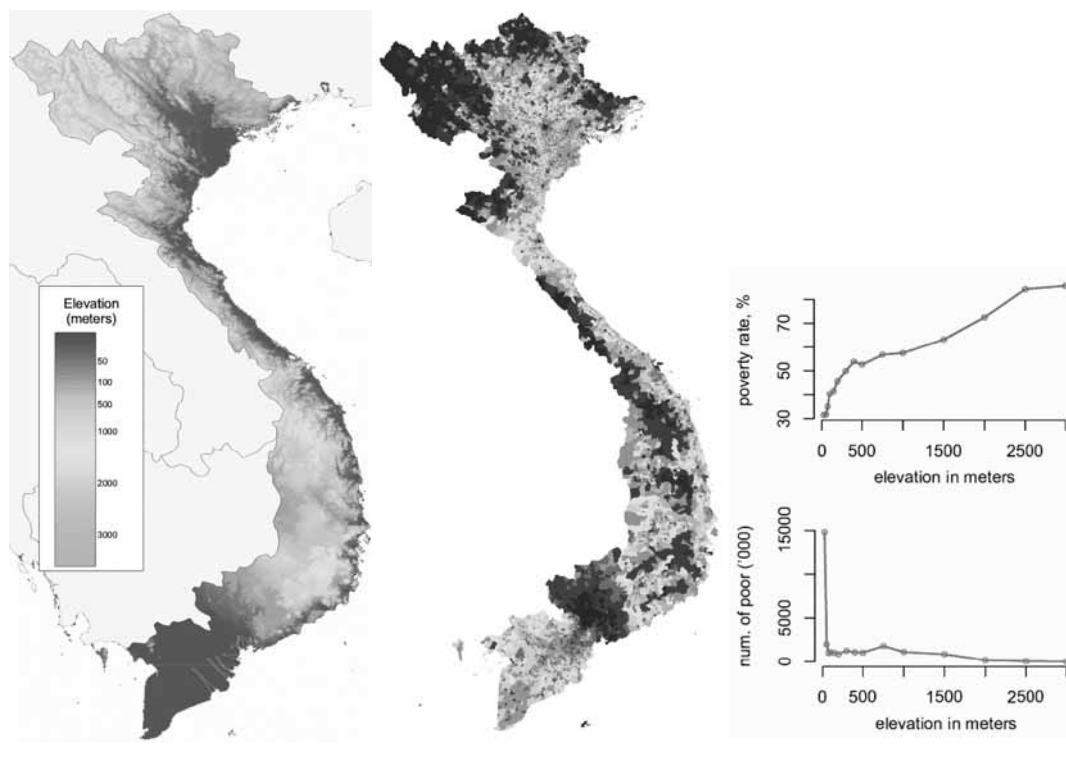
Analytical Methods Used in the PEN Study

The PEN analyses in the three countries followed slightly different approaches, since the nature of specific issues and data availability vary to some extent. However, for all three countries there is an overall unifying framework anchored in a tight linking of a national analysis using secondary data with locally relevant in-depth studies. In Lao

PDR, the sector-specific studies were very closely coordinated and implemented by local expert teams that interacted frequently among themselves and with a group of advisers. Consequently, all five case studies followed a very similar path. In Cambodia, the comprehensive natural resource management case study was implemented by a local policy research group, and in Vietnam sectoral policy research was conducted by different teams of national and international experts.

Tight Linking of National/Local Analysis

For all countries, the sector-specific, local studies are embedded in a comprehensive analysis at the national level. This analysis relied on a variety of information sources, including published reports and statistical data sets. For each country, the national population and household census, and to

FIGURE 1.4 Relation Between Poverty and Elevation in Vietnam

a lesser extent the agricultural and economic census, provided a core set of indicators at all levels of the administrative hierarchy. The census yields demographic information, as well as some indication of access to water and sanitation and available assets. As described previously, each country also has implemented comprehensive household surveys with the objective of collecting detailed information on general living conditions or on health status for a large sample of the population. While these samples are not large enough to yield reliable data at the district level, analysis of the individual-level micro data provides valuable insights, especially on environmental health issues. Wherever possible, indicators at various levels of aggregation were presented in map form for exploratory visualization and presentation of key results.

Statistical analysis of secondary data reveals initial correlations between environmental and

welfare indicators. While correlation does not necessarily imply causality, the resulting inferences provide some indication of possible relationships, which in turn suggest appropriate interventions. More formal testing of causal links is not possible in most cases, because most of the required information is available for only one time period. Fundamental questions—such as whether poor people are mostly victims of environmental degradation, or whether poverty itself causes a decline in the natural resource base—cannot be answered with statistical certainty without fairly extensive time series data. Furthermore, in attempting to identify causal links, there is also a problem of intervening variables that affect the poverty-environment interactions. For instance, children in poor households are more likely to suffer from waterborne diseases, but there is a significant influence

from factors such as the education of the mother, which can be both a cause and consequence of poverty. For these reasons, the studies presented in this report do not claim to show statistically sound proof of specific relationships. Rather they are designed to provide solid empirical evidence of relevant interactions and correlations that point to an urgent need for policy intervention.

In the first phase of the PEN study, the national-level analysis assigned districts or provinces into four categories in each of a number of dimensions of the poverty and environment nexus: poverty incidence, deforestation rate, steepness of slope as an indicator of soil vulnerability, wood/charcoal use, unsafe water source, and prevalence of childhood diarrhea. The compiled information was presented as a color-coded table that clearly highlights coincidence of high or low rankings (Fig. XX).

Selection of Case Studies

The national analysis in the first phase was extensively updated and expanded in the second phase. This process helped refine the development of a matrix of PEN issues and focused the identification of key knowledge gaps to be considered in the in-depth analyses. In discussions with national counterparts, the potential focal studies were then narrowed down to a subset for each country, as discussed below. The geographical selection of these studies was guided by the following main criteria:

- Poverty incidence, geographic distribution of poverty, and poverty persistence (so-called “poverty traps”).
- Government priority regions, provinces and districts for poverty reduction, economic development, and environmental management.
- Representation of the distinct socioeconomic, environmental, and renewable resource use patterns in the countries (e.g., upland/lowland, industrial concentration and “hot spots”, pesticide intensity, etc.).

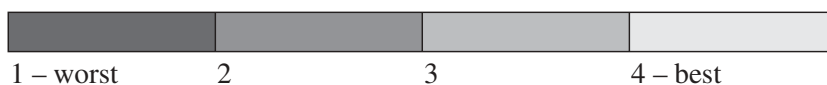
- Estimates of the number of poor and non-poor affected by environmental issues.

For **Lao PDR**, three studies relate to natural resource management issues: use of non-timber forest products by upland communities; investigation of the link between road access, poverty, and environmental quality; and the impact of unexploded ordnance on poverty and natural resource management. Two closely related studies, one in urban centers and the other in rural villages, focused on access among the poor to water supply and sanitation and the sustainability of water and sanitation services in poor villages. In each of these, a subset of districts was chosen based on criteria that ensured variations in conditions across the sample. For each selected district, the study teams assembled a detailed statistical profile by combining nationally available indicators with information collected locally from district officials. Further sampling proceeded by selecting villages within each district and households within each village. The selection aimed at achieving a pre-defined stratification—for instance, based on distance from roads or degree of in-migration. This approach is not intended to produce a scientifically accurate sample, as is the case in a large comprehensive household survey. Rather it supports more qualitative information collection through community questionnaires and interviews of focus groups and key stakeholders. The outcome of this process in each in-depth study is a contextually rich package of information that helps identify the complex interactions between human and natural systems in the focus regions.

The **Cambodia** study focuses on the status, trends, and impacts of access to natural resources among poor and non-poor households. The study selected two provinces, each of which had a protected area, different types of land access situations, and high migration and poverty rates. Households in six villages were selected for a structured interview. Additional information was collected from key informants, such as government officials and focus group interviews. As

FIGURE 1.5 Poverty and Environmental Problems in Lao PDR Provinces

Province	Poverty rate	Deforest-ation	Sloped land	Wood/Charcoal	Unsafe Water	Child Diarrhea
Luangphrabang	2	2	2	2	2	2
Huaphanh	2	2	2	2	2	2
Oudomxay	2	2	2	2	2	2
Savannakhet	2	3	3	2	2	2
Champasack	2	2	2	2	2	2
Xiengkhuang	2	2	2	2	2	2
Phongsaly	2	2	2	2	2	2
Saravane	2	2	2	2	2	2
Khammuane	2	2	2	2	2	2
Xayabouri	2	2	2	2	2	2
Vientiane Municipality	2	2	2	2	2	2
Vientiane	2	2	2	2	2	2
Luangnamtha	2	2	2	2	2	2
Bokeo	2	2	2	2	2	2
Attapeu	2	2	2	2	2	2
Borikhamxay	2	2	2	2	2	2
Sekong	2	2	2	2	2	2
Xaysomboon	2	2	2	2	2	2



Source: PEN I final report

Source: PEN I final report

in the Lao PDR case studies, poor and non-poor households were identified using a simple asset-based indicator approach.

The in-depth studies carried out in **Vietnam** present a more varied mix of PEN situations, reflecting the more complex set of problems faced in a country with a large population and rapidly growing economy. This balancing act of creating a dynamic economy that contributes to poverty reduction—while preserving natural systems on

which life depends—is reflected in the in-depth study of the Cau River Basin. The Cau River experiences significant pollution from industrial and municipal sources. The study aimed at identifying the distribution of the impacts and finding possible interventions for remediation. In contrast to most of the other studies, the geographic unit of analysis is the watershed, which does not completely match the administrative hierarchy for which most socioeconomic data

area available. The area of interest falls into two provinces, in which structured interviews with 700 households were conducted. This information was augmented by direct observation and interviews with decision makers and stakeholders. The poverty measure employed is based on income data from the questionnaire, which facilitates ranking of households by economic status.

Industry is also the focus of another in-depth study that analyzed the spatial relation between poverty, industrial concentration, air and water pollution, and environmental health risk. This analysis was accompanied by rapid local-level surveys of a number of urban hot spots and craft industry villages, highlighting that the pollution problem is not restricted to large industrial estates but also affects life in smaller towns and even villages. The comprehensive Vietnam National Health Survey of 36,000 households provided additional insights on possible outcomes of exposure to pollution such as respiratory illness and

contamination of shallow dug wells, on which the poor rely disproportionately. The same survey also yields insights at the national level on public health concerns related to substandard water supply and sanitation, as well as possible effects of pesticides in agriculture.

Environmental health implications of pesticide use are the topic of a case study in the Mekong Delta, which is the largest region of intensive rice cultivation in the country located in a fragile ecosystem. A team of medical researchers implemented a detailed survey of about 600 farmers in 10 districts that collected socioeconomic information as well as medical tests for the exposure to toxic chemicals. The land policy case study, finally, combined an analysis of a land-related database of 610 districts in Vietnam with a survey in three provinces in the upland regions. Within these, districts with contrasting conditions were selected. Asset-based poverty indicators aided the household stratification for

TABLE 1.2 Data Sources Used at Different Administrative Levels

	Nation	Province	District	Commune	Village	Household
Cambodia						
Census of Population 1998	■	■	■			
Cambodia Socioeconomic Survey (CSES) 1997	■	■				
Case studies					■	■
Lao PDR						
Census of Population 1995	■	■	■			
Lao Expenditure and Consumption Surveys (LECS) II-1997/98, III-2002/03	■	■				
Case studies					■	■
Vietnam						
Population and housing census 1999	■	■	■	■		
Vietnam Living Standards Surveys (VNLSS 1998, 2002);	■	■				
Vietnam National Health Survey (VNHS) 20XX	■	■				
Nationwide land inventories INEST/MOST (CV)			■			
Case studies					■	■

analysis of structured interviews and focus group discussions.

In summary, the process of analysis and consultation resulted in the following thematic stratification of in-depth studies of poverty-environment linkages in the three countries:

- PENs with a potentially high number of poor being affected by renewable natural resource issues and environmental health concerns: rural water supply and sanitation in Lao PDR and Vietnam, NTFPs and road development in Lao PDR, land use in Vietnam, and natural resource management in Cambodia.
- Development trends and emerging PENs in urban areas: small town water supply and sanitation in Lao PDR, industrial pollution in rapidly growing cities in Vietnam.
- Previously unexplored PEN issues where significant knowledge gaps exist: UXOs in Lao PDR, pesticides in Vietnam, indoor air pollution in Vietnam.
- Geographic priorities and cross-sectoral regional issues: Son Cau River basin and pollution issues in craft villages in Vietnam.

Endnotes

1. <http://www.undp.org/pei/pdfs/PEIPhase1Summary-Paper2.pdf>
2. This information also forms the basis for estimation of cross-nationally comparable welfare measures, such as the proportion of the population living on less than \$1 or \$2 a day.
3. Vietnam National Living Standards Surveys (VNLSS 1997/98); Cambodia Socioeconomic Survey (CSES 1997); Lao PDR Expenditure and Consumption Survey (LECS II 1997/1998; LECS III data from 2002/03 were also utilized in Chapter 3). Census enumerations in the 2000 census round were carried out in Vietnam in 1999, Cambodia in 1998, and Lao PDR in 1995. Data from the 2005 census in Lao PDR were not yet available.
4. See Angelsen and Wunder (2003) for a discussion of poverty-forest linkages on which this section draws.

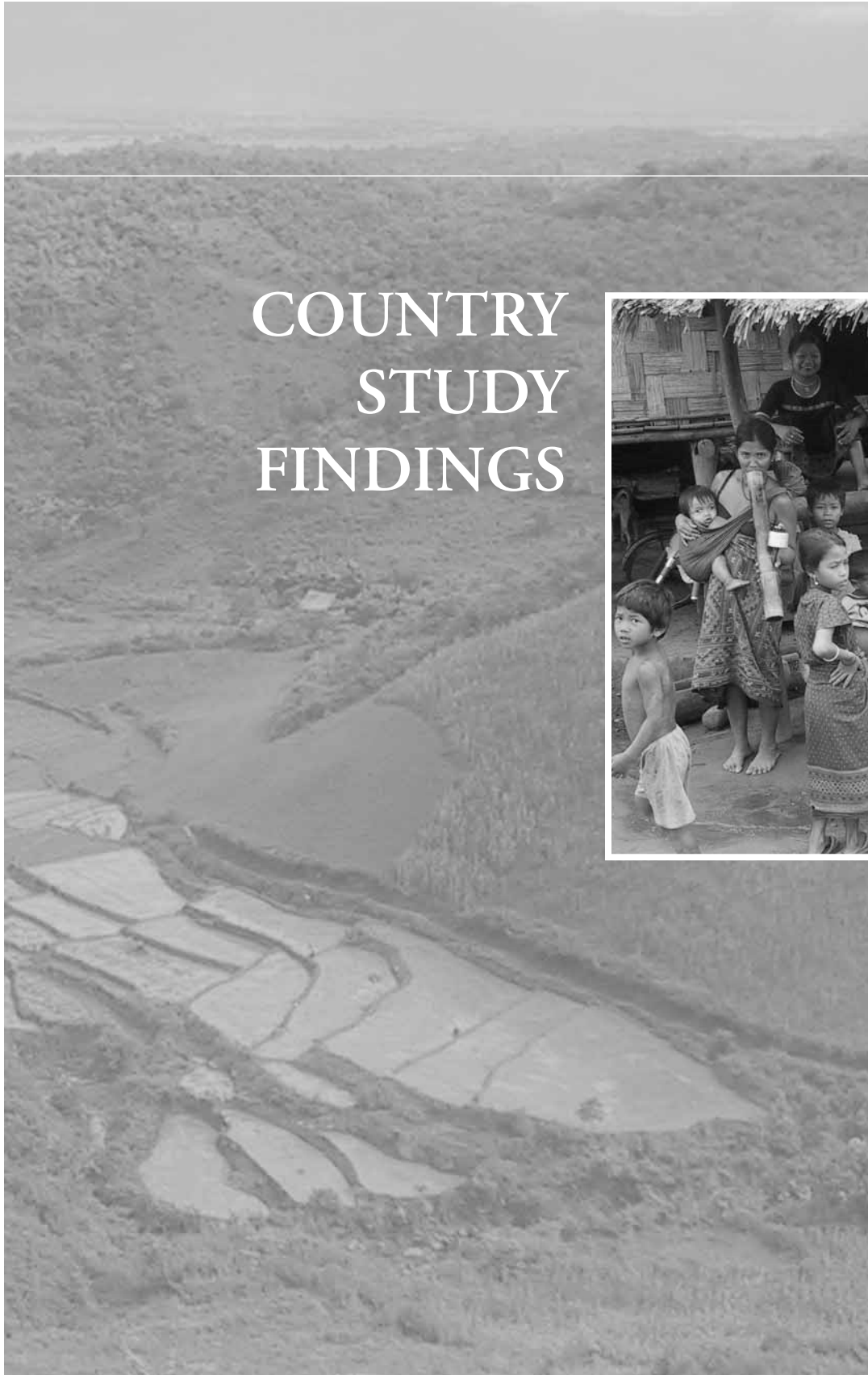
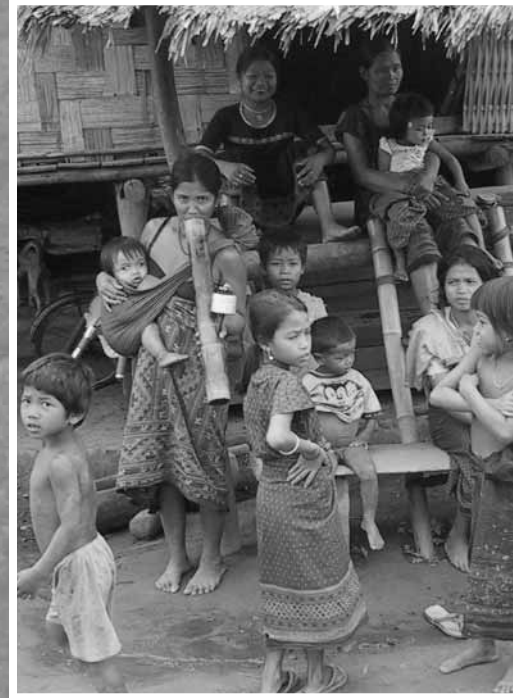
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COUNTRY
STUDY
FINDINGS



Poverty and Environment in Cambodia

This chapter examines poverty-environment relationships in Cambodia through an analysis of national data and case study findings. We begin with an overview of the national context and trends for poverty and natural resources, providing a synthesis of existing studies and information across Cambodia's regions and provinces (Map 2.1). Next, we conduct a range of new analysis to identify factors associated with poverty, and to investigate specific poverty-environment relationships pertaining to natural resource dependence, drinking water sources, sanitation, natural disasters, and mine/UXO contamination. To complement national analysis of poverty and natural resource relationships, we then present a case study on poverty and access to natural resources conducted in two provinces. Finally, we provide a summary of key findings and discuss policy implications.

POVERTY: CONTEXT AND TRENDS

Poverty incidence in Cambodia fell from about 47 percent in 1993–94 to 35 percent in 2004, according to findings from the 2004 Cambodia Socio-Economic Survey (CSES).¹ However, rural poverty incidence (37.8 percent) remains considerably higher than urban areas (17.6 percent) (Table 2.1). Since about 85 percent of

Cambodia's population is located in rural areas—11 million out of a total population of 13 million—poverty remains largely a rural problem. Indeed, of the total population living below the poverty line in Cambodia, more than 90 percent are located in rural areas, equal to more than 4 million people.

In addition to urban-rural differences in poverty, poverty rates are quite uneven across Cambodia's regions and provinces (Map 2.2). The percentage of the population living below the poverty line in coastal areas is 27 percent, but this rises to 52 percent in the plateau/mountains region. Although poverty severity is highest in the rural plateau/mountains region, this region is less populated than the plains and Tonle Sap regions, which together account for about 75 percent of the population in poverty.

Trend estimates across *geographically comparable areas* from CSES 1993–94 to 2004 indicate poverty has declined in all regions except for the rural plateau/mountains. Overall, most provinces made progress in reducing poverty over the past decade. Poverty rates only increased in two provinces—Kampong Thom and Kampong Speu, though these increases are within the statistical margin of error. Poverty reduction was considerably less on a percentage basis in the rural areas during this period than in the urban and

MAP 2.1 Regions in Cambodia (as applied in CSES Survey 2004)



Source: World Bank 2005b.

TABLE 2.1 Poverty Estimates by Region, Urban and Rural, 2004

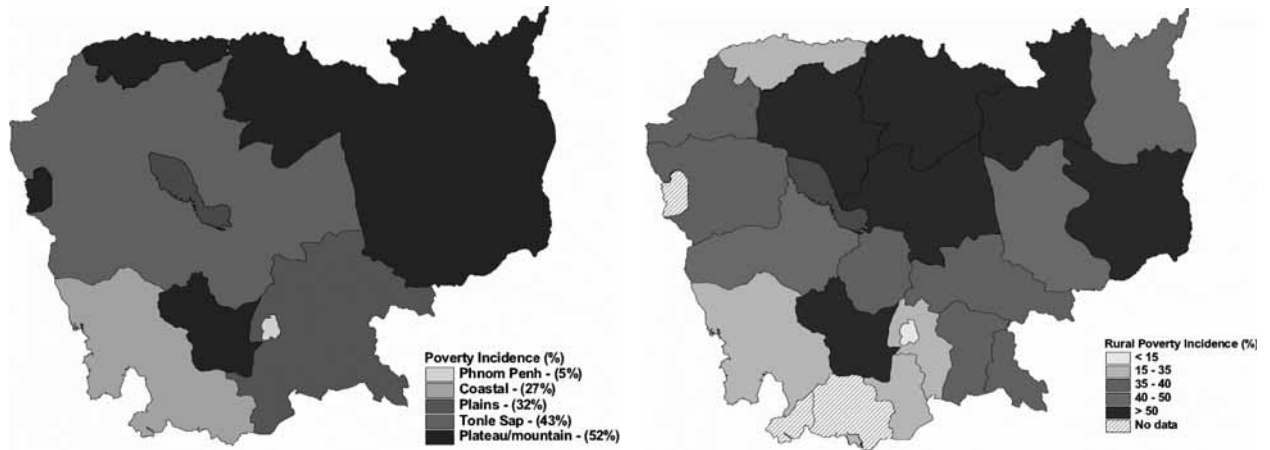
Region	Percentage of population below poverty line			Population distribution of poverty (% of all poor)		
	Urban	Rural	Total	Urban	Rural	Total
Phnom Penh	1.1	8.9	4.6	0.2	1.0	1.1
Plains	13.7	32.9	32.1	0.7	39.0	39.7
Tonle Sap	28.2	45.4	42.8	3.7	33.4	37.0
Coastal	20.4	30.1	26.8	1.6	4.6	6.1
Plateau/ mountains	32.6	56.3	52.0	1.8	14.2	16.1
Cambodia	17.6	37.8	34.7	7.9	92.1	100.0

Source: CSES 2004.

semi-urban areas. The main reason is because inequality in the distribution of per capita consumption increased significantly.² In decomposing inequality, approximately 86 percent of the total increase can be attributed to a rise in inequality within rural regions, while only 14 percent can be attributed to an increase in rural-urban inequality (World Bank 2005a).

Nationwide, poverty rates of households headed by ethnic minorities (defined as non-Khmer) are only slightly higher (35.8 percent) than Khmer-headed households (34.6 percent). However, because Chinese and Vietnamese households are typically wealthier than Khmer households, these minority groups may offset higher poverty rates among smaller ethnic groups concentrated in the upland areas of the north-eastern provinces—about 17 ethnic groups comprising over 100,000 people (Map 2.3).

MAP 2.2 Poverty Incidence by Region & Rural Poverty Incidence by Province



Source: CSES 2004.

NATURAL RESOURCES: CONTEXT AND TRENDS

Most of Cambodia’s rural population depends on one rice crop per year, fish and other aquatic resources, forest products, and wage labor. CSES (2004) data indicate the income of the average rural household is comprised of crop cultivation (30 percent); livestock (10 percent); common property resources, especially fish and forest products (25 percent); and wage labor, nonagricultural activities, other (35 percent). Although rice farming is the dominant livelihood activity, often households are active in all of these income-generating pursuits, diversifying in order to optimize labor resources during different seasons, and safeguard against the risks of agricultural failure (McKenney and Prom 2002; Chan and Acharya 2002; Prom and Ballard 2005).

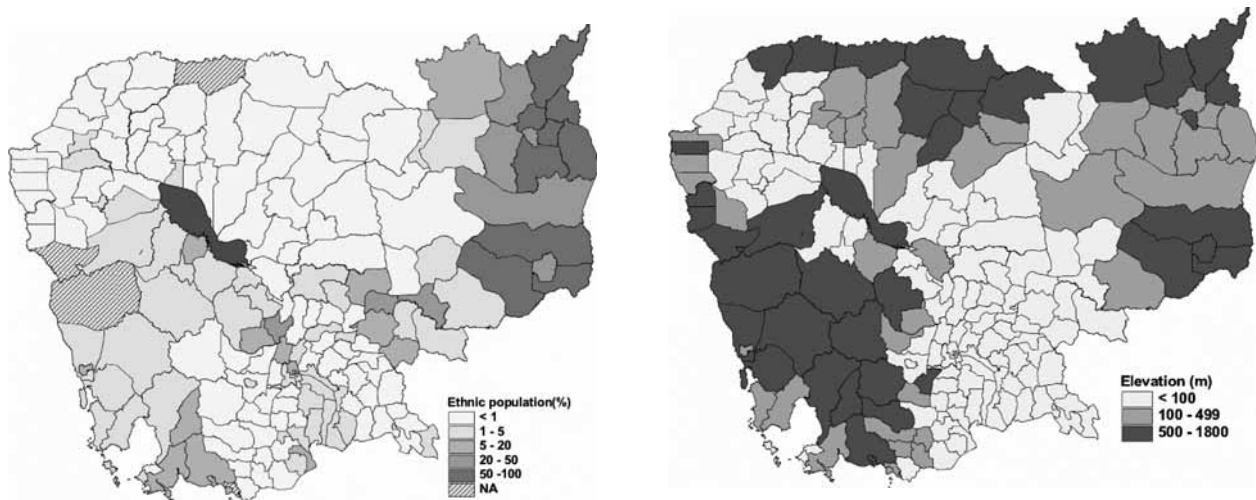
Cambodia enjoys one of the highest natural resource endowments per capita in the region. This includes considerable unused land, relatively abundant forest resources, and highly productive freshwater fisheries. A lack of (credible) data, however, makes it difficult to characterize the current status of natural resources with precision.

Fisheries

The national catch has been estimated in the range of 300,000 to 400,000 metric tons (360,000 metric tons in 2003), though the challenges of collecting catch data suggest a wide range of uncertainty about this estimate. About 80 percent of the catch is from inland fisheries, most from the Tonle Sap Lake, as well as the Mekong and Tonle Bassac River areas. Marine fisheries along Cambodia’s 435-km coastline provide the other 20 percent of the catch, important to coastal areas of Kampong Som, Kampot, and Koh Kong provinces.

Although fish catch and composition data are lacking, there is a strong public perception that fisheries resources are becoming scarcer due to overfishing and various destructive fishing approaches. In a recent opinion poll of commune leaders in Cambodia’s rural areas (1,500 communes), 86 percent reported that the volume of fish catch has decreased compared to five years ago (Seila and Danida 2005). A major concern is that ongoing habitat destruction and fishing pressure will reduce fish stocks and diversity to the point where fish production consists of a limited

MAP 2.3 Minority Ethnic Population & Uplands/Lowland in Cambodia

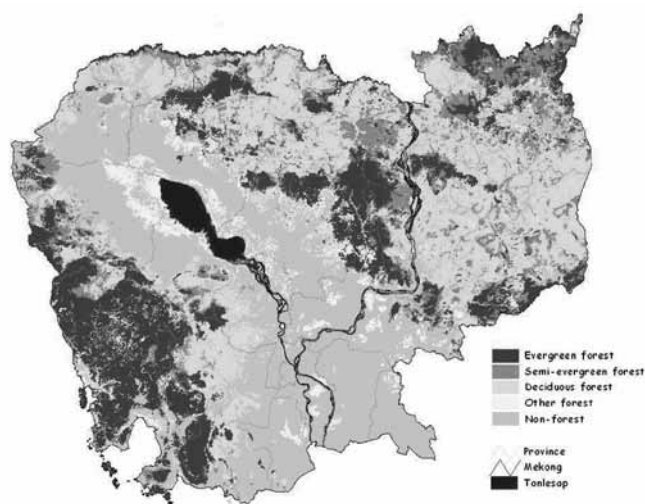


Source: Population Census 1998.

number of small, low-value species, while larger, higher-value fish species become a diminishing proportion of the catch. This occurs because larger fish species typically require more than a one-year cycle for reproduction, which makes

them more vulnerable to fishing pressure. The resulting change in the species composition reduces catch values per unit of fishing effort (Degen and others 2000).

MAP 2.4 Forest Cover of Cambodia, 2002



Source: Forest Administration 2003.

Forests

The Forest Administration estimates that forest cover increased from 58 percent of the country in 1997 to 61 percent in 2002 (Map 2.4). This estimate stands in stark contrast to numerous other forest sector studies, which indicate that logging and clearing of forests have been rampant during this period (Independent Forest Sector Review 2004; Fraser Thomas and others 2000; www.globalwitness.org). For example, the Independent Forest Sector Review (IFSR 2004) estimates 55 percent of forest area has been disturbed or heavily degraded (Map 2.5). The IFSR also highlights the problem of uncontrolled clearing of forests, which has been occurring at an accelerating pace over the past decade. Whereas 0.3 million ha of forest were cleared from 1993 to 1997, 1.3 million ha were cleared from 1997 to 2002 (Map 2.6). This finding is consistent with other

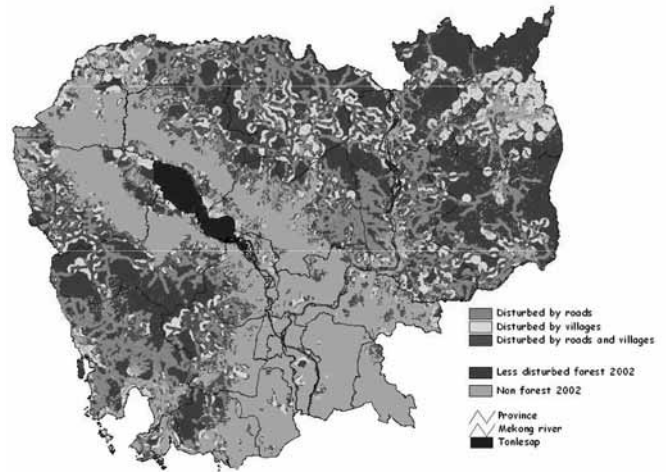
estimates indicating that the rate of deforestation increased from an average annual rate of about 0.5 percent prior to the mid-1980s, to about 1 percent from the mid-1980s to mid-1990s, and then to 1.0–1.7 percent from the mid-1990s to 2000 (IFSR 2004; McKenney and others 2004). The most recent indication of forest decline comes from a national opinion poll of commune leaders, which finds that 72 percent of commune leaders in rural areas report forest coverage has declined compared to five years ago (Seila and Danida 2005).

Land

Approximately 40 percent of the rural population lives off of less than 0.5 hectares of agricultural land, an area too small to yield sufficient rice to meet the needs of the average rural household. Landlessness appears to be on the rise, a result of population pressure, land sales under duress (for example, health emergencies), and speculative land purchases (usually by Phnom Penh residents). About 13 percent of the rural population was estimated to be landless in 1997 (CSES 1997), rising to 16 percent in 1999 (CSES 1999) and to 20 percent in 2004 (CSES 2004).

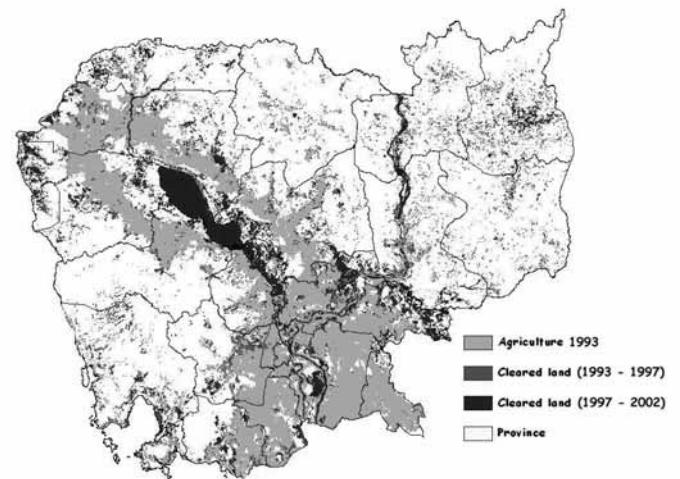
The chief means of acquiring new land for cultivation is forest clearance. This, along with uncontrolled logging, has resulted in rapid rates of forest loss in recent years. But with relatively large areas of forest remaining, it is not surprising that only 28 percent of commune leaders reported less access to land for cultivation compared to five years ago. Along with uncontrolled forest clearing, a key management concern is the quality of cleared land for agriculture over the long term. If cleared land does not support productive agriculture due to poor soil fertility and water availability (and much of Cambodia’s land has low/medium soil productivity, Map 2.7), forest clearance could result in an ongoing cycle of poverty and environmental loss. Indeed, current estimates are that more than half the land cleared from 1997 to 2002 had low-to-medium

MAP 2.5 Forest Disturbance by Roads and Villages in Cambodia, 2002

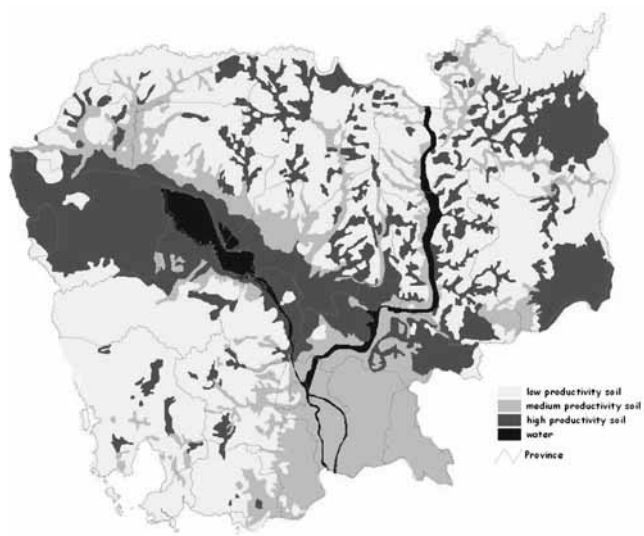


Source: IFSR 2004.

MAP 2.6 Forest Cover Clearance in Cambodia, 1993–1997 and 1997–2002



Source: IFSR 2004.

MAP 2.7 Soil Productivity of Cambodia

Source: Forestry Administration 2003.

soil fertility (Dümmer 2004). Agricultural yields in these areas are likely to be poor. In turn, this may lead to greater pressure on natural resources and more land clearing in these areas—creating an ongoing cycle of forest clearing, poor (and declining) agricultural yields, greater pressure on natural resources, and more forest clearing.

Establishing land use management regimes to bring logging and forest conversion for agriculture under control will be a significant challenge. Approximately one-third of the Cambodian population (about 4 million people) live within 5 km of forest, and about 10–15 percent of the population (about 1.5 million people) live within 5 km of high-value forest (evergreen/semi-evergreen), which provide richer timber resources and other forest products (Map 2.8). Moreover, the combination of in-migration and population growth is resulting in a rapid increase in new villages being established in rural forested/cleared areas. Whereas the establishment of new villages largely occurred along the agriculture-forest frontier prior to 1998, villages established from 1998 to

2001 have penetrated much more deeply into forest areas (Map 2.9).

Water

With an estimated annual runoff of 475 billion cubic meters from the Mekong system draining over 85 percent of the country, Cambodia's water resources are plentiful (World Bank 2005b). But rainfall is concentrated during a six-month wet season, with little infrastructure for capturing, storing, and regulating this runoff. Flooding is an annual occurrence, damaging infrastructure and crops, but also providing benefits to the floodplain by bringing soil nutrients, water, and creating areas for fish spawning/habitat. During the dry season, river levels drop substantially, and surface water resources are largely limited to rivers (Mekong, Sap, and Bassac) and the Tonle Sap Lake. Groundwater resources are largely untapped; they appear to be uneven geographically (most in close proximity to rivers), but more study is needed. Irrigation coverage in Cambodia (7 percent) is far less than the neighboring countries of Vietnam (34 percent), Thailand (26 percent), and Laos (18 percent) (World Bank 2005a). As a result, most agriculture is highly dependent on the timing and levels of rainfall.

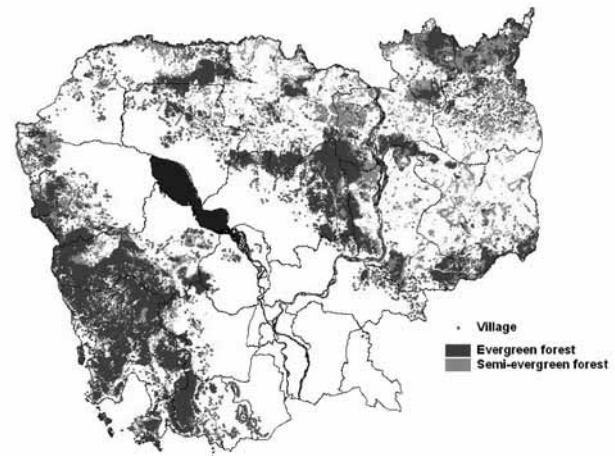
The Management Vacuum

Over the past decade, the Cambodian government's chief approach to natural resource management has been to contract out large areas to Cambodian and foreign investors as forest, fisheries, and agricultural/economic concessions. This has proven to be a highly ineffective management approach. It has failed to galvanize economic growth in rural areas; generated only limited levels of government revenue through taxes and fees; and often resulted in conflict between local communities and concession operators when communities have lost access to resources (McKenney 2002; World Bank 2005b).

Recent policy interventions suggest the government recognizes some of these problems and is seeking alternative approaches to natural resource management. Support for “social concessions”—a mechanism that could promote land distribution—is one acknowledgment by the government that a focus on large landholdings as “economic concessions” has, with few exceptions, attracted little investment (World Bank 2004). In the forest sector, several concessions have been canceled, and remaining concessionaires are being required to submit strategic forest management plans while a ban on logging and log transport is in effect. However, it remains unclear whether this process will result in tangible improvements in forest management, or to what extent alternative management approaches will be promoted. A number of forest sector studies call for a broader shift in focus from industrial approaches to the exploration of various commercially oriented community forestry approaches (IFSR 2004; McKenney and others 2004). In the fisheries sector, the government acted to improve access to fisheries in 2001 by canceling commercial fishing lots covering more than half the fishing concession area (McKenney and Prom 2002). However, many of the remaining fishing lots control the most productive fisheries.

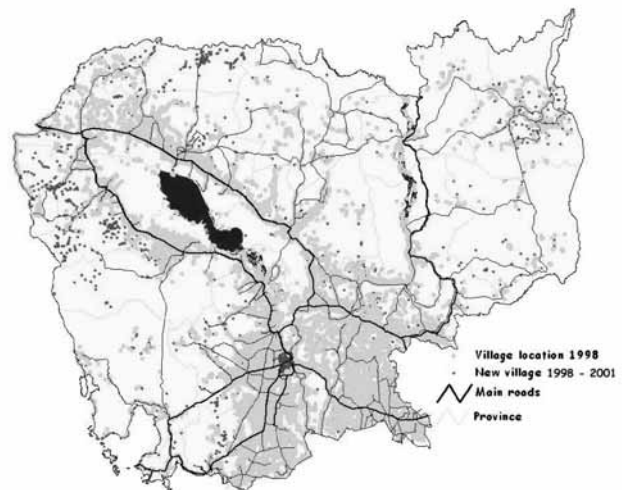
As a result of the changing management approaches, much of Cambodia’s natural resources (perhaps 30 to 40 percent of total area, Figure 2.1) are now under no clear management regime (World Bank 2005b). Canceled forest concessions have reverted to the “forest reserve,” but management arrangements have not been defined (Table 2.2). Likewise, the roughly 500,000 ha of fisheries concessions released in 2001 have not been brought under clear management regimes. Finally, an estimated 1.75 million ha of “unused” land has not yet been declared to be under any specific ownership, use, or control. Until these management vacuums are addressed, there will be the potential for misappropriation and over-exploitation of resources (World Bank 2005b).

MAP 2.8 Villages within 5 km of Evergreen/Semi-Evergreen Forests in Cambodia, 2002



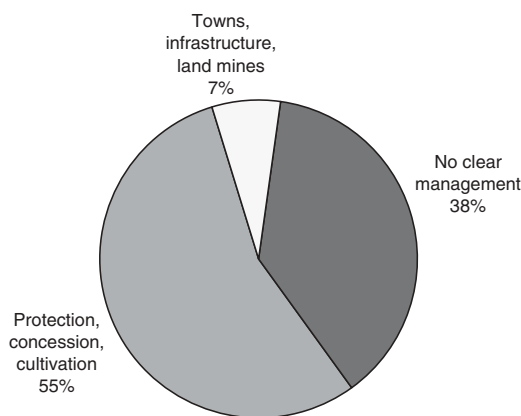
Source: Adaptation of data from IFSR 2004.

MAP 2.9 Cambodian Village Locations 1998, and New Villages 1998–2001



Source: IFSR 2004.

FIGURE 2.1 Managed/Unmanaged Areas



Source: World Bank 2005b.

Natural Resources and Moving Out of Poverty

With much of Cambodia’s natural resources under no clear management, and existing management regimes often weakly enforced, natural resources are frequently accessed and used by households as common property resources (CPR). The importance of these resources as a safety net for rural households has been established in a number of studies (Prom and Ballard 2005; CSES 2004; Chan and Acharya 2002; McKenney and Prom 2002). Indeed, the majority of rural poor households depend on CPR for some amount of consumption and income generation. But a recent study entitled *Moving Out of Poverty Study* (Cambodia Development Resource Institute 2006) attempts to take the analysis a step further by investigating the extent to which CPR may help households move out of poverty over time.³ The study’s findings suggest the role of CPR has been limited. Key conclusions include the following:

- CPR household income declined for all mobility categories due to declining availability and access. For some villages, forest access has been

TABLE 2.2 Cambodia Land Tenure/Use Estimates, 2004

Category	Area (million ha)	% Share
Forests not under concessions	4.7	26.1
Protected areas/forests	3.3	18.3
Cultivated areas	2.7	15.0
Forest concessions	3.1	17.2
Scrub land, nonwooded land	1.7	9.4
Towns, infrastructure	1.1	6.1
Released fishing concession lots	0.5	2.8
Agricultural concessions	0.8	4.4
Land mines contaminated areas	0.1	0.6
Total	18.0	100.0

Source: World Bank 2005b.

restricted or prohibited; others located in the Mekong and Tonle Sap areas have seen a sharp decline in fish catch.

- CPR played little or no role for households that moved out of poverty.
- Total income for the “chronic poor” group has become more dependent on labor (up from 28 to 38 percent), and less dependent on agriculture (33 to 23 percent) and CPR (28 to 18 percent). This reflects agricultural problems with floods and droughts, as well as declining access and availability of CPR.
- CPR access still played a crucial role as a safety net in sustaining rural poor households coping with shocks (floods, droughts, and health emergencies).

FINDINGS: ANALYSIS OF POVERTY-ENVIRONMENT RELATIONSHIPS

In this section we present findings from our analysis of poverty-environment relationships, drawing on a number of recently developed datasets.⁴ We identify major factors associated with poverty and

investigate specific poverty-environment relationships pertaining to natural resource dependence, drinking water sources, sanitation, natural disasters, and mine/UXO contamination.

To set the stage for this analysis, Table 2.3 presents major factors with a statistically significant relationship to poor and non-poor households in Cambodia. While most of these relationships are well-established, some are surprising (floods associated with non-poor households). Likewise, Table 2.4 summarizes the disparity between poor and non-poor households for a number of key poverty and environment indicators.

Natural Resource Dependence

Nationwide, a substantial proportion of households are engaged in collecting fuelwood and other wood forest products (72 percent), collecting non-wood forest products (21 percent), and catching fish/seafood (53 percent) (Figure 2.2). Not surprisingly, it is much more common for rural households to be engaged in these activities than urban households. Focusing on rural areas, the relationship between poverty and engaging in these natural resource-dependent activities is clear—more than twice as many households in the poorest quintile engage in these activities compared to the richest quintile (Figure 2.2). This relationship was noted in a previous analysis of CSES data by Knowles (2005):

“Two variables referring to sources of household income are positively and significantly related to food poverty, i.e., the “household catches fish, shrimp, crabs or oysters” and the “household collects firewood, charcoal, timber or other forest products.” The fact that these variables are positively related to food poverty does not mean that they cause food poverty. Instead, the causal link most likely runs in the opposite direction, i.e., food-poor households are more likely to use these activities to obtain additional income. This result underlines the importance of access to common resources as a coping mechanism for the poor.”

TABLE 2.3 Factors with Statistically Significant Relationship to Poverty

Factors associated with poor households	Factors associated with non-poor households
Household in Plateau/Mountain or Tonle Sap region	Household in urban area
Provincial capital not in close proximity	Household in Phnom Penh
Household size	All-weather road in close proximity
Female-headed household	Head of household has some schooling
Drought-affected in past five years	Head of household age (older)
Mines severely affect amount of available agricultural land	Flood-affected in past five years
Cluster bombs dropped in/ near village	

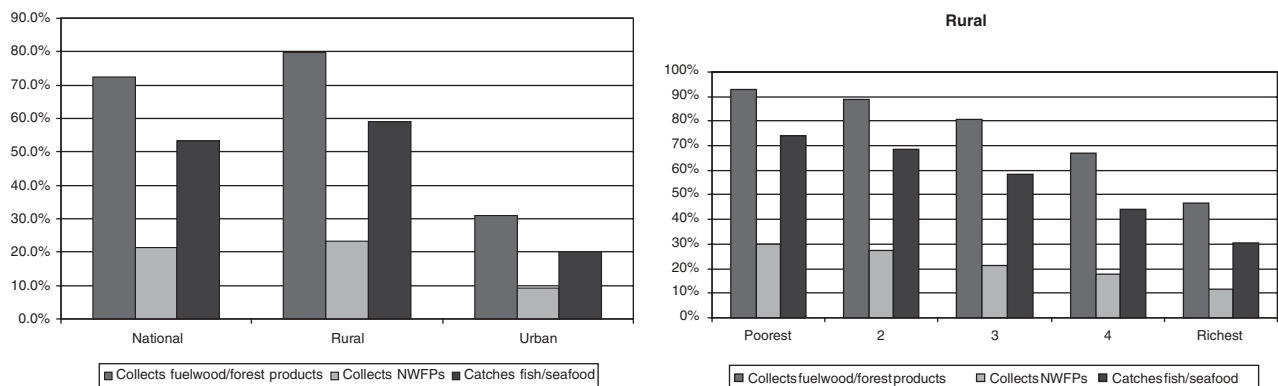
Source: Estimated from CSES 2004 and National Level 1 Survey 2002.

TABLE 2.4 Poverty and Environment Indicators and Population Affected

Poverty & environment indicator:	Estimated number of people affected	
	% of non-poor population	% of poor population
Lack of water supply (using open water sources)*	16	22
Using unprotected dug wells*	8	16
Lack of sanitation (no latrine)*	60	80
Households never boil drinking water*	24	48
Mine field and Cluster bomb Contamination (2002)**	19	28
Household use of Solid fuels/ indoor air pollution*	90	99
Flood (≥3 years in last 5 years)*	24	23
Drought (≥3 years in last 5 years)*	12	16
Urban environment***	<20	<10
No All-weather Road*	19	28

*Estimated from CSES 2004. **Estimated from a combination of CSES 2004 and the National Level 1 survey of minefields. ***This is simply the percentage of non-poor and poor living in urban areas, and therefore potentially affected by urban environmental issues such as outdoor air pollution.

FIGURE 2.2 Households Engaged in Natural Resource-Dependent Activities (left), by Household Consumption Quintile in Rural Areas (right), 2004



Source: Estimated from CSES 2004.

To take this analysis a step further, we assess the potential relationship between poverty, households engaged in natural resource-dependent activities, and areas where resources may be in decline. First, to understand trends in the natural resource base, we draw on recent opinion poll data from a survey of rural commune leaders

(Seila and Danida 2005).⁵ Specifically, we focus on responses to four poll questions (Table 2.5).

Map 2.10 indicates where these problems may be most concentrated, showing the percentage of communes within each province that responded “decrease” for at least three of the four responses. Problems of natural resource decline are most acute in the northern most provinces, with about 60 percent of the communes reporting natural resource decline in Ratanakiri, Stung Treng, and Oddar Meanchey. Regionally, the relationship between natural resource decline and poverty appears strongest in the plateau/mountain region (Figure 2.3).

The poor are likely to be disproportionately affected by the negative impacts of natural resource decline (Figure 2.4). By examining only the households engaged in natural resource-dependent activities in communes reporting resource declines, it becomes clear that the poor are considerably more dependent on these deteriorating resource bases than the non-poor. Indeed, about twice as many households in the poorest quintile depend on these activities compared to the richest quintile.

TABLE 2.5 Commune Opinion Poll Responses: Natural Resource Decline

Poll question	Communes responding decrease
Volume of fish catch compared to 5 years ago?	86 percent
Forest coverage compared to 5 years ago?	72 percent
Number of people with access to land for cultivation compared to 5 years ago?	28 percent
Number of people able to secure livelihood from natural resources in 2010?	19 percent

Source: Seila and Danida 2005.

Drinking Water Sources

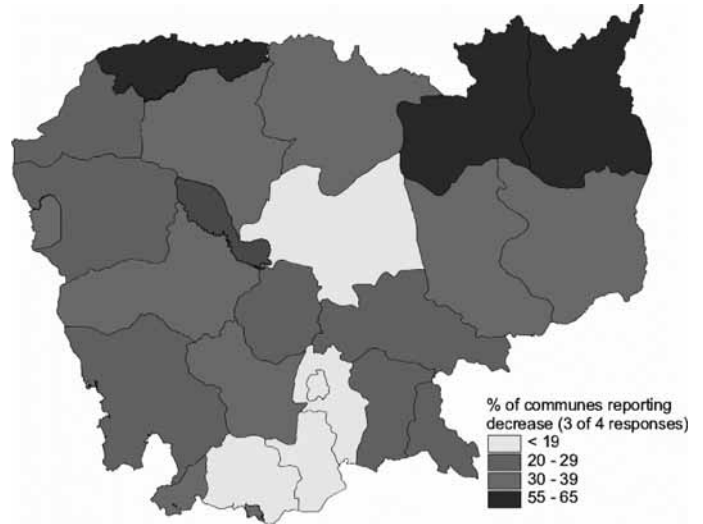
The proportion of Cambodian households with access to safe or improved drinking water sources ranges from about 65 percent (dry season) to 75 percent (wet season) (Figure 2.5). For this analysis, sources generally considered safe or improved include water piped in dwelling or on the premises, tube/piped wells or boreholes, protected dug wells, and rainwater. Water from tanker trucks and vendors may also be safe, but as this market is unregulated it is difficult to confirm. Unsafe sources include unprotected dug wells and ponds, rivers, and streams. Over 20 percent of the population uses rainwater for drinking water during the wet season, switching to this source mainly from rivers, ponds, and streams, tanker trucks and vendors, and tube/piped wells.

Drinking water sources: non-poor and poor households

The proportion of non-poor Cambodian households with access to safe/improved drinking water sources ranges from about 70 percent (dry season) to 80 percent (wet season), compared to 55 percent (dry season) to 65 percent (wet season) for poor households (Figure 2.6). Water piped in dwelling is much more common for the non-poor (17 percent) than the poor (2 percent). And almost one-quarter of non-poor households use rainwater as drinking water during the wet season compared to only 19 percent of poor households.

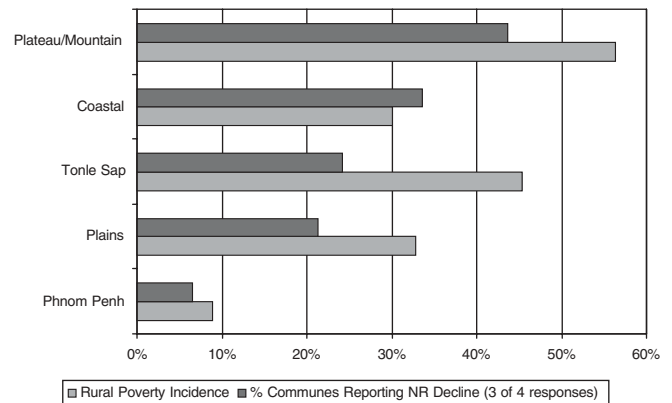
A strong relationship between poverty and *unsafe* drinking water sources (unprotected dug wells and ponds, rivers, and streams) is further revealed when examining across household consumption quintiles (Figure 2.7). Nationally, households in the poorest quintile are more than three times as likely to use unsafe drinking water sources as the richest quintile. This disparity is lower in rural areas, where the poorest quintile is only twice as likely to use unsafe water sources. But in urban areas, households in the poorest

MAP 2.10 Percentage of Communes within a Province Reporting Decreases in Natural Resources (3 out of 4 responses of decrease—fish, forest cover, land access, and long-term sustainability)



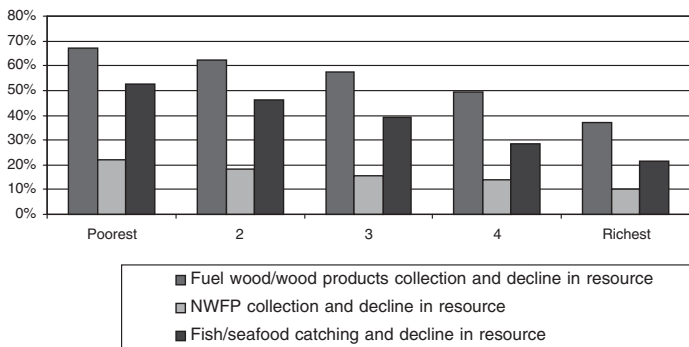
Source: Estimated from Seila and Danida 2005.

FIGURE 2.3 Natural Resource Decline and Rural Poverty Incidence by Zone



Source: Estimated from CSES 2004 and Seila and Danida 2005.

FIGURE 2.4 Households Engaged in Natural Resource-Dependent Activities in Communes Reporting Resource Decline, By Household Consumption Quintile



Source: Estimated from CSES 2004 and Seila and Danida 2005.

quintile are 8–10 times more likely to use unsafe water sources compared to the richest quintile.

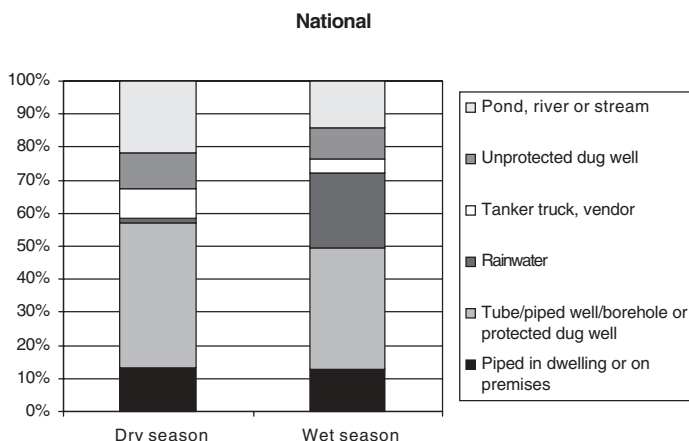
Drinking water sources: rural and urban households

The proportion of rural households with access to safe/improved drinking water ranges from

60 percent (dry season) to 70 percent (wet season), compared to over 85 percent for urban households (Figure 2.8). Looking at specific water sources, water piped in dwelling is far more prevalent for urban households (over 40 percent) compared rural households (4 percent). Use of rainwater during the wet season is more common for rural households (25 percent) than urban households (13 percent).

Analyzing rural and urban households according to non-poor or poor status sheds further light on relationships between poverty and drinking water sources (Figure 2.9). First, while rural non-poor households have somewhat greater access to safe/improved drinking water sources than rural poor households, this is largely due to more purchases from tanker trucks and vendors during the dry season and greater use of rainwater during the wet season. The disparity is greater in urban areas, where about 90 percent of non-poor households have access to safe/improved drinking water, compared to only about 65–70 percent of poor households. Moreover, non-poor households in urban areas are far more likely to have the convenience of water piped in dwelling (50 percent) than poor households in urban areas (7 percent).

FIGURE 2.5 Drinking Water Sources, Dry and Wet Season, 2004



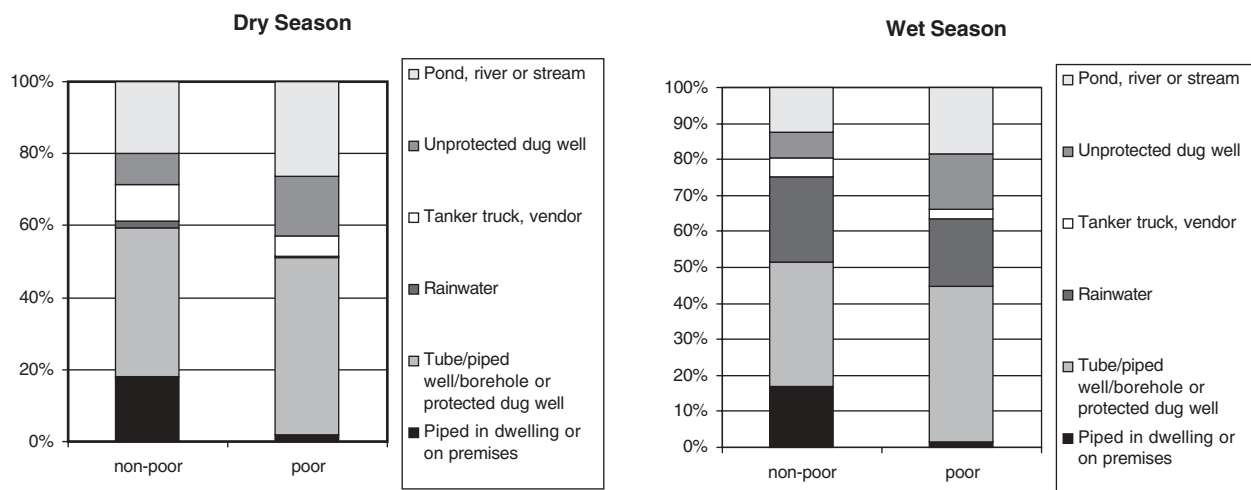
Source: Estimated from CSES 2004.

Factors associated with accessing drinking water sources: regression results

Several variables show a statistically significant relationship with access to drinking water sources. First, access to *unsafe* drinking water sources is associated with households that are poor, located in the coastal or plateau/mountain regions, and located in rural areas far from district and provincial capitals and all-weather roads. Access to unsafe water is also associated with male heads of households who have no schooling (female-headed households are associated with using *safe/improved* drinking water sources at a statistically significant level).

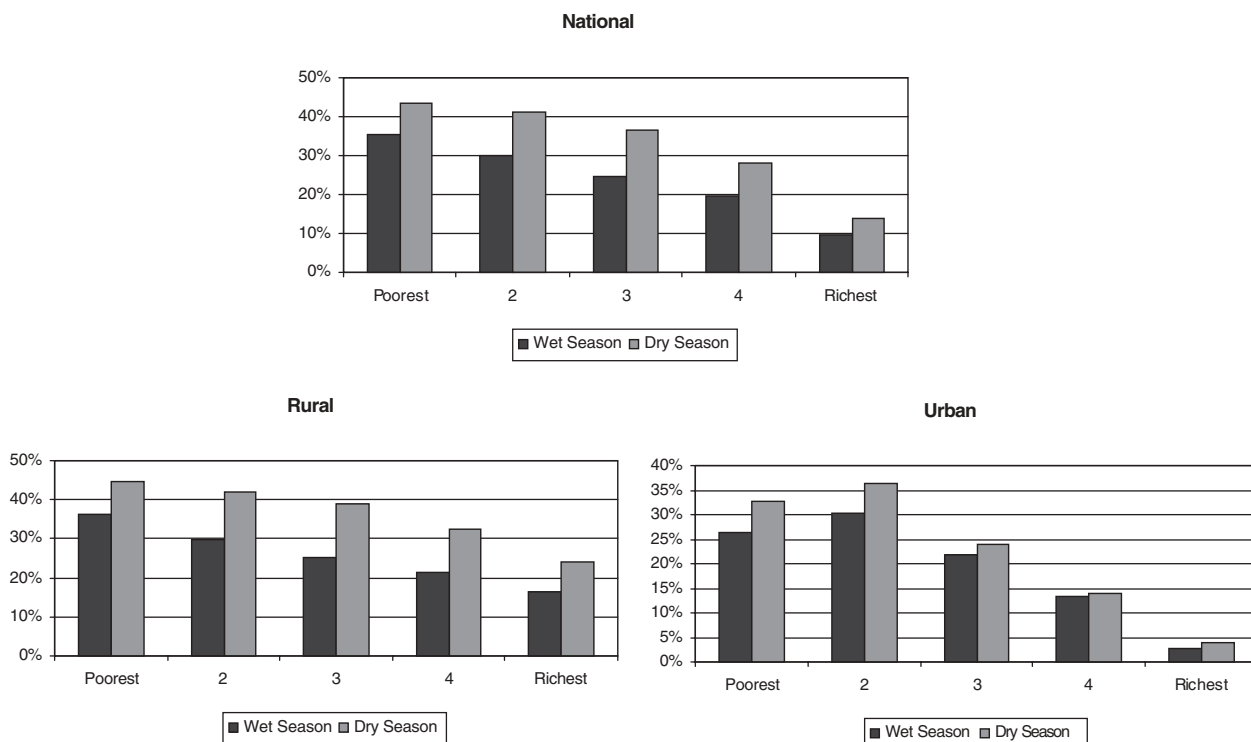
During the wet season, approximately one-quarter of households nationwide switch to the use of rainwater. Variables associated with using

FIGURE 2.6 Drinking Water Sources, Non-Poor and Poor, Dry and Wet Season, 2004



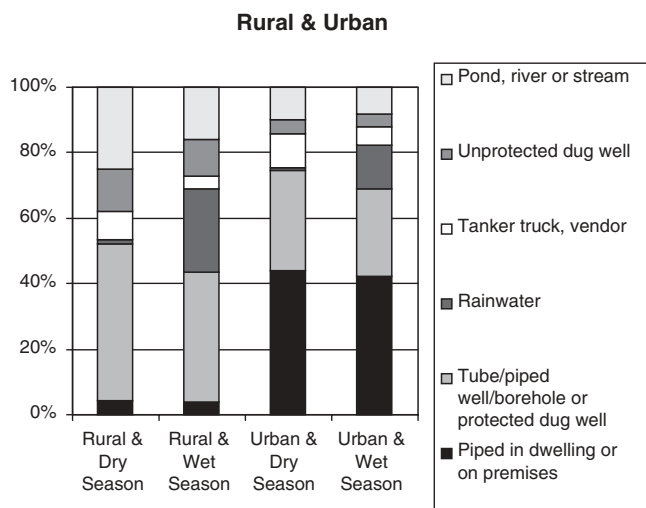
Source: Estimated from CSES 2004.

FIGURE 2.7 Unsafe Drinking Water Sources, by Household Consumption Quintiles, 2004



Source: Estimated from CSES 2004.

FIGURE 2.8 Drinking Water Sources, Rural and Urban, Dry and Wet Season, 2004



Source: Estimated from CSES 2004.

rainwater include non-poor households, female-headed households, and older heads of households with some schooling. Rainwater use is also associated with households located in the coastal or plateau/mountain regions, in rural areas with all-weather roads, and in areas close to the provincial capital. Similarly, variables associated with the use of drinking water from tanker trucks and vendors include non-poor households, female-headed households, and heads of households with some schooling, as well as households located in closer proximity to district and provincial capitals.

Boiling or otherwise treating drinking water

Nationwide, approximately 75 percent of non-poor households boil or otherwise treat their drinking water compared to only about 52 percent of poor households (Figure 2.10). This relationship between poverty and boiling drinking water is illustrated even more clearly when looking across household consumption quintiles, with about twice as many households in the richest

quintile boiling water compared to the poorest quintile. In rural areas, boiling drinking water by non-poor households (71 percent) and poor households (51 percent) tracks rates at the national level. But in urban areas, boiling drinking water is much more common, especially by non-poor households (nearly 90 percent). Note that boiling is by far the most common method for making drinking water safe; few households treat their drinking water by other methods.

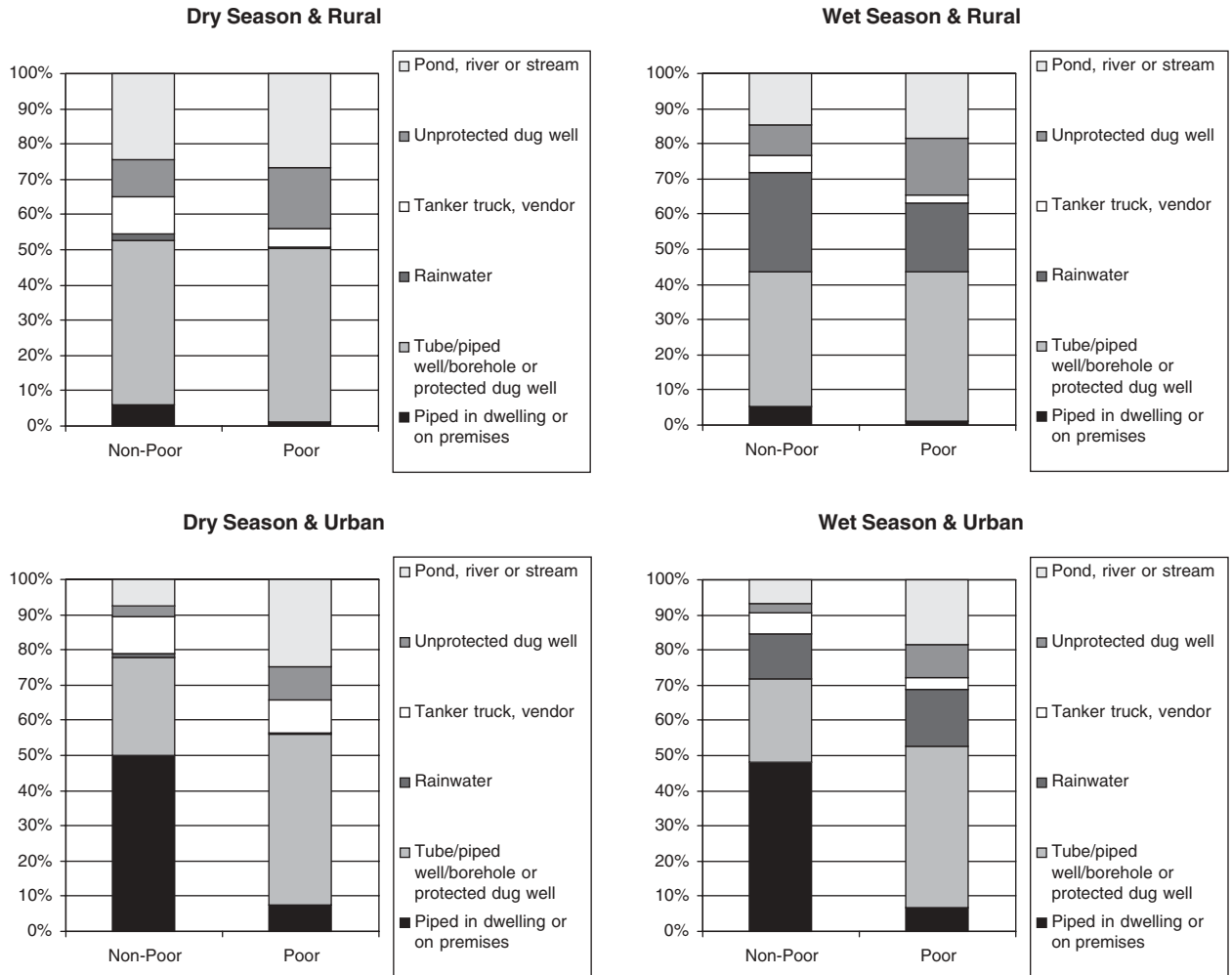
Analyzing by drinking water source reveals that those households accessing *unsafe* water sources are the *least* likely to be boiling their water (Figure 2.11). That is, the households that most need to boil their water are the least likely to do so. This is especially true for poor households, where boiling is done by less than 25 percent of households using water from unprotected wells and only about 40 percent of households using water from ponds, rivers, and streams. But poverty is not a sufficient explanation, as only a modest proportion of non-poor households using these unsafe drinking water sources boil their water—40 percent using water from unprotected wells and 57 percent using water from ponds, rivers, and streams.

Regression analysis indicates several variables associated at a statistically significant level with households boiling drinking water. These variables include households being non-poor, located in urban areas, and located in the plains or plateau/mountain regions. Boiling drinking water is also associated with older heads of households who have had some schooling, as well as with households that have separate kitchens and use clean fuels for cooking.

Sanitation

Nationwide, only about 30 percent of Cambodian households have access to basic sanitation—they are connected to sewerage, have a septic tank, pit latrine, or other facility without septic tank, or use a public or shared toilet (Figure 2.12). The rest of the population (70 percent) has no access to sanitation services.

FIGURE 2.9 Drinking Water Sources, Rural and Urban, Non-Poor and Poor, Dry and Wet Season, 2004



Source: Estimated from CSES 2004.

Basic Sanitation: non-poor and poor households

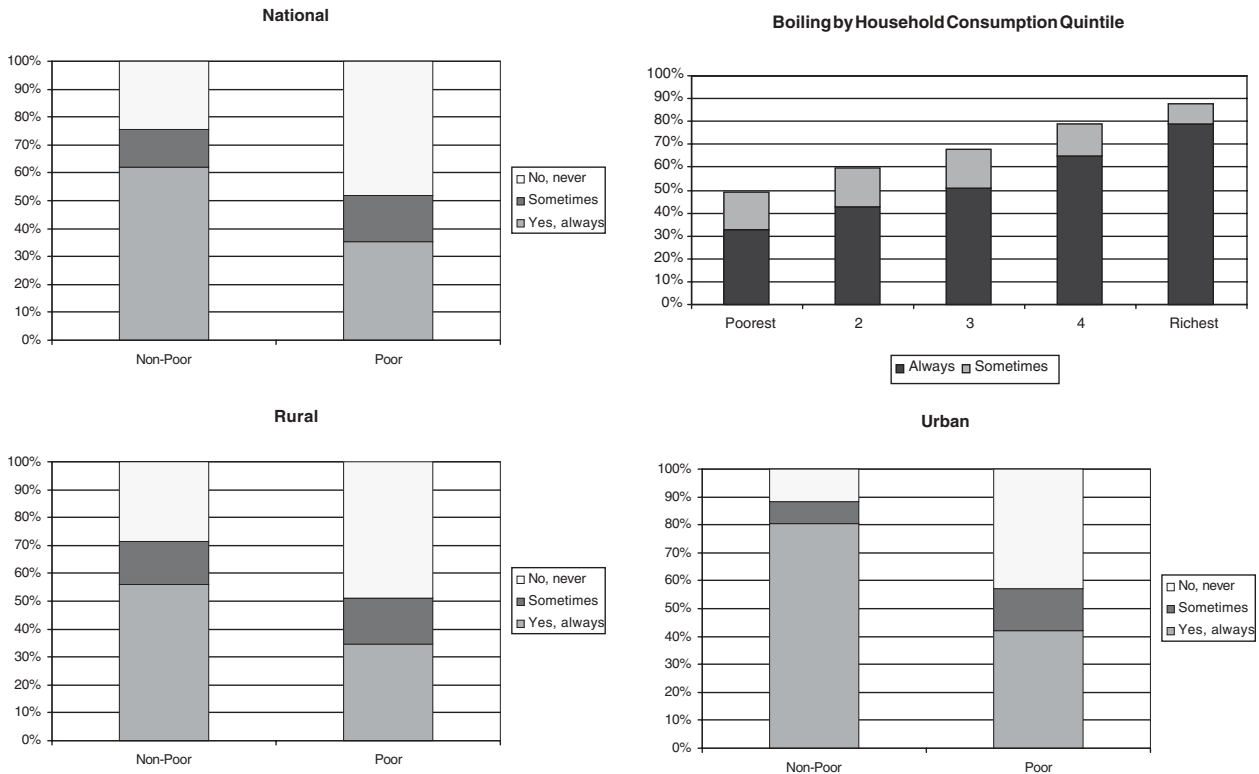
Nearly 40 percent of non-poor Cambodian households have access to basic sanitation (primarily connection to sewerage and septic tanks) compared to only about 8 percent of poor households (Figure 2.13). This relationship between poverty and lack of basic sanitation is illustrated even more clearly when looking across household con-

sumption quintiles, with about three times as many households in the poorest quintile lacking basic sanitation compared to the richest quintile.

Basic sanitation: rural and urban households

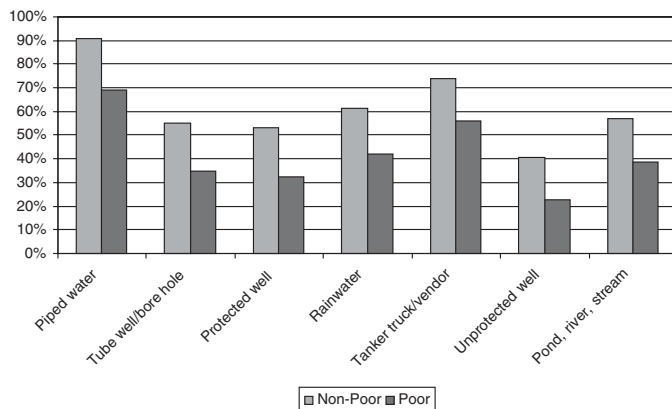
Access to basic sanitation is far more common in urban areas (65 percent of households) than rural areas (20 percent of households) (Figure 2.14).

FIGURE 2.10 Boiling/Treating Drinking Water, Non-Poor and Poor, by National (top-left), Household Consumption Quintile (top-right), Rural (bottom-left) and Urban (bottom-right), 2004



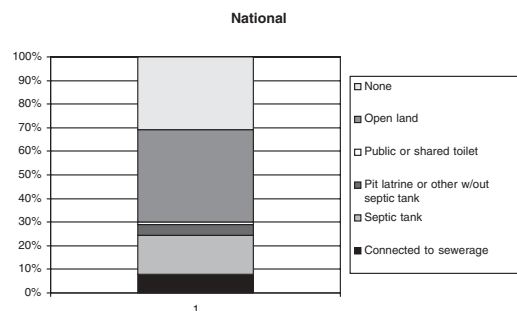
Source: Estimated from CSES 2004.

FIGURE 2.11 Boiling or Otherwise Treating Drinking Water by Source, Non-Poor and Poor, 2004



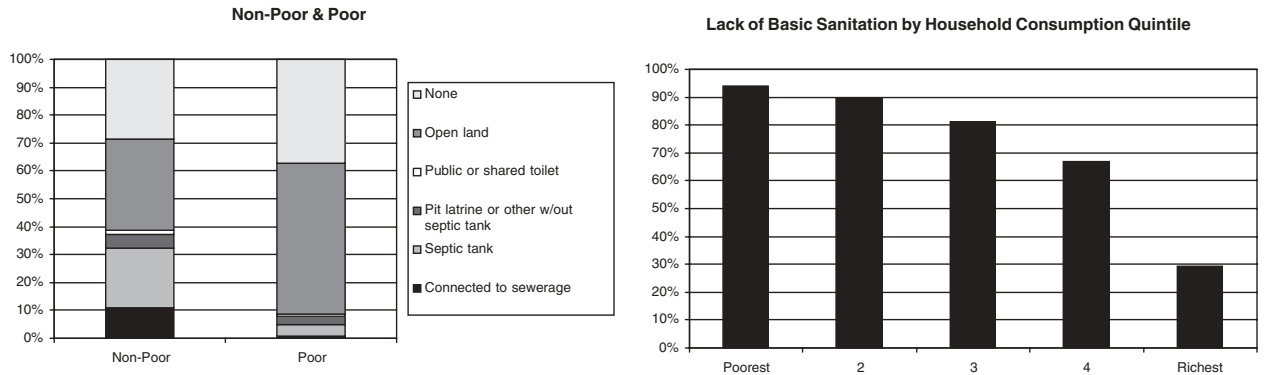
Source: Estimated from CSES 2004.

FIGURE 2.12 Access to Basic Sanitation, 2004



Source: Estimated from CSES 2004.

FIGURE 2.13 Sanitation by Non-Poor and Poor (left) and Household Consumption Quintile (right), 2004



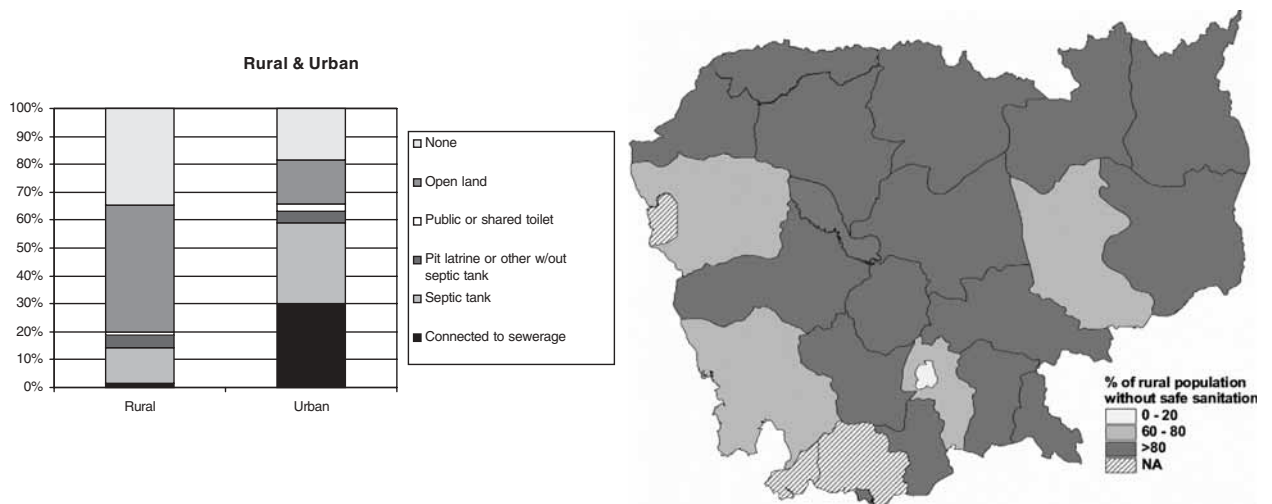
Source: Estimated from CSES 2004.

Connection to sewerage—30 percent of urban households compared to less than 2 percent of rural households—accounts for much of the difference. A closer examination of the lack of sanitation for rural households shows how the problem is nationwide, with more than 80 per-

cent of rural households lacking sanitation in all but five provinces.

Analyzing rural and urban households according to non-poor or poor status sheds further light on relationships between poverty and sanitation. Only 7 percent of rural poor households have

FIGURE 2.14 Sanitation by Rural and Urban (left); Lack of Sanitation for Rural Households by Province (right), 2004



Source: Estimated from CSES 2004.

access to basic sanitation, compared to 26 percent of rural non-poor households (Figure 2.15). Greater use of septic tanks by the rural non-poor accounts for much of this difference. In urban areas, about 20 percent of poor households have access to sanitation, compared to 73 percent of non-poor households. Here, the urban non-poor households are 10 times as likely as urban poor households to be connected to sewerage.

Factors associated with access to sanitation: regression results

Several variables show a statistically significant relationship with access to basic sanitation. These variables include households that are non-poor, located in urban areas, with access to all-weather roads and in close proximity to district and provincial capitals. Access to sanitation is also associated with older heads of households who have had some schooling. Female-headed households are more likely to lack access to sanitation.

Natural Disasters

Analysis of the relationships between poverty and households affected by natural disasters is based

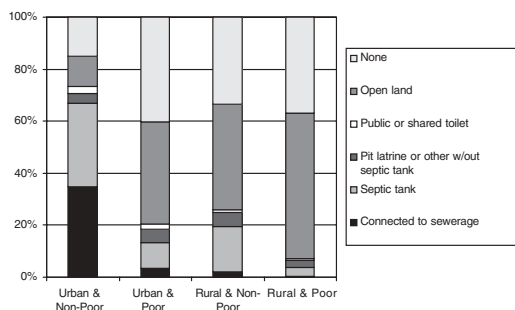
on CSES 2004, which provides data on households affected by floods and droughts between 1999 to 2003. Over this five-year period, 53 percent of households report being affected by flood and 63 percent report being affected by drought in at least one year. To isolate the households experiencing more severe problems with these natural disasters, we identified households that had been affected in three of more of the five years, either by flood (23 percent of households) or drought (14 percent of households), for further analysis.

For these flood-affected households, the poorest quintile was less often affected by floods than richer households (Figure 2.16). While it may seem counterintuitive that richer households appear located in more flood-prone areas than poor households, there may be two explanations for this finding. First, for rice farming purposes there are both “good” floods (providing water and replenishing soil nutrients) and “bad” floods (large unmanageable amounts of water). It is not clear whether the survey (and respondents) made this distinction. Second, the fact that richer households are more affected by floods may simply reflect their ownership of higher quality rice land nearer to water sources.

For households affected by drought in three or more of the five years, poorer households are more often affected than richer households (Figure 2.16). From 1999 to 2003, about 17 percent of households in the poorest quintile were affected by droughts in three or more of the five years. This percentage declines as household consumption increases, with only about 13 percent of the richest quintile affected by drought.

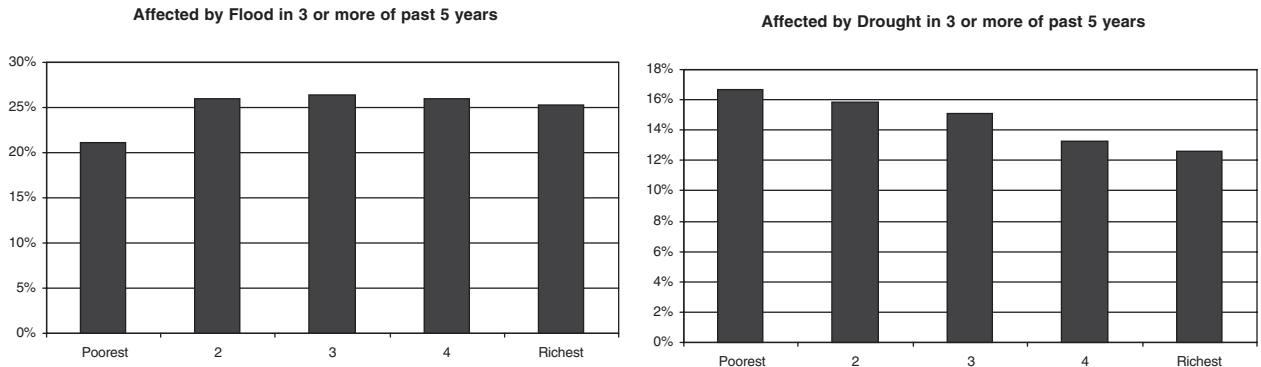
Controlling for other factors, both types of natural disasters show a statistically significant relationship to poverty. For households affected in three or more of the five years, drought is associated with poor households, whereas flood is associated with non-poor households (Table 2.3 above).

FIGURE 2.15 Sanitation, Rural and Urban, Non-Poor and Poor, 2004



Source: Estimated from CSES 2004.

FIGURE 2.16 Households Affected by Flood (left) or Drought (right) in Three or More of the Five Years from 1999 to 2003, by Household Consumption Quintile



Source: Estimated from CSES 2004.

Mine and Unexploded Ordinance (UXO) Contamination

Analysis of the relationship between poverty and mine/UXO contamination is based on CSES poverty data (2004) and the National Level 1 Survey (2002) conducted in nearly 14,000 villages to identify mine/UXO contamination. The National Level 1 Survey distinguishes between villages affected by mines, cluster bombs (a class of UXO that may affect villages in a similar way as mines), and spot UXO. Villages are more likely to experience socio-economic impacts, such as reduced access to agricultural land, from mine and cluster bomb contamination.

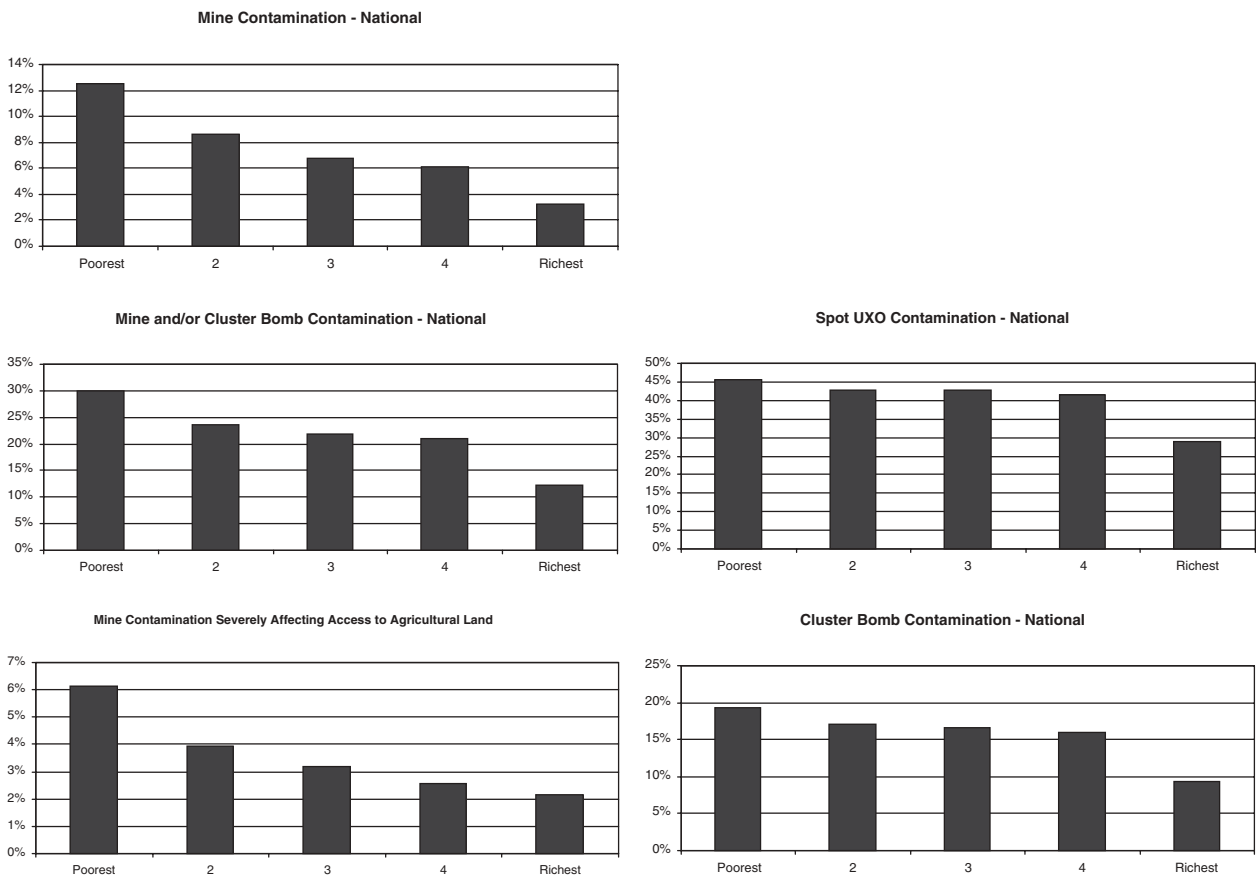
Analysis of affected households shows a strong relationship between mine and cluster-bomb contamination and poverty (Figure 2.17). The poorest quintile is almost four times as likely to be affected by mine contamination, and twice as likely to be affected by cluster bomb contamination, as the richest quintile. Likewise, mine contamination is much more likely to reduce access to agricultural land where households are poor. Indeed, controlling for other factors, the presence of mine contami-

nation limiting access to agricultural land shows a statistically significant relationship with being poor.

CASE STUDY FINDINGS: ACCESS TO NATURAL RESOURCES AND POVERTY⁶

The PEN II case study was undertaken to investigate relationships between access to natural resources and poverty (Box 2.1: Case Study Methodology). Household survey findings indicate that across the six villages studied the percentage of poor households range from 30 to 60 percent. More than half of poor households experience significant annual rice deficits—they must buy rice for more than half of the year to support consumption. The average amount of agricultural land for poor households is only 1.1 ha compared to 2.4 ha for non-poor households. Overall, the poor are more likely to live in a thatch (rather than wooden) house, own fewer and lower-value livestock, and have less involvement in petty trade and small business activity. While the proportion of poor and non-poor households hiring out their labor is similar, a

FIGURE 2.17 Households Affected by Mines (top left), Cluster Bombs (top right), Mines/Cluster Bombs (middle left), Spot UXO (middle right), and Mines Limiting Access to Agricultural Land (bottom left), by Household Consumption Quintile



Source: Estimated from CSES 2004 and National Level 1 Survey 2002.

higher percentage of the poor hire out labor to clear degraded forests, while non-poor tend to be more involved in timber extraction.

Nearly all rural households across the study areas, whether poor or better-off, depend on natural resources for their livelihoods. In most cases, households are cultivating rice (83 percent), raising livestock (68 percent), collecting forest products (98 percent), and fishing (75 percent). The proportion of households engaged in these livelihood activities is quite similar to rural households across Cambodia (CSES 2004), though some-

what more households in the study areas collect forest products and somewhat fewer raise livestock.

At the commune and village level, officials report a number of changes in natural resources over the past decade. First, significant forest clearing for rice and other agricultural crops has occurred, consistent with national trends. At the same time, progress in improving agricultural productivity has been mixed, with some areas reporting increases, some decreases, and some no change. Across the study areas, households

BOX 2.1 Case Study Methodology

In the design of PEN phase II for Cambodia, interviews were conducted with a range of key stakeholders to identify poverty-environment issues of national priority. This included consultations with a number of government partners, including the Ministry of Environment, Ministry of Economy and Finance, and Ministry of Planning. These interviews revealed several recent and ongoing studies addressing critical issues associated with poverty and natural disasters, land, water, and health and sanitation. In addition, a number of studies were focused on poverty issues in floodplain areas around the Tonle Sap Lake and in the Mekong Delta region (Prom and Ballard 2005; So and Ballard 2005). However, one issue of increasing concern for Cambodia—the relationship between access to natural resources and poverty—was not the explicit focus of any of these studies.

To address this concern, PEN II examines access and poverty issues for a variety of natural resources, including agricultural land, forest products, grazing land, fisheries, and drinking water. As the study sought to avoid floodplain areas (in order to avoid repeating the work of other studies), fisheries concerns are not covered in depth, whereas forest and land issues receive more comprehensive coverage. For the purposes of this study, access to natural resources is defined as households having the ability to collect/obtain the specified resource or product. In practice, it was found that all households with access to resources had also made use of this access in the past year.¹ Lack of access may be attributed to a lack of means (transportation, resource extraction equipment), physical barriers such as poor road conditions, and/or legal and institutional barriers such as restrictions on access to land or specified areas/resources.

The case study is guided by the following research questions:

- To what extent do the poor differ from the non-poor in terms of current access to natural resources and environment in Cambodia?
- What trends in access to natural resources and environment can be observed, and do these trends differ between the poor and the non-poor?
- What are the environmental impacts from different types of natural resources and environment utilization by the poor and non-poor? What are the key determinants of the environmental impacts? To what extent can these environmental impacts be economically evaluated?
- What are the specific and practical policy options leading to poverty reduction and sustainable utilization of natural resources and environment?

PEN II case studies are intended to deepen current knowledge about poverty-environment relationships and to support broader investigation of potential poverty-environment linkages in national data. In Cambodia, two provinces were selected for study of natural resource access issues—Kampong Speu and Kampong Thom. These were chosen because each fulfills the criteria of having a “protected area,” diverse types of concessions, ongoing in-migration, and a substantial share of poor districts/communes. A total of six villages (three in Aoral district of Kampong Speu province and three in Santuk district of Kampong Thom province) were then selected for more focused study based on their proximity to protected areas, proximity to roads, and population densities.

Data were collected through (a) semi-structured interviews with officials at the provincial, district, commune, and village levels; (b) a household survey of 120 households (20 households randomly selected in each of the six villages); and (c) focus group discussions to capture additional information on the potential effects of wealth differences and gender. Data analysis required classifying households into “poor” and “non-poor” categories. This study relied on methods developed and employed by GTZ in its rural development programs (including in the villages in Kampong Thom). Key criteria in establishing poor and non-poor status included amount of residential land, amount of productive land, sources of family income, livestock, housing, means of transport, electric appliances, and period of time in which the household lacks food within a year.

It should be noted that problems were encountered in applying these selection criteria. First, proximity to a protected area was revealed to be unimportant, as parks tend to lack enforcement. Proximity to (quality) forest resources is a more meaningful variable to consider. Second, proximity to roads was not as meaningful as proximity to markets. For example, in Kampong Thom, while the three selected villages have differing levels of road access, all are less than one hour from a marketplace. Likewise, the three selected villages in Kampong Speu have differing road access, but all are very far from a marketplace. Finally, although *provinces* were selected according to their

(continued)

BOX 2.1 Case Study Methodology (Continued)

low and high population density, at the *village* level it was found that all potential rural villages had a population density well below the national average.

A number of limitations of the PEN II study require noting here. First, the sample size (20 households per village for six villages) for the case study is small; the intention was for the survey to provide on-the-ground insights regarding the poverty and environment nexus, but not necessarily to provide data for analysis of statistical significance. Second, as noted above, the classification of “poor” households is not based on a robust poverty line. This may lead to a small margin of error in the classification of “poor” and “non-poor” households, and in the comparison of case study findings to national data. Third, at the time of writing, PEN II had only limited access to data and findings from the CSES, which suggests potential scope for identifying additional relationships between case study findings and the national context and trends beyond those discussed in this chapter.

Finally, analysis of spatial associations between poverty and environment was hampered because most credible data (such as CSES) are only presently available at the provincial level, with some data also available at the commune level (for example, Seila/Ministry of Planning commune database 2003). For analysis in Cambodia, Vietnam, and Laos, PEN II has targeted poverty-environment spatial analysis at the *district* level. While this may be an appropriate administrative level for analysis in Vietnam and Laos, it has a number of shortcomings in Cambodia. First, Cambodia has only had elections at the national and commune level.¹ As a result, most policy (and donor) support targeting local issues focuses on communes and their elected Commune Council. Policy development is less driven at the district and provincial levels because they are administered by unelected officials.

Second, from a geographical standpoint, aggregating data at the district level has not been found to be highly relevant because most rural districts include semi-urban areas (district markets). This mix of rural and urban areas makes district-level data less meaningful for study of poverty than more disaggregated units. Moreover, districts may include floodplain and upland areas,² and thus villages dependent on different types of natural resources (e.g., fisheries, forestry) for their livelihoods, all of which complicate assessments of poverty-environment relationships at the district level. To achieve more meaningful results, with greater opportunities for policy mainstreaming at the local level, future analysis of poverty-environment issues in Cambodia would be better targeted at the commune level.

¹When the term “access” is translated into Khmer, it implies the household has the internal ability to obtain a resource. Households with the ability to obtain resources also have experience doing so, given that these resources are relied on and often constitute a major part of livelihoods.

²Cambodia’s governing levels include national, provincial, district, commune, and village.

³For instance, many districts surrounding the Tonle Sap Lake also include forested areas far from the lake.

and officials report that availability of natural resources (especially forest and fisheries resources) has decreased substantially over the past decade, with the sharpest declines occurring in the past five years. Officials blame the declines on increased demand, overexploitation, and uncontrolled activity.

Access to Agricultural Land

Gaining access and claim to land in the study areas involves little more than clearing it. As a result, in some villages there has been significant in-migration of landseekers (including landless

and better-off “newcomers”). Newcomers often hire local people to clear land, usually for agriculture but also for speculative purposes. In some areas, there is plenty of access to land available, but the land is unproductive. For instance, migrants were drawn to one village by the promise of three ha of land. While this was provided, they have found yields to be very low due to poor soils and a lack of rain. Most are now trying to make a living in charcoal production.

Approximately 25 percent of the households surveyed report being landless. The landless households are almost all poor, and most are highly dependent on access to natural resources

(especially forest products) for their livelihoods. Many of these households express concern that increasing overexploitation of resources may make it difficult for them to sustain their livelihoods in the future. In addition to landlessness, there are indications of increasing concentration of land ownership. For example, the average non-poor landholding household in Santuk owns 2.77 ha, compared to 0.73 ha for poor landholding households.

Access to Forest Resources

Availability of forest products has decreased markedly over the past several years in all study areas. Timber, resins (which are produced by large trees), and wild animals are among the products that have declined most dramatically. Wood for charcoal production is also on a rapid declining trend. Decreasing at a somewhat slower rate are wild vegetables, vinery, and other minor products. As low-value products, these resources are likely under less extractive pressure than timber and other wood resources.

Access to forest resources in the study areas is limited by legal restrictions, taxes, and Forest Administration (FA) control of forest concessions (in Santuk district, where three forest concessions operated until recent suspension of activities). Households in Santuk district recall that when concessionaires tightened forest boundaries and placed armed guards to restrict access several years ago, they became poorer. The hardship continued during the years of concession operation, and has become worse as the forest resources have come under FA management. The FA not only restricts forest access but also either charges fees to villagers collecting forest products, or confiscates the products altogether. The restrictive regime appears to be selectively enforced, with more non-poor households gaining access to timber (46 percent) than poor households (11 percent).

At present people have the right to access the forests to collect forest by-products. However, the authorities (forest wardens, soldiers, and police) wait to

very unjustly and cruelly take a share from the products collected by the innocent people. For instance, when people transport the products they worked very hard to collect to the market or home, these people charge very high informal fees from people without shame or confiscate their transport means, making people lose their last resort of livelihood. The community can only educate people to love nature, but cannot protect ourselves from such abuses. (A village chief in Santuk district)

Given the restrictions, some households have found creative ways in which to collect timber while avoiding fees and confiscation. For instance, villagers often cut up large logs (worth considerable sums) into low-value firewood to avoid restrictions. Likewise, villagers may cut timber for house construction and wait for a year or more for the wood to become “old” looking before transporting it. This way they appear to be moving their house, rather than construction materials, and can avoid paying officials on the road. Such delays and inefficiencies caused by the current enforcement regime represent a sub-optimal use of forest resources, but villagers see no other options, given the current restrictions.

In Aoral district, many households are involved in charcoal production. Although access to forest resources is open, a fee of R10,000 (\$2.50) must be paid to authorities for each unit of charcoal produced (1 meter by 1 meter). Charcoal producers consider this to be a high fee, as it is equal to their labor costs per unit. Authorities enforce against timber extraction selectively, stopping villagers from logging, but also allowing bands of loggers to operate as long as they pay fees twice per month. Households in the study areas complain about what they perceive to be unjust restrictions and selective enforcement. They believe the presence of enforcement authorities, or designation of protected areas, has little effect if outside logging interests are involved.

“The whole village is in protected area but logging is happening every day.” (A village chief in Aoral district)

As charcoal production has been ongoing for several years in Aoral district, the forest surrounding

the study villages has all been cut. The forest is now 6–10 km away, with the frontier moving farther away each year. Early in the morning, these villagers depart on *koyun*⁷ to go to the forest to collect firewood for charcoal and timber for fences. Most villagers use axes; chainsaws are only owned by powerful people in the area. In the current forest area, villagers are in the process of making a “second cut” (the best wood has already been collected). While villagers express concern about the future, they also say they will make a third cut (to extract roots) if they have no other option.

Access to Grazing Land

Access to grazing land is important to rural livelihoods because raising cattle and buffalo provides draft animals for agriculture as well as supplemental income if sold. On average, 65 percent of the households in the study villages raise cows or buffaloes, with poor households owning fewer animals than non-poor households. Likewise, the average value of animals owned by poor households is only half that of non-poor households.

Where grazing areas are available, access is generally open to all. Most households report a decrease in grazing areas compared to 10 years ago due to conversion of these areas into cropland. However, some households (usually non-poor) no longer require grazing land, as they have opted for machinery (*koyun*) to replace draft animals, so they have less need to raise cattle and buffalo.

Access to Fisheries

Cambodia’s fisheries play a major role in rural livelihoods, supporting consumption and providing the chief source of protein in the rural diet. Even though the six surveyed villages are primarily forest-dependent, 75 percent of households benefit from catching a small amount of fish, frogs, and other aquatic resources. Most vil-

lagers fish during the wet season and early dry season, when there is enough water in these areas to support more abundant aquatic life. Catches are primarily for household consumption.

There are no restrictions on access to fishing areas for the study villages. Although roughly the same proportion of poor and non-poor households fish, non-poor households catch twice as much fish as poor households. This occurs because the non-poor can afford better fishing equipment. Households report a decline in their overall catch, especially over the past five years. They attribute this decline to overexploitation, including the illegal use of destructive fishing equipment and methods.

Access to Drinking Water

Access to drinking water is similar for poor and non-poor households in the study areas. However, all villages complain about the quality of water and the difficulty of collecting it. Drinking water in Santuk district is mainly drawn from wells, but many households note that the water smells and tastes bad. They believe there is lime in the well water, and therefore they prefer other sources when available. Households in Aoral district use a variety of sources, including rain water, streams, and hand pumps. Although households understand that water from streams is generally not clean, they often use it. Where possible, households in both study areas use water from streams for irrigating vegetables, bathing, washing clothes, and feeding animals.

Less than one-quarter of households boil water before drinking. Villagers note that it is quicker and easier to drink un-boiled water. Most households report that they do not wash their hands before having meals and there is a lack of other hygienic practices. However, there is a degree of awareness among most households that hygienic practices and drinking boiled water help reduce health problems and illness.

Summary of Case Study Findings

Restrictions on timber access appear to benefit non-poor households; no restrictions were identified for other natural resources. Although this case study did not find restrictions on access to most natural resources, access to timber was restricted for forest areas currently managed by the Forest Administration in Kampong Thom. This restriction appears to be selectively enforced, with more non-poor households gaining access to timber (46 percent) than poor households (11 percent). In Aoral, charcoal producers pay an informal tax to authorities on each unit of charcoal produced; in effect, the tax doubles their cost of production. For other natural resources studied (agricultural land, grazing areas, fisheries, and drinking water), no notable differences in the proportion of poor and non-poor households with access were identified. This appears to be the case because nearly all households in the six villages studied, whether very poor or better off, depend on access to these resources.

Non-poor households make more effective use of open access. The study did find differences in how effectively (and profitably) non-poor households make use of their access to natural resources compared to poor households. This appears to occur for two reasons. First, non-poor households tend to have better means of transportation and equipment for exploitation of forest and fisheries resources. This allows them to collect more, over greater distances. Second, because the non-poor are able to collect products more efficiently, they are better able to cover the fixed costs associated with travel to resource-rich areas, pay fees to officials, and still make modest earnings. Poorer households may require longer travel times, collect fewer products for their labor output, and have difficulty covering fee charges. These differences in the productive use of access tend to compound over time, as non-poor households use some of their earnings to invest in better trans-

portation and equipment for extraction, supporting even more extraction, while the poor continue at a level of subsistence.

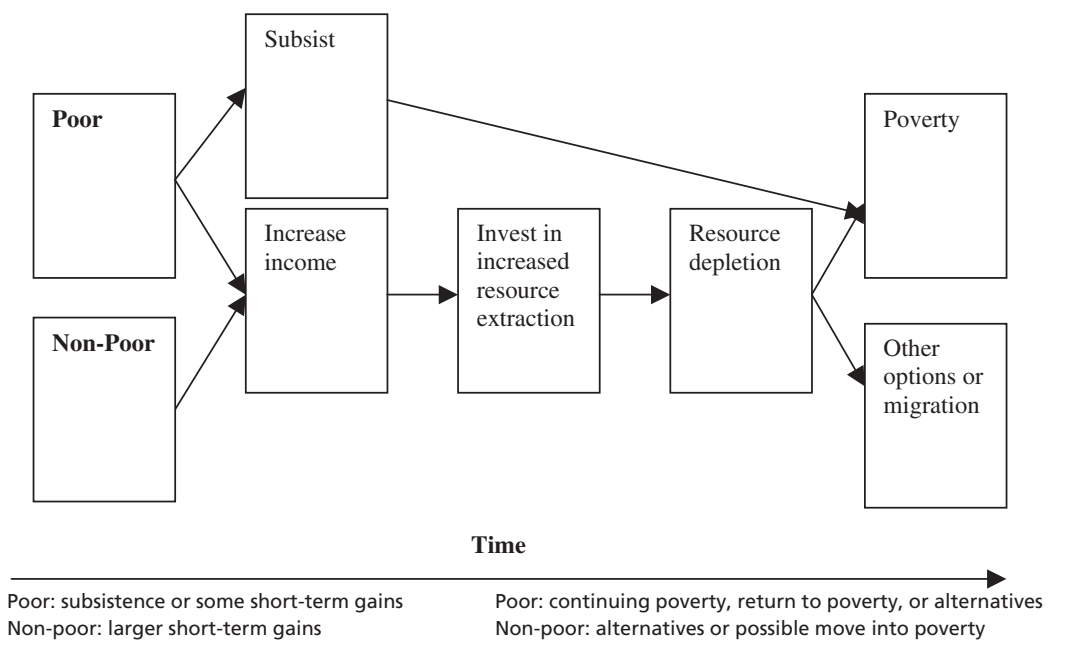
Poverty reduction associated with opening of access tends to be short-lived, likely to be followed by increasing poverty over the long term. Although both non-poor and poor households may initially benefit from the opening of access to natural resources (for example, cancellation of forest concessions or fishing lots), this poverty reduction is likely to be short-lived. Opening access—with no clear management structure to fill the vacuum—results in a period of overexploitation, often involving destructive practices, that will likely be followed by increasing poverty over the long term as the resource base declines (Figure 2.18).

For example, rapid exploitation of charcoal resources by villages in Aoral district appears to have led to short-term poverty reduction. Many households used initial profits from charcoal to make home improvements and invest in *koyun* transportation (to support farming and the transport of charcoal). It is only more recently that, as the forest frontier has moved farther away, charcoal is becoming less profitable and charcoal producers are worried about the future. Due to poor farming conditions (drought and low soil fertility), they do not see options other than continuing charcoal production. Thus, it can be expected that poverty will increase as resources become scarcer and farther away, unless other opportunities arise for the community members to make their living.

Although Figure 2.18 reflects this case study's finding for villages in forest areas, the same appears true for fishing villages in Cambodia. Non-poor fishing households tend to have better boats and gear, providing them a greater ability to benefit from open access fisheries. As noted in the interim findings of the *Tonle Sap Participatory Poverty Assessment*:

“[Fishing] villagers defined three different categories of well-being: medium, poor, and destitute. Medium households are differentiated

FIGURE 2.18 Poor vs. Non-Poor—Open Access and Natural Resource Dependent Livelihoods



from poor and destitute households based on ownership of different fishing assets, both in terms of quantity and quality. The medium households tend to have larger boats with larger engines, which enables them to go further out in the lake to fish. These same households also tend to have much better quality fishing gear than do the poor/destitute households” (Prom and Ballard 2005).

Like the overexploitation of open access to forest resources, open-access fishing leads to a rapid decline of fisheries resources. A study of fishing lots released in 2001 for open access fishing notes: “Initial positive impacts from improved access to fisheries are now perceived to be declining due to unregulated competition for resources and widespread use of illegal fishing gear” (Community Fisheries Department Office 2004).

Strict controls on previously accessed resources can increase poverty and cause sub-optimal use of resources. This impact has been noted in numer-

ous rural livelihood studies (Oxfam GB 2000; Chan and Acharya 2002; McKenney and Prom 2002; IFSR 2004; World Bank 2005b; www.ngoforum.org.kh). This case study found that stricter controls on forest product collection imposed by concessionaires, and then the Forestry Administration (FA), have caused considerable hardship to local communities in Santuk district. These measures reduce the income of local households, to the benefit of concessionaires, FA, and a few non-poor households (who still have the means to harvest timber and simply bribe officials and guards when they are caught). Moreover, selective enforcement of restrictions (for example, outsiders are allowed access while locals are not) likely intensifies the scramble for resources, as local people act to benefit from rapidly declining resources in any manner they can. For instance, in Santuk district, logging by outsiders continues despite restrictions affecting local households. At the same time, locals have

identified a number of informal ways of benefiting from timber resources as well, but in a highly inefficient manner.

The abundance and quality of natural resources in the areas surrounding the six villages is in significant decline, suggesting the potential for increasing poverty in the future. This is especially the case for forest and fisheries resources. Villagers indicate that the decline has worsened in recent years. While resource decline has negatively affected both poor and non-poor households, it was not possible to distinguish if one group has been disproportionately impacted. Compared to poor households, non-poor households tend to collect more resources, often of higher value. As a result, a decline in resources would likely reduce the total income of non-poor households by a greater amount than poor households. But this may not move these households into poverty, as they may still earn an adequate income from natural resources or be able to redirect their labor to alternative income-generating activities. Poor households earn less from natural resources than non-poor households, but these earnings are often a substantial proportion of their total income. As a result, any reduction in earnings from natural resources can cause severe hardship, especially since poor households often lack alternative income-generating options.

SUMMARY AND POLICY IMPLICATIONS

Natural resource dependence and poverty

1. **The poor are disproportionately dependent on natural resources for their livelihoods. And this holds true in areas reporting declines in the resource base. Problems of poverty and resource decline appear to be most pronounced in the plateau/mountain region.** In analyzing households that are both engaged in natural resource-dependent activities and located in communes reporting resource declines, we find twice as many households in the poorest quintile depend on these activities compared to the richest quintile. This suggests that if these resource bases continue to deteriorate, the poor will bear a disproportionate burden.

Policy implication: Targeting support of local resource management, land use planning, and agricultural and off-farm assistance should consider communes reporting declines in forest cover, fisheries, and land access, and concerns about future resource-based livelihoods, as well as poverty levels and other indicators (such as soil quality, water resources).

BOX 2.2 Potential Policy Links: Ongoing Initiatives on Natural Resources

- Policies to promote institutionalizing land and natural resource management at the commune level (e.g., Seila Program and Commune, Community Based Natural Resource and Environment Management (CCB-NREM)).
- Initiatives aimed at improved productivity and diversification of agriculture, off-farm opportunities, and land, forest, and fisheries reform under the *Rectangular Strategy* and the *National Strategic Development Plan (NSDP)*. The NSDP consolidates a number of past planning processes and documents, including the National Poverty Reduction Strategy (World Bank), Socio-Economic Development Plan (Asian Development Bank), and the UN Millennium Development Goals.
- Reform efforts aimed at improving land, forestry, and fisheries laws; regulations; and enforcement mechanisms. Of particular importance are policy interventions for forest and fisheries concessions (especially addressing possible reform/termination, monitoring, and enforcement) and land distribution mechanisms (for example, social concessions).
- Programs using an array of criteria for identifying target areas and communes (Seila, CCB-NREM, and various other rural development and conservation NGOs).

2. **Natural resources provide an important safety net for the poor, but not often a pathway out of poverty.**

The poor are disproportionately dependent on natural resources for income/consumption, and these resources play a critical role in helping households cope with crises, such as floods and droughts. Despite the important role of natural resources in rural livelihoods, income generation activities (fishing and forest product collection) appear to play little or no role in moving households out of poverty. Indeed, findings from our case study in Kampong Speu on charcoal production indicate households often use initial earnings from resource extraction to invest in more efficient extraction (equipment, transportation), which in turn can lead to an acceleration in the decline of the resource base. Both non-poor and poor households may benefit from this period of rapid extraction, though non-poor households tend to be better positioned to do so. As resources are depleted, however, many households may return to poverty, especially where other livelihood options are lacking, as is the case in Kampong Speu. The fact that natural resource-dependent activities play little role in moving households out of poverty is unlikely to change, as income from these activities is falling as a proportion of household income, and this is occurring across all households, rich and poor. The fall in income reflects an overall decline in the resource base, and in some areas increasing control over resources by private concessions and powerful interests (as illustrated by our case study site in Kampong Thom).

Policy implication: Natural resource management should be focused on developing local management regimes suitable for maintaining resources and providing access for the poor/vulnerable, not aimed at industrial-level extraction, which has a history of dismal results for the environment, local communities, and government revenue. In establishing

local management regimes, consider targeting interventions where rapid resource extraction is either beginning, and/or the resource base is not yet highly degraded, and encourage a combination of sustainable resource management and investment of extraction earnings in agricultural and off-farm opportunities (rather than even more extraction).

3. **Natural resource management at the “extremes” is not pro-poor; both highly restrictive regimes and open access management appear to result in negative outcomes for the poor compared to the non-poor.** Clearly, restricting the rural population’s access to natural resources (as has been the case for many forest, fishing, and economic/land concession areas) takes away productive resources that support rural livelihoods. While this can make the surrounding rural population worse off, the impact can be especially severe for food-poor households, which tend to be more dependent on these resources.

But the converse to restrictive regimes—“open access” (or a management vacuum)—may not be much of an improvement for the poor over the long run. First, the poor tend to be less able to take advantage of open access to exploit resources as profitably as non-poor actors, because they lack the capital means (equipment, transportation). Second, “open access” generally is not fully open, but rather involves paying a range of informal fees for access—a disproportionate burden for the poor. Lastly, the poor tend to be more dependent on natural resources and have fewer alternative options for income generation. As a result, when open access exploitation leads to resource decline, the impact on livelihoods is again felt disproportionately by the poor.

Policy implication: The management vacuum created by past cancellations of forest concessions and fishing lots needs to be addressed with greater support for natural resource assessments, setting priorities for

management (for example, rural poor, conservation), and promoting locally appropriate management regimes. Remaining concessions in Cambodia still claim a large proportion of the richest resource areas. These (selectively) restrictive management regimes should be reformed to improve appropriate access for local communities (with ongoing independent monitoring), or the concessions should face termination. It is critical, however, that reforms and terminations do not lead to management vacuums (as has been the case in the past), which invite *ad hoc* control by powerful interests. There must be support for resource assessments, consultation and priority-setting, and establishment of fair and enforceable management.

Drinking water sources and poverty

4. **The poor are disproportionately dependent on the use of unsafe water sources.**

Our analysis indicates households in the poorest consumption quintile are three times as likely to use unsafe water sources (unprotected dug wells and ponds, rivers, and streams) as households in the richest quintile.

Policy implication: In targeting service provision for drinking water, consider factors identified in this analysis as associated (at statistically significant levels) with the use of unsafe drinking water sources. These include households located in the coastal or plateau/mountain regions, as well as rural areas far from district and provincial capitals and all-weather roads. Additional factors include households that are poor and have heads of households with no schooling.

5. **Households accessing unsafe water sources are the least likely to be boiling their water.**

This is especially true for poor households, where boiling is done by less than 25 percent of households using water from unprotected wells and only about 40 percent of house-

holds using water from ponds, rivers, and streams. However, only a modest proportion of non-poor households using these unsafe sources boil their water—40 percent using water from unprotected wells and 57 percent using water from ponds, rivers, and streams.

Policy implication: Consider education and awareness programs to encourage the boiling of drinking water, especially for households using unsafe sources. Although poor households using unsafe sources are more at risk due to their lower levels of boiling, even a considerable proportion of non-poor users of unsafe sources do not boil. This suggests poverty itself is not a sufficient explanation for the lack of boiling, and there may be a potential for significantly reducing drinking water-related health impacts through greater education and awareness programs targeting this segment of the population.

Sanitation and poverty

6. **Access to basic sanitation is lacking across all rural areas.**

In urban areas, 65 percent of households in urban areas have access to basic sanitation, with 30 percent connected to sewerage. But such sanitation infrastructure/services are dearly lacking in rural areas, where only 20 percent of households have access to sanitation and less than two percent are connected to sewerage. The problem is even worse for the rural poor—only seven percent have access to basic sanitation and less than 0.5% are connected to sewerage.

Policy implication: With so much of the rural (poor) population lacking access to basic sanitation, targeting based on poverty is unlikely to be meaningful. To make progress at such a broad scale, improving basic sanitation in rural areas needs to be elevated as a national policy priority, with appropriate technical and resource support for action.

Natural disasters and poverty

7. **Both droughts and floods show a statistically significant relationship to poverty. But whereas droughts are associated with poverty, floods are associated with not being poor.** Droughts and floods are a common problem for Cambodian households. For the five-year period from 1999 to 2003, 63 percent of households report being affected by a drought and 53 percent report being affected by a flood in at least one year. Whereas poorer households tend to be more often affected by drought than richer households, the reverse is true for households affected by floods. This may reflect the challenges of defining “flood” (which depending on its nature may be viewed as good or bad for rice farming), as well as the likelihood that richer households own higher quality rice land (in flood-prone areas).

Policy implication: In targeting problems affecting the poor, developing appropriate disaster responses to drought problems should be elevated to a higher priority. This is not to diminish the importance of addressing floods, but only to recognize that droughts disproportionately affect the poor and therefore deserve due attention in poverty reduction strategies.

Mine/UXO Contamination and Poverty

8. **Mine and cluster bomb contamination show a strong relationship with poverty.** The poorest household consumption quintile is almost four times as likely to be affected by mine contamination, and twice as likely to be affected by cluster bomb contamination, as the richest quintile.

Policy implication: In targeting areas for demining, village poverty rates (as identified in the CSES 2004 data) should be considered as an additional element of the targeting criteria currently used. Where villages in contaminated

areas have higher poverty rates, demining these areas should be given higher priority.

Endnotes

1. The CSES is the largest and most extensive multi-objective survey undertaken in Cambodia, involving a sample of 15,000 households. Cambodia’s baseline poverty line consists of a single national food poverty line and three regional nonfood allowances. Poverty estimates are based on per capita consumption.
2. A sharp and statistically significant increase in the Gini coefficient occurred in rural areas—from 0.27 in 1993–94 to 0.33 in 2004.
3. The study assesses how poverty has changed for 1,000 households in nine villages between 2001 and 2004. The villages were selected to represent Cambodia’s different eco-regions. To capture mobility, the study groups households into seven categories: (1) comfortably rich, (2) climbing into wealth, (3) escaping poverty, (4) static middle, (5) chronic poor, (6) deepening poverty, and (7) falling into poverty.
4. Key datasets include CSES 2004, Seila and Danida 2005, and National Level 1 Survey 2002.
5. Rural communes account for nearly 1,500 out of just over 1,600 communes in Cambodia.
6. This section summarizes key case study findings; more detailed case study findings, data, tables, and information can be found in the Annex.
7. “Koyun” is a Khmer word referring to a machine intended to be used for pulling a plow, but it is also commonly used for transportation. To a degree, it is a mechanized substitute for draft animals and an oxcart.

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Poverty and Environment in Lao PDR

GEOGRAPHIC DIMENSIONS OF POVERTY

Over the last decade, Lao PDR's economic growth averaged nearly 6 percent per year and was accompanied by significant poverty reduction. Poverty incidence declined from 46 percent in 1993 to 33 percent in 2003.¹ At the same time, there was a substantial narrowing in poverty incidence among provinces and the highest provincial poverty incidence came down from over 70 percent in 1993 and 1998 to less than 55 percent in 2003 (Map 3.1).

Lao PDR is still, however, one of the poorer countries in Asia, with a GDP per capita of \$425 in 2004 (World Bank, 2005). Substantial urban-rural divides remain, and there are large geographic variations in poverty and development. More than 85 percent of the poor live in rural areas with rural poverty incidence at 38 percent in 2003, in contrast to 20 percent in urban areas (LECS III).

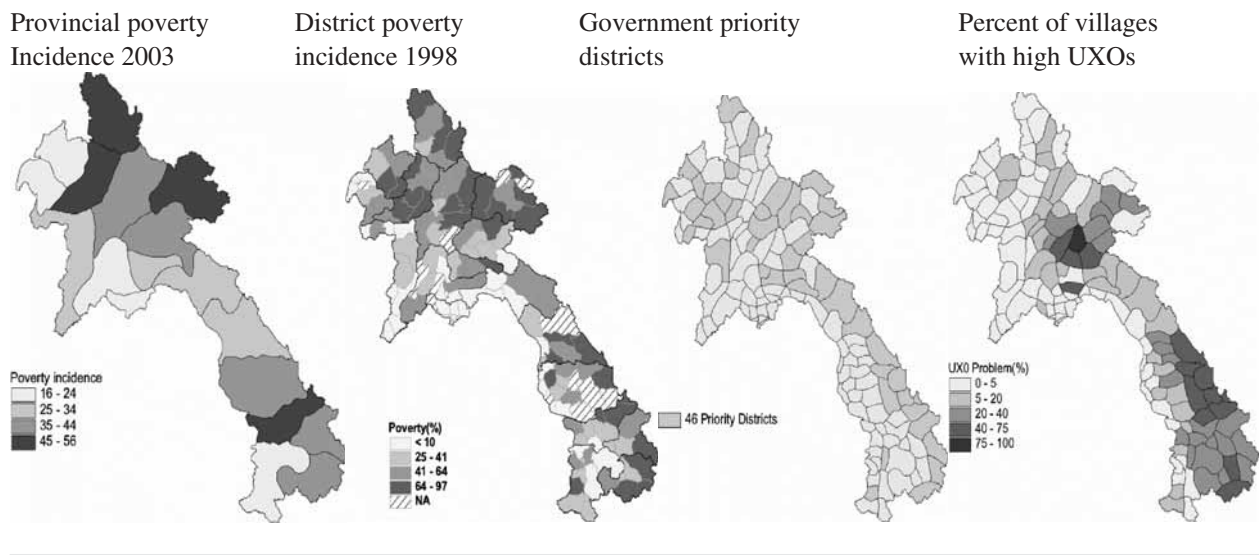
Poverty, as discussed above, is defined as consumption or expenditure below a minimal level. This provides a quantifiable measure useful for monitoring progress over time and for identifying geographic areas with persistent poverty in need of focused attention and interventions. Poverty can also be defined in broader perspectives. The Government of Lao PDR defines poverty as the lack of basic necessities—such as inadequate food

and clothing, permanent housing, access to transportation, and inability to meet health and education expenses. In this context the Government identified 46 districts of first priority for poverty reduction.² Many of these districts are also heavily contaminated by unexploded ordnance (UXOs) from the Vietnam War (Map 3.1). In the eyes of the poor themselves, poverty includes rice insufficiency, lack of large animals, and vulnerability to ill health (ADB 2001). From these broader perspectives, improving our understanding of poverty-environment linkages is vital for the development of more sustainable livelihoods and an improved quality of life, both in terms of natural resource management and environmental health risks.

The poorest districts in Lao PDR are characterized by very sloped land, relatively low population density, and—particularly in the South—by ethnic minorities. Many communities in these districts are small and remote, with limited access to roads and markets and improved water supply and sanitation, and a high reliance on natural resources for their survival. In the central and southern part of Lao PDR, it is the poorest districts that also have the highest forest cover (Map 3.2).

The National Growth and Poverty Eradication Strategy (NGPES) of the Government of Lao PDR establishes a link between poor districts

MAP 3.1 Poverty Incidence and Government Priority Districts for Poverty Eradication

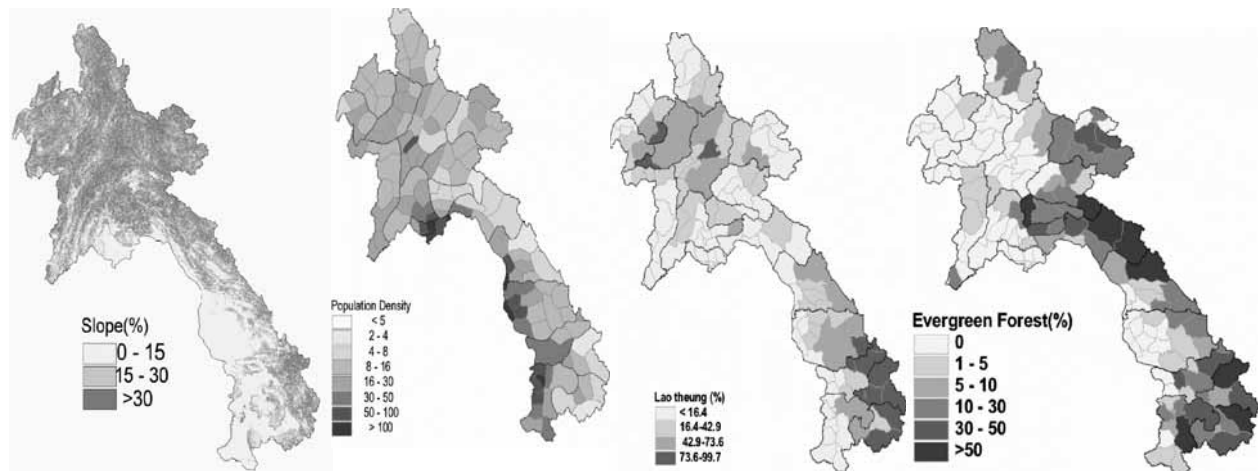


Sources:

and upland districts, but there is no official definition of upland districts in Lao PDR and no direct correlation between elevation and poverty. Some 55 percent of the 142 districts in Lao PDR have a maximum elevation between 500 m and

200 m, but only 28 percent of the 46 priority poor districts are among them. Slope, however, is a variable that may describe poor upland districts better since about half of the districts with higher poverty incidence than the national average have

MAP 3.2 Geographic and Demographic Characteristics of Lao PDR



Sources:

more than two-thirds of their land area with slopes higher than 16 percent (Maps 3.1–3.2).

Grouping the districts in Lao PDR by poverty incidence provides some perspectives on poverty-environment linkages (Table 3.1). The two groups of districts with the highest poverty incidence are less populous, but have the largest number of poor.³ In these districts, forest cover was lower and deforestation higher during the 1993–97 period.⁴ Per capita agricultural land and rice production was substantially lower, and significantly less flat land is available for cultivation.⁵ The districts' share of population with sanitation facilities was substantially lower, and reliance on open unprotected surface water was higher.⁶ Crude mortality rates were also higher, and literacy rates considerably lower. Access to roads was also lower in these poor districts.⁷

The government of Lao PDR has identified 46 priority districts—or nearly one-third of the country's districts—for poverty reduction and development (NGPES). Many of these districts are in the poorest provinces—Oudomxay,

Phongsaly, Houaphanh, and Saravane—and along the border with Vietnam in the South (Map 3.1). A comparison of these districts to the 46 districts with highest poverty incidence in 1998 is revealing.⁸ The government's priority districts have (a) the lowest rate of water supply coverage and highest reliance on open unprotected surface water; (b) the highest reliance on fuel wood; (c) the highest share of sloped land (slope greater than 16 percent); (d) the highest crude mortality rate; (e) the lowest literacy rates; and (f) the lowest rice production per capita. The only environmental indicator that is higher in 46 poorest districts is the deforestation that occurred from 1993 to 1997.

The priority districts show high consistency with the government's definition of poverty and overlap closely with many environment-poverty priorities. NGPES, which initiated the first poverty reduction program with a geographical focus on 46 priority poverty districts, identifies the environment as one of the key inter-sectoral priorities in the fight against poverty. For forest

TABLE 3.1 District-Level Poverty Profile

District poverty incidence (1998)	0–25%	25–41%	41–64%	64–96%	All Lao PDR*
Number of districts	32	32	32	32	128
Population (million) 1995 Census	1.4	1.2	0.9	0.9	4.4
Population (million) 2000 Estimate	1.7	1.4	1.0	0.9	5.1
Population in poverty 1998 (million)	0.27	0.47	0.52	0.70	1.96
Percent of total area with slope >16%	41.9	50.5	66.0	70.3	59.5
Rice production per capita (kg/person)	280.4	264.5	229.4	188.1	247.3
Large animals per household	1.84	2.75	2.52	2.59	2.36
Forested land % of total land 1997	39.4	43.8	37.7	34.6	38.6
Deforestation rate of forested land 1993–97	2.9	2.4	2.7	3.2	2.8
Agricultural land % of total land 1997	12.2	8.3	3.2	1.7	5.5
Percent of households relying on open unprotected surface water in 1995	24.6	53.8	63.4	74.2	49.9
Percent of households <i>without</i> toilet facilities in 1995	52.0	76.3	76.6	84.3	69.7
Crude death rate in 1995 (per 1000 population)	6.8	10.6	12.1	14.7	10.5
Percent of population with education in 1995	72.9	58.3	49.7	40.3	57.7

Sources:

*ADB (2001) only presents poverty estimates for 128 districts (of a total of 142 districts).

resource degradation and issues related to agricultural land, however, it is necessary to consider a broader focus than the priority group of districts.

POVERTY-ENVIRONMENT ISSUES

A set of environmental issues in relation to poverty can be estimated from available data, pertaining to environmental health, natural disasters, and the urban environment (e.g. outdoor air pollution). The disparity between poor and non-poor households is particularly substantial with respect to lack of potable water supply, basic sanitation, and UXO contamination. While a lesser number of people are affected by malaria and drought, the poor are also disproportionately affected by these problems.⁹ Flooding seems to affect a larger share of the non-poor population than the poor. Solid fuels are the main sources of household energy for cooking both among the poor and non-poor population. As more than 85 percent of the poor reside in rural areas, and urban poverty incidence is “only” 20 percent, urban environmental problems, such as outdoor air pollution, are more an issue for the non-poor population. Urbanization is still low in Lao PDR,

and urban air pollution remains moderate and nowhere close to the levels in many large cities in South-East Asia. Access to a road, an important determinant of, for instance, environmental services, such as water supply and sanitation, is significantly lower among the poor population.

Sufficient data is not available to provide an estimate of the number of poor and non-poor affected by environmental issues related to natural resources such as forests, non-timber forest products, or land. In agriculture, however, rice sufficiency and livestock holdings are defined by the poor themselves as principal indicators of poverty in Lao PDR (ADB 2001). Illness and lack of health services were also raised by the poor as central issues.

In the context of this study, poverty dimensions are those factors that affect rice sufficiency and livestock holdings, which include, but are not limited to, quality and quantity of natural resources. Indicators for groups of districts by poverty incidence confirm the importance of rice sufficiency (Table 3.1). However, the analysis does not apply to animal numbers: poorer districts have higher overall livestock numbers, even though the poor within these districts may often be those with fewer or no animals.

TABLE 3.2 Number of Poor and Non-Poor Affected

Poverty & environment indicator:	Estimated number of people affected	
	% of non-poor population	% of poor population
Lack of water supply (using open water sources)*	20	30
Lack of sanitation (no latrine)*	40	70
UXO Contamination (1997)	20	28
Household use of Solid fuels/indoor air pollution*	95	98
Malaria Incidence (confirmed cases 1999–2001)**	0.2–0.4	1.0–2.0
Flood (1995–97 and 2002)***	5	1
Drought (1995–97)***	0.2	1.7
Urban environment	na	<10–15
No Access to Road*	15	30

Source: Estimated using a variety of statistical techniques from the following data: *LECS III 2002/03, **WHO data, ***Natural Disaster Management Office data. ****Less than 15 percent of the poor reside in urban areas (LECS III 2002/03).

PEN Study Focus Areas

The PEN study set out to deepen the understanding of poverty and environment linkages in Lao PDR by examining their relationship at the province, district, and household levels and to mainstream the findings into the national policy agenda. The scope of the study was designed to fit into the national policy framework for poverty reduction. This includes the National Growth and Poverty Eradication Strategy (NGPES) and the National Poverty Reduction Strategy Paper (PRSP), published in 2003.

The main national partners of the PEN study in Lao PDR were (a) the Committee for Planning and Investment (CPI); and (b) the Environmental Research Institute (ERI) of STEA (Science, Technology & Environment Agency), which is the national agency in charge of environment directly under the prime minister. In addition, a number of other government agencies participated in the implementation of the study and provided critical data for the study (Table 3.3 and Box 3.1).

Dialogue with these partners—and findings from the initial PEN analysis (e.g. an extensive PEN study background report and Table 3.2)—led to the selection of five focus areas, three of which are related to natural resources and two in the area of water supply and sanitation (Table 3.3). Four of the focus areas relate to rural development and one to urban development, reflecting a rural population share of more than 75 per cent in Lao PDR.

The PEN focus areas cover three of the four NGPES policy sectors: transport, health, and agriculture and forestry. None of the focus areas dealt directly with education. However, it became evident during the course of the PEN study that education—and more broadly information- and awareness-building—is an essential ingredient in all five PEN focus areas. One of the focus areas relates to the Lao UXO program, which is one of three poverty-related national programs included in NGPES.

A two-pronged approach was followed in the study of the PEN focus areas. A nationwide analysis was carried out using secondary data at province, district, village and household level, and field surveys were undertaken in four districts. The nationwide analysis and field surveys informed each other, strengthened the confidence in the PEN findings, and provided wider geographic relevance. The field surveys were implemented by a study association led by ERI/STEA, comprised of research groups from the national ministries and their agencies.

On the recommendation of the Government of Lao PDR, the field surveys took place in two provinces in the far north of the country and in two provinces in the far south. The government selected one district in each province for the rural field surveys and the two smallest provincial capitals for the urban field surveys (Table 3.4).

All four districts where the rural focus studies took place are located in the upland districts.

TABLE 3.3 PEN Focus Studies and Implementing Agencies

	Poverty and environment focus	Implementing agency
Natural Resources and Livelihood	NTFP management	National Agro-Forestry Research Institute MAF)
	Road access and development	Environment and Social Division of MTCPC
	UXO contamination	Environmental Research Institute (STEA)
Environmental Health	Rural water supply and sanitation	Department of Hygiene (MoH)
	Urban water supply and sanitation	Urban Research Institute (MTCPC)

BOX 3.1 Methodologies and Data

The methodology employed in each of the five focus studies entailed the combination of national mapping and correlation analysis of poverty and environment indicators with village and household surveys. The research teams, especially those working on the rural field surveys, were confronted with substantial challenges in carrying out local research in remote locations, so the methodology was carefully adapted to overcome these challenges (see chapter 1 for more detail). In addition, the study team took great care to ensure consistency between the indicators collected in the national databases and those collected through the surveys.

The study utilized precise sampling criteria for villages and households. Poverty levels in the surveys were assessed through a scoring system based on both productive and non-productive household assets (asset indicators, in turn, were collected at the household and village levels). Three of the PEN focus studies conducted comparative analysis of poorer and less-poor households, while the two others completed a simple comparison at the village level only.

For some of the variables, information could not be updated from the first phase of the PEN study conducted in 2003–04. For example, the 1993–97 forest data were used, even though patterns of deforestation may have changed significantly in the last eight years. Selected variables at district level (ADB 2001) from the LECS II (1997/98) surveys were analyzed in correlation with variables from the PEN database. While the LECS III data provided further insights into some of the same indicators at household and province level, reliable district level data have not been produced from LECS III. Moreover, the new Population Census 2005 can be an important source of analysis of PEN linkages.

Partner	Data assistance
National Statistical Center (NSC) MCTPC Lao UXO program office	LECS III, and economic and demographic data Road network data at district level UXO contamination data from the national UXO survey in 1997
NAFRI URI Environmental Health Division (MoH)	NTFP database for 39 districts (the PEN focus study) Urban water supply for several provinces Water supply breakdowns in rural villages

TABLE 3.4 PEN Field Survey Districts and Towns

District and towns	Location	Poverty incidence (1998)
Notou district	Phongsaly province (North)	79%
Phongsaly town	Phongsaly province (North)	na
Namor	Oudomxay province (North)	93%
Kaleum district	Sekong province (South)	63%
Lamam town	Sekong province (South)	na
Phouvong	Attapeu province (South)	71%
National average		39%

Source: District poverty incidence is from ADB (2001) based on LECS II. Poverty incidence is not available (na) for the two towns.

They are among the poorest within the group of 46 priority poor districts identified in NGPES. The proportion of ethnic minority people is higher than 98 percent in three of the selected districts, and is 72 percent in the fourth. The Mon-Khmer ethno-linguistic group accounts for more than half of the district population in three of the districts.

All four districts border either China or Vietnam, and two of the borders are located at high elevations. The marginalization of these districts is decreasing, however, as international roads and borders are opening up.

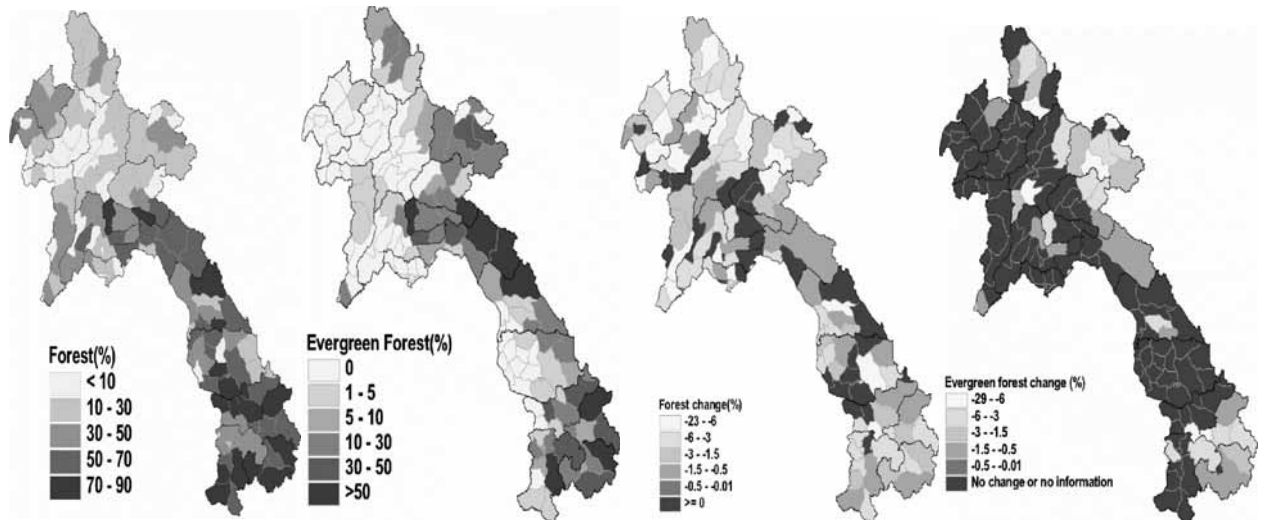
As the PEN field surveys focused on the upland districts listed as priority poor districts in NGPES, the surveys have a strong *de facto* linkage to the ongoing national policies of rural development based on “focal areas” and of stabilization of shifting cultivation. These policies are discussed in the context of individual PEN focus areas and at the end of the chapter.

POVERTY AND NATURAL RESOURCE MANAGEMENT

Close to 40 percent of land area in Lao PDR was classified as forest in 1997, according to satellite imagery data. Agricultural land, including fallow land, occupied 13 percent of the total territory. Shrub and grassland constituted 43 percent of total land area (differentiating between fallow and shrub and grassland, however, is subject to debate). There are substantial differences in land use and vegetation across the three regions in Lao PDR. Forest land was 65 percent of total area in the South, 48 percent in the Center, and only 21 percent in the North. Evergreen forest constituted 36 percent of total forest (Map 3.3).

Deforestation in 1993–97 was highest among the districts with the highest poverty incidence, and, geographically, in the northern provinces, which have some of the highest poverty incidence and lowest forest cover. A total of 1,118 km² of forest was lost during these four years in the

MAP 3.3 Forest Cover 1997 and Deforestation 1993–97



Sources:

North, representing more than 5 percent of remaining regional forest cover in 1997. There are at least two important dimensions to this situation. First, these findings alone are not sufficient to conclude that poor people’s livelihoods are significantly affected by this deforestation, and even less so that the poor are responsible for some of this deforestation. Second, the findings refer to 1993–97, and patterns of deforestation may have changed significantly in the last eight years. For instance, losses and scarcity of evergreen forest are a particularly growing concern arising from the PEN focus study of NTFPs.

Demographic, socioeconomic, and geographic factors seem to have influenced the long-term trends in forest cover in Lao PDR.¹⁰ Population density and agricultural land area are associated with lower forest cover. Road access and road density is not found to have a negative effect. Steepness of land is found to be negatively associated with forest cover. This is particularly the case for land with steepness above 30 percent. No association between overall forest cover and flat land is found beyond the influence of population density and agricultural land. Conversely, flatness of land is more influential in explaining lower evergreen forest cover than population density and agriculture.

Compared to the Central region, the Northern region is found to have significantly less and the Southern region more forest cover than expected from steepness of land, population density, and agriculture. No “border effect” was found for districts bordering Thailand or Viet-

nam in terms of total forest cover, that is, differences in overall forest cover between border districts and the rest of the country are all explained by the aforementioned factors. Districts bordering Vietnam do however have more evergreen forest than can be explained from the factors discussed above, and districts bordering Thailand have less evergreen forest.

The higher household poverty incidence in districts bordering Vietnam could be a particular concern for PEN linkages. These districts still have higher rates of forest cover than the average district in Lao PDR. A poverty reduction strategy that opens the Vietnam border districts with road linkages to Vietnam may want to pay particular attention to forest conservation objectives.

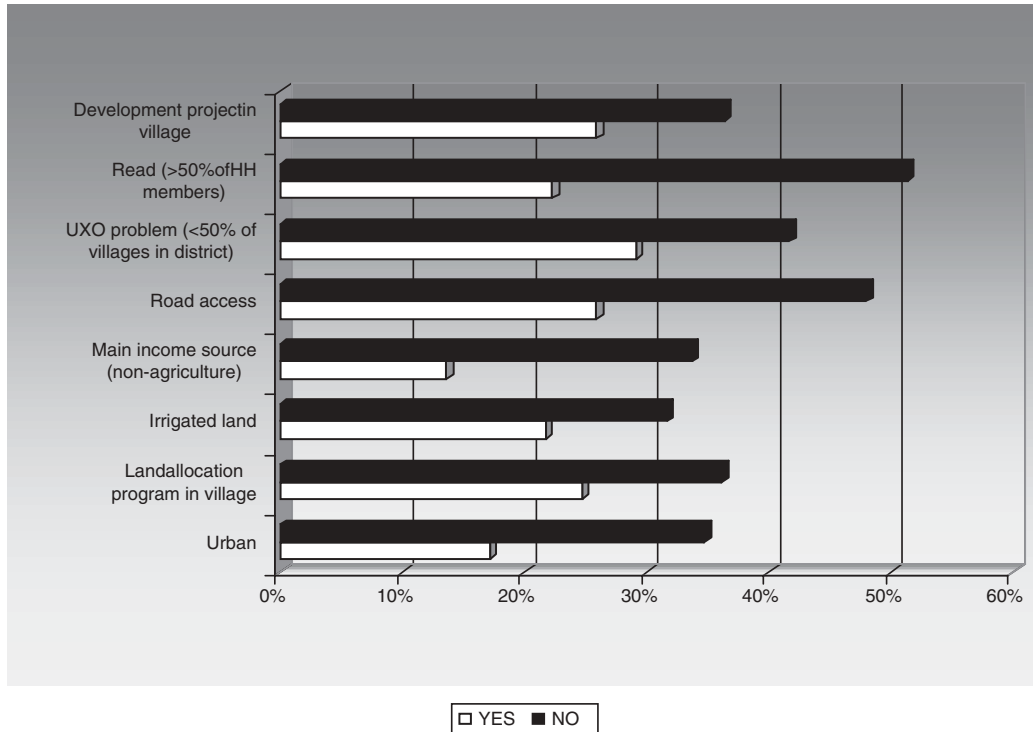
These findings confirm the existence of a poverty and environment nexus between poverty, forestry, and land in Lao PDR: there are strong linkages between indicators, poverty groups, and regions, but causal relationships that would help explain these factors are not identified through this analysis.

Many factors potentially affecting poverty are directly or indirectly related to natural resources (Figure 3.1). The largest difference in poverty incidence (i.e. substantially lower incidence) is associated with literacy, road access, non-agriculture as main income source, and urban household location. Poverty is also lower in communities with development projects and land and forest allocation programs, and those communities that have less UXO contamination and more irrigated land. Proximity to district cen-

TABLE 3.5 Poverty & Environment Nexus in Natural Resource Management

PEN areas:	Indicators:	Poverty and geographic analysis:
Poverty	Poverty incidence 2002/03	Somewhat higher in the NORTH Highest in districts bordering Vietnam
Forest	Deforestation (% and km ²) 1993–97 Evergreen forest cover 1997	Highest in the NORTH and POOREST DISTRICTS High districts bordering Vietnam
Land	Agricultural land per capita 1997 Sloped land (% of total land)	Lowest in the NORTH and POOREST GROUP Highest in the NORTH and POOREST GROUP

FIGURE 3.1 Poverty Incidence in Relation to Select Indicators



Source: Cross-tabulations from household and village data in LECS III 2002/03.

ter and residing in the provincial capital district is also associated with lower poverty incidence. In contrast, poverty incidence in the Government’s 46 priority districts and in districts bordering to Vietnam are higher than can be explained by the factors discussed above.¹¹

As many of the factors are associated with urban-rural household location, an analysis was undertaken for rural households only. The analysis confirmed that all the factors are associated with poverty incidence even within rural areas.

The lower poverty incidence among households that have irrigated land and that are not dependent on agriculture as their main source of income deserves further analysis. The first indicates a relationship between more intensive agriculture and poverty reduction, while the second indicates a relationship between diversification of

incomes out of agriculture and poverty reduction. Poverty in relation to UXO contamination and road access is further discussed later in the report.

New information about villages with land and forest allocation programs and development projects, and other factors was also revealed from the analysis:

- More than 40 percent of the villages in the LECS III survey reported that land and forest allocation programs had been implemented there. Poverty incidence in these villages is significantly less than in villages without allocation programs, even when comparing villages within rural areas. Conversely, the Participatory Poverty Assessment (ADB 2001) indicates that there are significant trade-offs between protection efforts and poverty reduction in the short

to medium term in many districts. Many communities depend heavily on the forest for their livelihood, and many villages reported that they no longer have sufficient access to forest resources after the implementation of allocation programs.

- Nearly 50 percent of surveyed villages reported having an ongoing development project at the time of the survey. Poverty incidence in these villages was lower than in villages without a project. However, a development project had a somewhat stronger association with higher household consumption than lower poverty incidence. This could suggest that development projects may be benefiting non-poor households more than poor households, but further assessment of this issue is needed.
- Last but not least, ethnicity, village migration, and market access were not on their own associated with lower or higher poverty incidence.

These findings confirm the complex linkages between poverty and natural resource management. Poverty and renewable natural resource linkages must be seen in the context of broader economic development. These issues are highly complex and interdependent. They involve the long-practiced traditional agricultural production systems, forest protection and agricultural land allocation, availability and access to NTFPs, the village consolidation program, and development and participation in a market economy. Natural resources are used not only by rural households, but also by other stakeholders. No information can be derived on the latter from the datasets analyzed. These issues all deserve further quantitative analysis in combination with local research.

Non-Timber Forest Product Resources and Poverty

Non-timber forest products (NTFPs) are important to the vast majority of rural households in the uplands of Lao PDR. The Lao government views

NTFPs as having substantial potential to improve rural livelihoods in the poorest districts. There is a two-way beneficial relationship between forest conservation and sustainable use of NTFPs. Marketed NTFPs, in addition to self-consumed ones, have historically been important export products and remain so today. In contrast, the regulatory framework is vague, and only anecdotal quantified information on NTFPs is available. There is an acknowledged risk of resource decline. The PPA (ADB 2001) reported that the quantity of NTFPs was declining in many village areas. Pilot rehabilitation or cultivation projects are being initiated, but a clear policy statement is missing.

The government's interest in NTFPs is closely related to the stabilization policy for shifting cultivation. NTFPs are often cited as an alternative to shifting cultivation—for example, in villages consolidated into “focal areas.” The relationship between sustainable NTFP management and swidden agriculture¹² or village consolidation appears, however, to be a complex one, as there is contradictory evidence from field research. Some researchers argue that most NTFP species require some type of human intervention for maintenance. Swidden cultivation in the form of rotational agriculture would, therefore, have a positive impact on several NTFP species. Others, on the other hand, argue that swiddening in a context of population growth inevitably impacts NTFP resources through a reduction in old-growth forest. NTFPs are, therefore, an entry point to research poverty, environment, and shifting cultivation.

The PEN study of NTFPs was designed to answer two questions. First, the study looked at two potential NTFP development strategies: (1) sustainable harvest of natural NTFPs, and (2) NTFP cultivation. The objective was to seek evidence about the viability of these strategies, especially for poor households. Second, the PEN study explored the relationship between village migration and consolidation policies and the pressure on NTFP resources in poor communities.

NTFPs in Lao PDR are not incorporated into a statistical collection system. A collection of data and information was therefore undertaken from the districts. A total of 39 districts responded with detailed data and information on predominant types of NTFPs, trends in their availability in district forests over time, trends in market demand, and other valuable information. Data is available for most districts in three provinces in the North, one in the Center, and one in the South. Only 15 of the respondent districts are among the 46 priority districts (Map 3.4).¹³

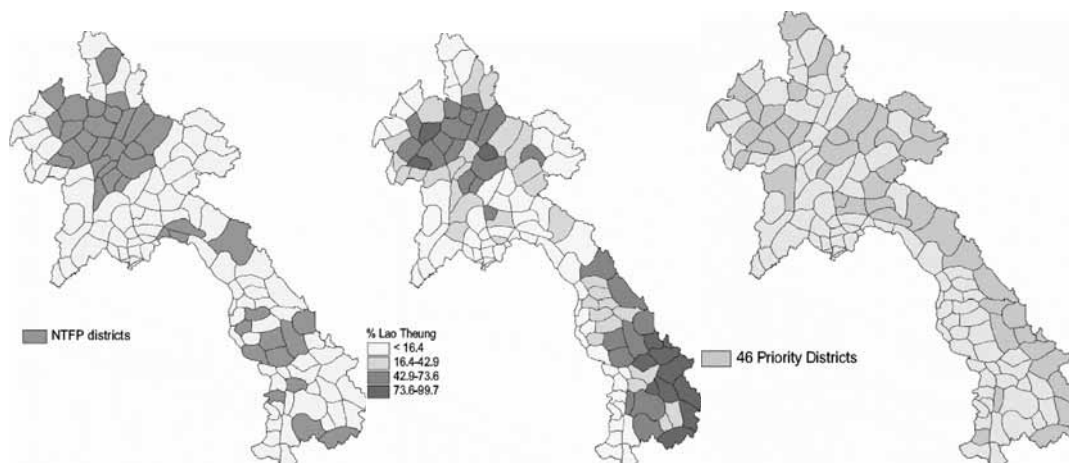
The large number of NTFP species used in Lao PDR is an important reason for the lack of clarity in the sector. The survey led to the identification of 13 major species, on which the analysis subsequently focused. Finally, NTFP incomes and the importance of swidden practices are two topics that are difficult to address in rural surveys, since households may be wary of taxation and the swidden control policy. Proxy indicators were assembled in addition to these. The analysis was, however, able to use survey findings on NTFP incomes and upland rice areas after data consistency was confirmed.

NTFPs of National and Regional Importance

The districts reported altogether 37 different marketed NTFP species, with three species on average considered as very important (Map 3.5). Among these, eight are important marketed species in at least two among the three regions (North, Center, and South) and five in one region (Table 3.6). Cardamom was cited as important in almost 70 percent of the districts, and rattan in almost 60 percent. Only benzoin, an important local species, was left out of this analysis, because the producing districts in northeastern Lao PDR did not answer the survey.

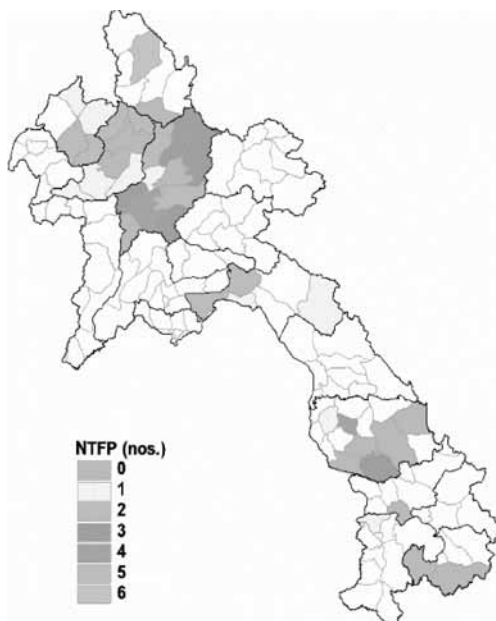
While NTFP species are harvested from three clearly differentiated domains—old-growth natural forests, secondary forests, and young fallows—classifying individual species into one category is not easy. Only three of the 13 main species were reported as fully harvested from the “natural forest” domain. On average, four main NTFP species were reported as forest species and two as fallow species.

MAP 3.4 NTFP Survey Districts in Relation to Ethnic Minorities and 46 Priority Districts

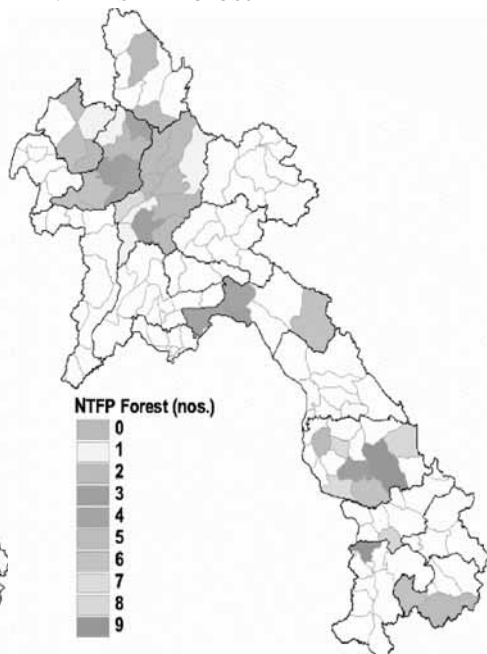


MAP 3.5 NTFPs of National and Regional Importance Reported by Each District

NTFPs on Fallow Land



NTFPs in Forest



Source: PEN study (NAFRI).

All main species identified, except for broom grass and paper mulberry, are mostly harvested from natural forest. A marked contrast is observed between forest species and fallow species. The districts reported a decline in resources of most NTFP species, particularly forest species, and only reported an increase for the two fallow species (Map 3.6). Declining quality was also reported, especially for species. District respondents primarily attributed resource degradation to overharvesting and shifting cultivation.

Northern districts reported an active market trend, especially close to the China border. Price increases were noted for forest species, with declining populations and decreasing marketed quantities. Conversely, the two fallow species showed an increase in population, marketed quantities, and prices.

Some domestication, predominantly in the Northern provinces, was reported for seven of the 13 main species and for five secondary species. However, only one species—eaglewood—was

TABLE 3.6 Commercially Important NTFPs in 39 Districts

8 Species of national relevance	5 species of regional relevance
Cardamom, rattan, orchid, bong bark, dammar, eaglewood, bamboo shoots, broom grass	Malva nut, galangal, sugar palm fruit, meuak bark, paper mulberry

reported as partly cultivated by a larger majority of the districts (about 90 percent). Paper mulberry, which grows spontaneously in fallows, ranked second in cultivated species. Cardamom and galangal, two species that are easy to cultivate, are harvested from the wild in around 70 percent of districts.

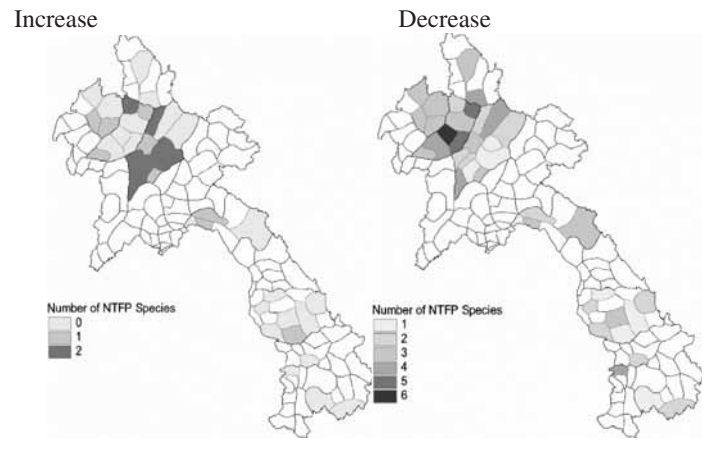
NTFPs in the Household Economy

About 96 percent of households in the northern districts and 72 percent in the South reported cash income from NTFPs every year. Households reported average annual NTFP sales of US \$73 in the Namou District in the North and US \$22 in the southern district. This is respectively 16 percent and 5 percent of average cash expenditures in the provinces in the LECS III survey. However, the fact that households ranked NTFPs as their second highest income source—after food crops and before animal sales—would indicate much higher incomes. Reported incomes, however, provide a useful basis for comparison between households.

Poverty was not a primary factor in NTFP collection. The lowest household income from NTFPs was less than US \$5, while the highest was 1,000 times more. NTFP income was, however, 40 to 50 percent higher in households in the lowest wealth category than in the medium- and high-wealth categories in the northern district.¹⁴ There was a reverse, but not statistically significant, relationship in the southern district.

Other than poverty, variables that were significantly correlated to NTFP incomes were the age of the village, cultivation of upland rice, and marketing channels. In the northern district, households with more than one hectare of upland rice area had 2.5 times more income from NTFPs than households with less than 0.5 hectares. In the southern district, the households in the survey had resettled to a new paddy basin, upland rice areas were small, and the difference in income between households with less than and those with more than 0.5 hectares of upland rice was minimal (Figure 3.2).

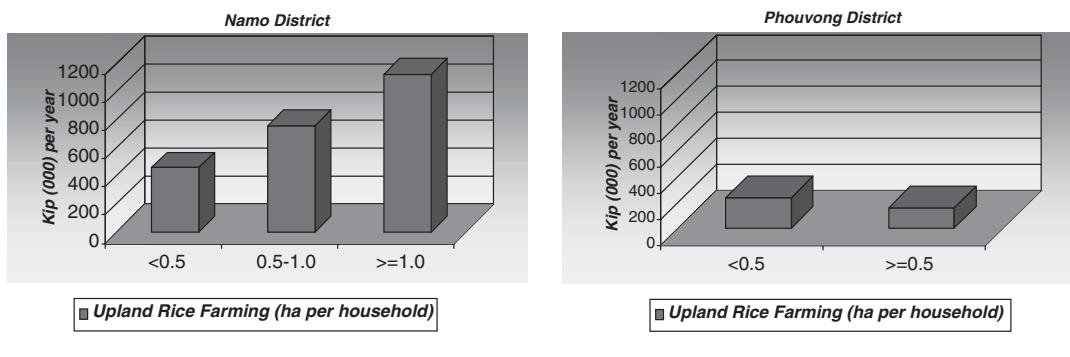
MAP 3.6 Number of Increasing/Decreasing Main NTFP Species



Distance to NTFP collection sites increased markedly during the last 10 years, from less than 5 km to almost 10 km on average in the northern district, and from less than 7 km to 16 km in the southern district. This is an indication of resource degradation in the North, and of village resettlement in the South. However, walking distance is not an absolute obstacle to NTFP collection. Only 9 percent of households, all of them in the North, cultivate some NTFPs.

More than 90 percent of households in the North and slightly fewer in the South were aware of customary NTFP management. NTFPs for self-consumption are an open resource, while NTFPs for sale are reserved for the local community. No improved management system was observed in any of the villages surveyed, the newest of which was two years old and the oldest thirty. The older villages have significantly more income from NTFPs. The only new village with a substantial NTFP income has the largest upland rice area per household, and as much as 35 percent of the surveyed households are members of a marketing group. Members of the NTFP marketing group have NTFP incomes more than three times higher than non-members. There

FIGURE 3.2 NTFP Income in Relation to Upland Rice Farming



was an absence of extension of this successful organization to other villages.

Discussion

NTFPs are important for the rural population of upland areas in Lao PDR regardless of ethnicity, gender, wealth classes, or distance to forests. Households are more likely to use NTFPs as an income source when they are engaging in shifting cultivation, because this gives them knowledge about resources, closer access, and time for collection. These households may be poorer, and use NTFP income to compensate food deficits. This is the case in some communities, but not in others.

The existence of a declining NTFP resource trend is obvious for species growing in mature forests and calls for urgent action. The disappearance of some of the NTFP resources would substantially affect broad numbers of upland communities, where poverty incidence remains high. Domestication has hardly started, so NTFPs remain by and large a common property resource. NTFP cultivation is, however, an option only for some NTFP species. Community-based resource management will remain the only option for other species. Communities’ customary regulations are weak in the face of high market demand and in the absence of a formal regulatory framework.

The existence of regulations and the interest of both communities and local governments in more sustainable resource management indicates, however, that community-based NTFP management can be a viable option. Market-related community groups appear to work well and to integrate poorer households successfully. Such groups have more potential to limit harvest levels than quotas. Local governments do set up quotas based on rough estimates of resource demand and supply, but these are difficult to manage.

The small number of marketable species of national relevance offers an opportunity for policies and programs to address individual NTFP species in a specific manner. Efforts to help cultivation take off could concentrate on those forest species, for which domestication is technically feasible and not on open-space species. Community-based resource management programs could focus on other forest species that cannot be cultivated. Public access to open-space species does not threaten resources and is an appropriate option for the poorest.

Land use systems are evolving as a combined outcome of migration trends to roadsides and areas with potential for paddy field development and government policies. Stabilization of shifting cultivation through land allocation generally shortens rotation cycles. One can expect an increase in the availability of fallow NTFPs, but

these have provided limited incomes so far. Encouragement of migration to new settlements along roadsides with no option for paddy fields will enhance this trend, and so will the merging of several small villages into a larger one under the village consolidation policy.

Migration to roadsides, where paddy fields are available, may reduce households' NTFP incomes in the short term and impact the livelihoods of poorer households, but longer-term trends are unclear. In the absence of such policies, however, the more valuable NTFP resources will continue to decline together with old-growth forest.

NTFPs are valuable observation lenses to remind policy makers of the complexities and time dimensions of policies related to land use change in upland areas, where swidden agriculture remains an important livelihood source. The prevailing sentiment that there is a simple causal relationship between shifting cultivation and the decline of NTFP resources may overlook other critical factors behind the ongoing decline of NTFP resources.

What is needed is neither a rapid shift of land use systems out of swidden cultivation nor the status quo. Instead, communities need government support in managing their forest resources, including NTFPs, particularly in the context of an active market. Communities living in remote locations and away from roads are equally in need of such support. The stability of villages and slow land use change may be important factors for success.

Roads, Environment, and Poverty

The Government of Lao PDR faces the challenge of building a sustainable road network in a country where both poverty and natural resources are concentrated in upland districts. The NGPES acknowledges a high correlation between the lack of road access and poverty. The policy framework of the transport sector in Lao PDR follows a step-by-step approach. The government and the donor-funded projects started to direct their efforts toward rural roads in the second half of

the 1990s, after the national and provincial networks had been largely completed (MRCDP 1996). The mid-2000s appear to be a turning point. All districts are now connected at least by earth roads, projects have demonstrated the viability of village feeder road construction, and various options to fund and ensure village road maintenance are in place or being piloted.

In the next stage, the government may either continue to follow a step-by-step approach by ensuring all-weather links to district towns, or opt for a feeder road network serving a broad number of villages. The first option is stated as a priority in NGPES for poor districts. Policy choices need to take into account the environment: the opening of roads is widely regarded as an important factor behind deforestation (IUCN 1997). Policy choices are also related to the government's overall policy of supporting migration to roadsides in upland areas. "Focal areas" are stated in NGPES as a priority for road development next to district towns.

A central question—whether to build a rural road network with fewer roads of higher quality, or to expand the network to a broad number of villages—is an important area of policy decision making. The latter option might be viable, provided that lower, cheaper standards are selected. The PEN study seeks to compare opportunities and constraints of these two options in terms of poverty reduction and preservation of environmental resources.

The PEN study encountered significant difficulties both in national analysis of district-level indicators and in the village survey. The percentage of villages within 6 or 11 km from a main or secondary road is a useful road access indicator,¹⁵ but no update was available. Actual village access may be more valid in a country where village location evolves rapidly. NGPS compiled data for the selection of priority poor districts and NSC prepared the population census, but the two datasets are largely inconsistent. This may be related to the difficulties of tracking numbers of villages. Defining road access also is difficult.¹⁶

In addition, local governments may sometimes have limited incentives to report accurate information on village roads. Road density, used in conjunction with density of population and villages, would conversely be a convenient indicator. Unfortunately, rural roads are not recorded separately from paths.

These difficulties have limited the scope of the national data analysis but have shed light on the obstacles that the government is facing in monitoring and planning its local road network. The field surveys provided a valuable comprehensive picture about the actual status of local road and transportation systems in two marginal districts. Interview findings were mostly assembled at the community level.

The survey team found it difficult to avoid selecting villages recommended by local authorities. The villages surveyed mostly turned out to be recent or upcoming beneficiaries of road construction. This has limited the scope for using the PEN study's methodology of comparative analysis between poorer and less-poor villages and households, but it has provided valuable insights into the processes used by local governments when selecting beneficiary villages in their road programs.

Nationwide Perspective

LECS II (1997–98) demonstrated that poor districts had substantially lower access to roads, as measured by percentage of villages with main or secondary roads within 6 kilometers. LECS III confirmed this correlation by showing that poverty incidence is almost twice as high among households in villages with no access to a road compared to households with access. However, correlation between road access and poverty incidence is not a simple causal relationship. For example, the road network is being built at a markedly slower pace in upland districts, where various poverty factors are combined.

Road access and road density were not found to have a negative effect on overall district forest

cover, but is associated with lower district evergreen forest cover.¹⁷ This indicates that opening roads may lead to some deforestation, and that this potential impact needs to be managed. This is particularly important in districts bordering to Vietnam where most of the remaining evergreen forest in Lao PDR is located.

Overall, 72 percent of villages in Lao PDR already have at least seasonal road access. Villages may be served by these roads, by districts roads, or by rural roads linking villages only. Around 36 percent of the 30,000 kilometers of roads are rural roads; an unknown proportion of these are paths that are not suitable for motorized access. Village access to roads is uneven among districts. Average road density in the country is slightly above 12 km per 100 km², but it ranges from 1 to 35 in the rural districts. In 22 provinces, more than 50 percent of the villages have no road access.

In short, the country has already achieved some coverage of village road access despite low road densities. A simple theoretical assessment of village densities provides a rationale for this. Rural population density was below 17 people/km² in half of the districts in 1995, and below 10 in half of the NGPES priority districts.¹⁸ Villages in rural districts¹⁹ have an average population of not less than 380 people nationwide and 325 people in priority poor districts. Only 23 districts have an average village size of less than 250 people. This means that a district with 10 people per km² has on average less than 3 villages per 100 km². Road investment cost per village served would increase rapidly in correlation with lower village densities, if villages were equally distributed over the national territory.

This, however, is not the case. In the four districts surveyed, only the southern half of the Namo District in the North has a traditional settlement of villages scattered over hilly terrain. Elsewhere, and in many districts, judging from the available detailed topography maps, most villages are distributed in strings along paths or rivers, which are the traditional transport modes. In many such districts, 10 kilometers of rural

roads per 100 km² may be sufficient to offer full road access. This is equivalent to 10 meters of road per inhabitant, or \$150 per capita based on a rough estimate of \$15,000 per km of earth roads, a figure that can be smaller if local communities provide part of the labor.

There is also a direct link between low community density and limited environmental impact. Should road opening affect a corridor of 50 meters on each side of the road, the resulting impact would still be relatively limited as a percentage of total land. Environmental risk analysis, therefore, relates more to areas of specific environmental value than to overall forest cover rate.

A District and Village Perspective

Kaleum District in the South and Nhot Ou District in the North have both very low population density and very limited village road access (Table 3.7). Both districts cover large territories of more than 300 km², which is 70 percent above the national average. Nhot Ou is crossed by an all-season road from the South to an international border with China. Only one village other than villages along this main road has a motorable road, and plans for future road construction are limited to one other village. In Kaleum, the road to the district town itself is hardly passable outside the dry season. This road serves only two rural villages. All other villages are cut off from the district town during the rainy season floods. However,

an increasing number of villages are accessible by trucks during the dry season. The government has not mentioned specific plans for building village access roads.

The road network maps available at the national level are misleading. They mention several rural roads with their registration number. In Nhot Ou, these are the traditional paths that continue to serve for travel by foot or with horse animals. A substantial proportion of villages are distributed along or close to these paths. In Kaleum, many of the paths are not used much, since most villages in Kaleum are located along rivers, and boats are the traditional travel mode.

Enterprises are intensively involved in road construction in both districts. A Chinese enterprise has built the new village road in Nhot Ou. The main road was also reportedly built through a Chinese enterprise, although no confirmation could be obtained. In Kaleum, the enterprise controlling the metal scrap market from UXOs in the district has built a dry-season road to access villages in the eastern part, and a State Forest Enterprise (SFE) from Vietnam reportedly built another road.²⁰ Unfortunately, enterprises do not build bridges, so the rainy season access problems either remain unsolved or increase with road degradation from the enterprise trucks. Information regarding road construction by enterprises, even location, was difficult to access in the districts and is not available at the national level.

Village discussions provided detailed accounts of how a direct road link makes a critical difference

TABLE 3.7 Rural Road Network Indicators in the Two Districts Surveyed

	Road density Km/ 100 Km	Villages with no road access/total villages	% of villages with no road	Villages with no dry season cart access	Village density per 100 Km ²	Rural population density people/Km ²
Kaleum	3	53 / 60	85%	23 / 60	1.9	4
Nhot Ou	4	62 / 86	72%	57 / 86	2.8	8

Source: national database and in-district checks

to villages today, now that active market outlets are within reach.²¹ Frequent market trips with buses become feasible. They increase both income opportunities and social links. Farm product sales and job opportunities increase substantially in the rainy season, which remains a food deficit season for many. Increased incomes allow purchase of transportation means and access to media, which in turn reinforce all other advantages. Information exchange and support from the local government increase as well.

Consensus on the difference that road access makes for a village has become so strong that all parties, from government to villagers, tend to equate poverty with absence of road access. Differences between poorer and less-poor villages among the ten villages studied indicate, albeit on a non-representative village sample, that roads are one of the key factors that influence the interaction. Ethnicity, not roads, stands out as the first causal factor for poverty in the survey.

Villages that are gaining road access are making substantial efforts to receive government approval

and expedite the process of completion. In Nhot Ou, in the first village community to obtain a road, villagers started the work by themselves and brought small tractors in spare parts before the road was built. The second village awaiting a road appears to be using its opium producer status and position right on the border to be recognized as a poor village and a focal area, therefore qualifying for road construction.

It is, therefore, not surprising that the villages interviewed made strong statements that they were confident in their ability to manage their forest resources after a road was opened and to restrict access from outsiders. Data does show some increase in NTFP collection for sale in villages along roads, but this increase was not significant. Spontaneous answers during interviews also tend to validate the NTFP study findings regarding the potential of community participation in natural resource management systems.

Preferred transportation tools have regional specificities. In Kaluem, mostly transportation trucks are available, which require larger roads and high maintenance costs. Motorbikes and small tractors, available through the Chinese market, would allow the construction of narrower and cheaper roads. Tractors have a dual advantage; they can be used for both plowing and transportation.

TABLE 3.8 Selected Village Indicators in Relation to Poverty

Category of village	Poorer	Less Poor
% Lao Loum households	0	55
% Households with means of Transportation	5	34
% Villages located by All-Season Road	17	50
% Households with Media Equipment	22	55
% Villages with Seasonal Road	50	75
Hours Walk to All-Season Main road	2,8	3,5
% households with NTFP Income	74	75
% Villages with Land Use Planning	83	75
Hours Walk to Old Growth Forest	2,3	0,8

Source: From PEN survey in 10 villages (MCTPC).

Discussion

The case of Kaleum illustrates the validity of the priority given in NGPES to completion of the all-weather road network to district centers. However, both Kaleum and Nhot Ou demonstrate a need for further road outreach to the rural areas. Roads are one element among multiple poverty factors. Direct road access to existing villages makes a critical difference to communities in upland areas because it gives them access to an active market. Communities in remote locations are willing to invest tremendous energy in securing road access. Market access is not only a means

to improve cash incomes, but also an important social link in isolated areas.

The district surveys shed some light on the bargaining process between local governments and village communities in applications for a new village road. This is a very competitive process, given the modest level of on-going road construction projects. In this process, the successful communities are generally those that have developed specific strategies. These villages may be better off, stronger communities, or communities with special features that make them qualify as focal areas.

This trend raises the question of how to organize and rank applications. Donor-funded road sector projects have piloted prioritization through a scoring system based on community participation and cost in relation to population served. The survey highlights this need for prioritization in districts that are located on borders that have large investment needs and/or have a multi-ethnic population with contrasting socioeconomic status. Nhot Ou has all these features.

Full village coverage by the road network is a distant prospect in marginal districts. This may partly explain the absence of a strategy in future rural road network development at the national or local level. No comprehensive financial framework is in place. Such a strategy is needed, however, and could be designed to address poverty and environment at the same time. Building cheaper tracks instead of roads does not appear to meet current local expectations. This might change rapidly, however, as smaller transportation means have become more available through border trade. The widespread view that building a road network in a sparsely populated territory is a challenge further limits active planning of a rural road network. Figures show instead that a well-distributed network may serve strings of villages as soon as the country's GDP makes investments of less than \$200/capita economically viable.

The information flow between national and local government levels regarding the status of the road network is incomplete and not up-to-date. This is especially the case for roads built by

enterprises. The role of private enterprises other than construction companies in developing the road network is already important in poor districts located on the borders. The role of government remains critical in planning and monitoring as well as in ensuring additional investments, for example in bridges. In contrast, there is surprisingly little information available on these enterprises.

Linkages between road construction and increased natural resource extraction are somewhat ambiguous. Communities appear highly motivated to manage their resources well, provided they are given the responsibility to do so. Conversely, the involvement of large enterprises in building roads against logging contracts is likely to generate impact. What is needed may not so much be to question current practice that allows them to log a limited area on both sides of the road as it is to ensure sound implementation and monitoring.

UXOs, Environment and Poverty

Unexploded ordinance (UXOs) dating from the mid-1960s and mid-1970s affect 15 of Lao PDR's 18 provinces. Linkages between UXO contamination and poverty are obvious, but the issue has not achieved high visibility. Decontamination started in 1996/97 under the national Lao UXO program, but it is a very expensive process and is proceeding at a slow pace.

Little is known about linkages between UXO contamination and the environment. Some argue that farmers are coping with UXOs by farming on slopes, while others claim that UXOs could limit encroachment on forests and exploitation of timber and biodiversity degradation. In the latter case, UXO contamination would have an unfortunate effect on communities' health and livelihood but positive linkage to the environment, while in the former case the negative linkage to the environment would be an additional reason to support UXO-affected communities.

The Government of Lao PDR has created the national Lao UXO program—which provides a

channel for funding decontamination and public awareness initiatives—into the NGPES. The program is described as relating strongly to poverty reduction and to the shifting cultivation stabilization policy. Decontamination is to be planned in areas identified as priority under these policies.

The PEN study sought to analyze poverty and environment linkages of the UXO issue by ascertaining the impacts of UXO presence on households’ agriculture and overall land use systems. And it sought to analyze poverty and environment linkages of the current prioritization process in activities related to the UXO decontamination, and to identify potential environmental linkages specific to forested areas that might arise from decontamination.

The study benefited from the national Lao UXO program database. The database includes findings of the comprehensive 1996/97 survey of UXO impact (Handicap International 1997) as well as the updated status of village operations. These data were analyzed by linking district level UXO contamination and LECS II–III poverty data. The methodology for field research took into account substantial obstacles, which were expected. The research only took place in the Kaleum district.

The national Lao UXO program and the local government provided logistical support and translation from the local Mon-Khmer languages. Information was mostly collected at community level through focus group discussions. The national research team mostly used household interviews to confirm information derived from group discussions.

The limited possibilities of directly observing detailed land uses could not be fully overcome. However, quantitative indicators were assembled for the six villages surveyed, and discussions with elder people, who could remember the pre-war situation, indicated qualitative trends. A realistic set of findings was derived after supplementing this information with the national database analysis and with district interviews.

UXO Contamination

The national survey of UXO contamination revealed in 1997 that at least 22 percent of all villages in Lao PDR had a problem with UXOs, affecting close to 25 percent of the total population.²² In the Central region, nearly 50 percent of all villages are affected (Map 3.7).

UXO contamination is affecting the poor disproportionately. An estimated 28 percent of the poor and 20 percent of the non-poor lived in villages with a UXO problem in 1997/98.²³ More than 70 percent of villages are affected in the poorest districts of the southern region. The 1997 survey ascertained that more than 450 UXO-related accidents had occurred annually between 1974 and 1996. Casualties are only decreasing slowly: the Lao UXO program has recorded 110 accidents annually from 1999 to 2004, but these figures only cover 59 districts.

Both LECS II and LECS III show that UXO contamination in the South and Central regions is associated with higher poverty, less productive assets, and lower food security. In addition, LECS III shows that living in districts of the South and Central regions, where more than 50 percent of villages are affected by UXOs, is associated with

MAP 3.7 Percent of Villages in District Having UXO Problems

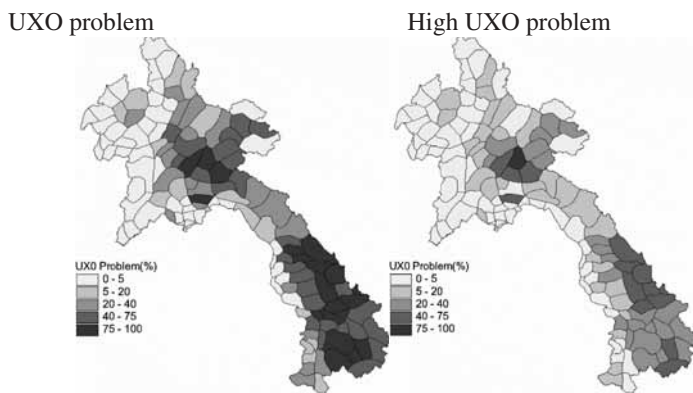
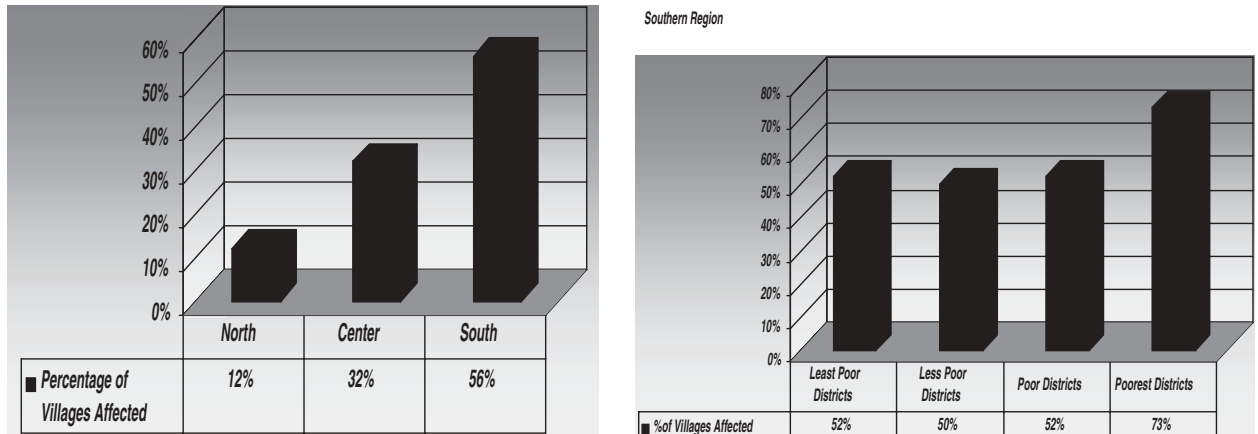


FIGURE 3.3 Left: UXO Contamination in Lao PDR (1997). Right: Percent of Villages Affected by UXOs in Relation to Poverty in the Southern Region (1997/98)



Sources: Left: calculated from the national UXO survey 1997; right: Data are from LECS II 1997/98 and UXO national survey 1997.

lower improved water supply and sanitation coverage rates, more household time spent on fuel wood and water collection, and lower education levels and health status. This difference between districts highly affected by UXOs and other districts is especially high for access to safe water in the South (Table 3.9).

Villages in highly contaminated areas are also less likely to have ongoing development projects, and some villages are experiencing a higher rate of out-migration. As seen from the NTFP study, there is also an indication that districts with high UXO contamination have less income from NTFPs, a source of income that could potentially compensate for the lower availability of paddy rice and irrigation.

Two positive findings were observed: (1) road access is equally available in districts with low and high UXO contamination, and (2) forest resources are relatively abundant in the South and Central regions.

The Government’s 46 priority districts account for 49 percent of highly affected villages and 46 percent of recorded deaths since 1999. They only account for 30 percent of the

TABLE 3.9 UXO Contamination and Key Indicators 2002/03 in the Southern Region

	UXO > 50%	UXO < 50%
Poverty Incidence 2002/03	41%	22%
Irrigated land (percent of households)	4%	4%
No Rice (months per year)	3.6	2.6
Fuel wood collection (hours per day)	0.9	0.6
Water collection (hours per day)	1.2	0.8
No toilet facility	72%	64%
No water supply (using open water source)	20%	7%
Emigration rate (last 12 months)	1.6%	1.1%
Literacy (> 50% of household members can read)	63%	83%
Death rate (last 12 months)	0.6%	0.5%
Development project in village	48%	62%

UXO > 50 (or < 50): households living in districts where more (or less) than 50 percent of villages are affected by UXOs. Source: The indicators are generated from LECS III 2002/03. UXO data are from the national UXO survey 1997.

agricultural land decontaminated between 1999 and 2004.

The geographical distribution of UXO contamination in the six southern provinces is not unrelated to the distribution of Mon Khmer ethnic groups. Mon Khmer people form the vast majority of villages in the Indochinese Cordillera. UXO-impacted villages are widely distributed in the six provinces except in the Mekong corridor, so there is no correlation between the proportion of Mon Khmer people and proportion or number of villages affected by UXOs. It is, however, likely that several of the small Mon Khmer groups mostly or fully live in districts with a high proportion of UXO-affected villages. The map of Agent Orange missions shows close concentration of impacts on the Cordillera (Lao UXO program 2004 & Chaignon 2000).

No association was found between forest cover and percent of villages with UXO contamination in a district. This finding is perhaps not surprising, since affected areas range from the densely forested Cordillera to the Xieng Khouang plateau, where forest cover is low. However, in districts with high UXO problems, forest cover is lower than can be explained by region, population density, agriculture, or topography. This finding deserves further analysis.

Kaleum District

The distribution of villages affected by UXOs in Kaleum derives from two factors: (1) the initial bombing impacts, and (2) active migration trends since the 1990s. All quantitative data in Kaleum should be regarded as tentative.²⁴ Most villages with UXO impact are located today in the western third of the district closer to the district town. Several of the seven severely affected villages are right next to the district town. Villages from the eastern part of the district are strongly encouraged to migrate to the west. The bombings followed the Ho Chi Minh trails that extended throughout much of the district. One village surveyed was created from the migration of two

of the 22 contaminated eastern villages and has been quite successful with support from an international project. The number of villages that had moved out is unclear.

Village consolidation in Kaleum is also active, with or without migration.²⁵ The 1997 UXO survey mapped 54 villages affected by UXOs out of a reported total of 115 villages. The research team recorded 60 villages. One village surveyed was formed by merging three nearby villages. The new location was severely contaminated, and reportedly no decontamination support was made available. There is also out-migration to other districts in the province, both spontaneous and government-sponsored. District population reportedly has declined by 7 percent in the 1990s (Chaignon 2000).

Bombings within villages precisely targeted the Ho Chi Minh trails. This has clearly resulted in higher UXO contamination along rivers and valley floors and in village centers. People are exposed to UXOs in daily activities such as cooking or fishing. Paddy cultivation is especially dangerous, both when reclaiming new paddy fields and when plowing the land. UXO decontamination is a prerequisite in construction works for roads and community buildings like schools. Since 2000, areas of paddy reclamation range from zero to only three hectares in all villages except for one, which has benefited from a donor-supported program. This old village is easy accessible from the district town and had been selected for decontamination for paddy field opening in the coming year. Altogether the Lao UXO program has cleared 19 hectares of paddy fields and 30 hectares for construction works between 1999 and 2004.

Swidden agriculture is comparatively one of the least dangerous activities, because UXOs explode spontaneously when the fallow is burned, and crops are sown without plowing. Swidden agriculture nowadays takes place close to the villages with very short rotations as a result. It is not possible to determine to what extent this is a coping strategy due to UXOs, or is the result of the shifting cultivation stabilization strategy. The fact

that hunting nowadays also takes place close to the villages—and that only one out of six villages reports substantial NTFP collection—points to the former explanation. The fact that all villages have a land use plan points to the influence of government policy, and so does the fact that local communities have been coping with high UXO presence on their own from 1973 until 1999. For example, they have become accustomed to collecting UXOs either to store them away or more recently to sell metal scrap. The latter has become a major income source in the district. Villagers stated that they saw several thousand—up to 13,000—UXOs in their own village within one year and that many more are still unidentified.

Households appear to be adjusting their livelihoods in several ways. Interestingly, only one out of six villages is developing “classical” improved agriculture based on paddy and livestock. All other five villages are reporting alternatives and plans that range from migration to innovative income sources (Table 3.10). Villagers seem to be moving around without limitation from UXOs. Inhabitants in all villages collect NTFPs and go to the market regularly by foot. Decreasing ani-

mal assets may be an indicator of difficulties in adjusting. Half of the villages had lost large animals since the war, and another 50 percent (not necessarily the same ones) have decreasing or stable animal numbers today.

Discussion

The PEN study confirms that UXOs do not protect forests from encroachment and that decontamination has no potential for negative consequences on forest cover. First, decontamination is proceeding at a very low pace. About 5,500 hectares have been decontaminated between 1999 and 2004, an average 16 hectares per district per year. Second, UXO contamination is a powerful factor limiting reclamation of paddy fields and decrease of swidden agriculture. The industrial forestry sector is important in Kaleum and elsewhere in the Indochinese Cordillera²⁶ but, except for NTFPs, it is mostly unrelated to households and was not covered by the study. UXOs are certainly an issue for this sector, too, and its linkage to environment deserves analysis.

TABLE 3.10 Past & Current Trends in Six Villages Surveyed

Village New or old village		1 Migrated from east, consolidated village	2 Old village	3 Migrated from nearby village	4 Migrated from nearby village	5 Migrated recently from nearby, consolidated village	6 Old village
UXO impact		Low/Moderate	Moderate	Moderate	High	Severe	Moderate/ High
Animal assets	Since war Since 2000	Decrease Increase	Increase Decrease	Decrease Stable	Decrease Increase	Increase Decrease	Increase Stable
Paddy development since 2000		Large area 95% HH	Small area 10% HH	None Metal scrap	Small area 95% HH	Small area 20% HH	Small area 10% HH
Livelihoods	Today Tomorrow	Paddy & live- stock dvt	Seasonal migration Sawmill	Tourism	NTFPs Out- migration	Metal scrap Fruit trees	Gold panning Paddy dvt

Source: PEN village survey (ERI). HH = household.

UXOs may be contributing to rotational agriculture with much shortened cycles together with the government's policy of shifting agriculture stabilization. The combination of both issues may create unique difficulties for the local population. Making the new farming systems sustainable is challenging. Few locations in UXO-affected areas are appropriate for opening sufficient areas of paddy fields. There is no indication of UXOs limiting animal husbandry, but the difficulties of adjusting livelihoods appear to result in several communities' selling out their animal assets.

A clear national policy statement is needed to link UXO decontamination to shifting cultivation stabilization, but actual results appear to be limited in the district surveyed. Very few villages are prioritized for the opening of paddy fields. Access is obviously one of the conditions of village selection. Within a village, some communities opt for sharing the new paddy fields, while in others paddy fields are operated by a few families only.

UXOs are not so much a natural resource management issue as a strongly limiting factor to overall rural development. The PEN study demonstrates that even villages with no UXOs are indirectly affected by them in districts with heavy UXO contamination. This is especially the case in districts where UXO impact is concentrated closer to the district town.

The livelihood strategies observed in the village survey also point to the limitations of agriculture in most villages and to the need for support of a more diversified rural economy. However, prioritization of decontamination efforts may be more critical for construction works than for agriculture. A high proportion of the districts use decontamination mostly for purposes other than agriculture.²⁷ This is perhaps why in 1998, roads—and not UXOs—were cited as the main problem by village leaders (Chaignon 2000). The private sector is also playing its share in decontamination.

Prioritization of UXO-related support is, therefore, especially relevant at the district level and may relate to all sectors. In 2004, the Lao

UXO program was planning to work only in districts listed as poor in NGPES, including two-thirds of very poor districts (Lao UXO program 2004). With widely spread UXO contamination, it is understandable that the more densely populated lowland and urban areas may have attracted support in the past. Yet, within districts, UXO-related activities—with the important exception of awareness raising, which is already covering broad numbers of villages—do need to be targeted for expansion.

Targeting villages with easy road or river access may be the only solution, but doing so in the framework of the village resettlement and consolidation policy is particularly questionable. Kaleum is not the only district where UXOs are concentrated in areas targeted for resettlement.²⁸ Local governments in marginal districts do not have the capacity to identify safe locations for new settlements and to plan timely decontamination. Their energies would be better employed in planning infrastructure for existing villages and supporting communities' initiatives for livelihood diversification.

POVERTY AND ENVIRONMENTAL HEALTH

Water Supply & Sanitation

Achieving equitable access to sustainable water supply and sanitation services is essential for protecting the health of the poor and improving their quality of life. Poor households tend to have more young children and elderly than non-poor households. These age groups are most vulnerable to disease. Poor households have less access to quality health services, and can least afford the cost of medical treatment and income losses from disease.

Increasing household access to improved water supply and basic sanitation is viewed by the Government of Lao PDR as an important part of poverty alleviation and socioeconomic development. The Sixth National Socio-Economic Development Plan 2006–10 aims at increasing

national water supply coverage rates by several percentage points in the next five years.

Substantial progress has been achieved in providing the population with safe and accessible water supply in the last decade. Improved water supply coverage increased from less than 20 percent in 1995 to 55 percent of the population in 2003.²⁹ The population share with protected groundwater tripled during the period and the share with unprotected groundwater declined by nearly 10 percentage points. The most striking achievement was the reduction in the population share relying on open, unprotected water sources, such as rivers, ponds and streams, which declined from nearly 50 percent to 22 percent. Other types of water supply, including gravity-fed systems, increased from practically nonexistent to 18 percent of the population.

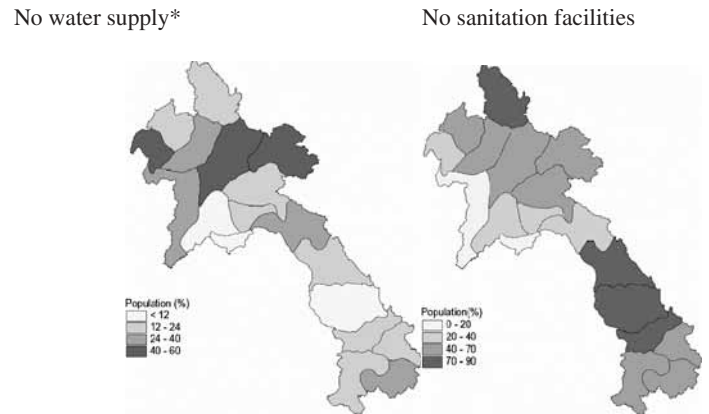
The increase in sanitation provision has been substantially slower than the increase in improved water supply, but is still significant. The population share with no sanitation facilities (“no toilet/latrine”) declined from 70 to 50 percent from 1995 to 2003, and pour-flush toilets now serve 37 percent of the population.

The poor have not benefited enough from these improvements. Of particular concern for environmental health is the population continuing to rely on open, unprotected water sources, such as surface water. In 2003, about 30 percent of the poor relied on surface water, compared to 20 percent of the non-poor (LECS III). While this represents a substantial decline from 1995, there was no relative gain for the poor.³⁰

The situation is more pronounced for basic sanitation. Nearly 70 percent of the poor did not have toilet facilities in 2003, compared to slightly more than 40 percent of the non-poor. The non-poor population with no toilet facilities declined by 21 percentage points, while for the poor, the decline was only 13 percentage points from 1995 to 2003. The gap between the poor and the non-poor therefore seems to have increased.³¹

The inequity in access to improved water supply and sanitation is not only an urban-rural

MAP 3.8 Population with No Water Supply and Sanitation



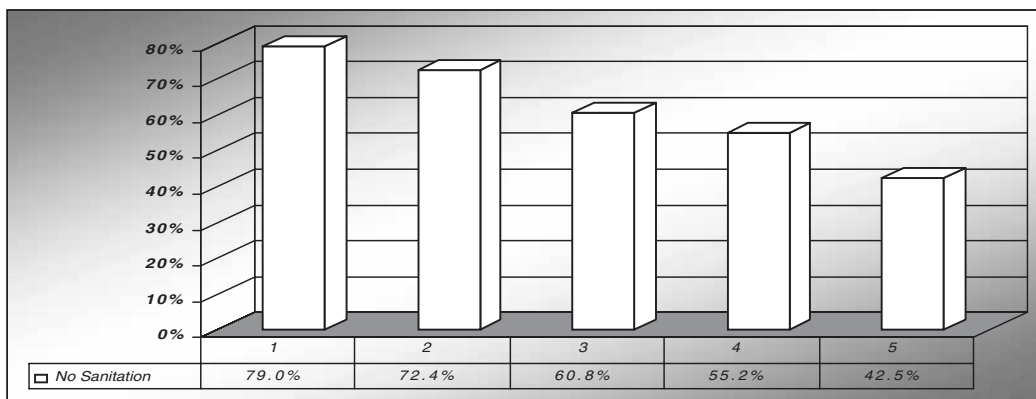
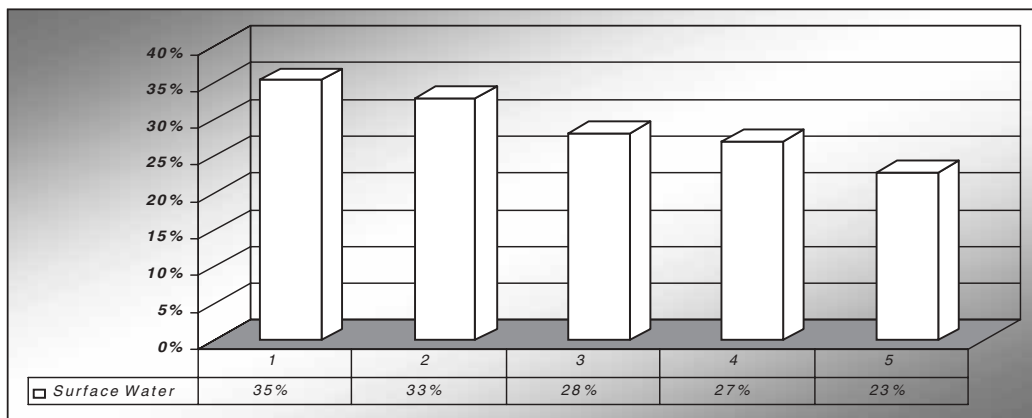
Source: LECS III 2002/03. *Population with drinking water directly from rivers and other open, unprotected water sources.

disparity. More than a third of the poorest rural households depend on surface water compared to 23 percent of the richest rural households.³² Almost 80 percent of the poorest rural households do not have basic sanitation, compared to 43 percent of the richest (Figure 3.4).

The reliance on open, unprotected water sources (surface water) and the lack of sanitation varies greatly across provinces and for non-poor and poor households. More than 50 percent of the poor in Luangphrabang and Houaphanh provinces use surface water, and more than 80 percent of the poor have no toilet/latrine in Phongsaly, Luangphrabang, Khammouane, Savannakhet, and Saravane. Access also varies during the rainy and dry seasons. In the South, there are significant differences across the two seasons.

In 1995, district population water supply and sanitation coverage rates were strongly associated with urban population share, villages' access to roads and their education level, and to some extent UXO contamination.³³ This continues to be the case today. About 28 percent of the rural population relies on surface water, compared to only 4 percent in urban areas. Population with toilet facilities exceeds 85 percent in urban areas,

FIGURES 3.4 Reliance on Surface Water and Lack of Sanitation in Rural Areas in 2003



Source: Calculated from LECS III, grouping households from poorest (=1) to richest (=5)

but is only 40 percent in rural areas. Of the population with access to roads, less than 20 percent use surface water and nearly 60 percent have toilet facilities. Of the population without access to road, more than 40 percent use surface water and only 20 percent have toilet facilities. Having no water and sanitation services is also strongly associated with household literacy level. Only 18 percent of households rely on surface water in which more than half of the members can read, while nearly 35 percent of households use surface water in which less than half of members can read.³⁴ Rural areas lag far behind the urban with respect to literacy levels.

An analysis was undertaken to assess the role or association of each of these factors with household use of surface water and lack of a toilet facility.³⁵ The analysis enabled a comparison of households that are generally similar except with respect to one factor of the assessment. The analysis resulted in the following conclusions:

- Rural households are 7.7 times more likely than urban households to rely on surface water.
- Households in villages with no access to roads are 1.9 times more likely to rely on surface water than households with road access.

- Households in which more than half of the members cannot read are 20 percent more likely to rely on surface water than households in which more than half of the people can read.
- The presence of UXO problems in a village is associated with a 34 percent higher likelihood of using surface water.
- Controlling for the above factors, being poor increases the likelihood of relying on surface water by 15 percent.³⁶

There is an even stronger association between the same factors and lack of sanitation; that is, no toilet/latrine:

- Rural households are 8 times more likely than urban households to have no sanitation facilities.
- Households in villages with no access to roads are 3.4 times more likely to lack sanitation facilities than households with road access.
- Households in which more than half of the members cannot read are 4.3 times more likely to lack sanitation than households in which more than half of the members can read.
- Having UXO problems in the village is associated with a 7.8 times higher likelihood of not having sanitation.
- In addition, controlling for the above factors, being poor increases the likelihood of not having sanitation by 60 percent.

These factors have supply and demand aspects. Household or community location and road access are likely to have influenced supply decisions in the water and sanitation sector, with priority given to urban areas, easily accessible rural areas, and areas with low risk of UXO accidents and/or low cost of UXO clearance. These supply decisions, among other issues, may be driven by cost considerations as well as concerns about the sustainability of water and sanitation services in remote rural areas.

On the demand side, road access, education and literacy, and poverty may influence the capac-

ity of communities and their perceptions of priorities to obtain and sustain water and sanitation services. Remote communities often have less contact with and less access to water and sanitation decision makers. Moreover, less educated communities may be less skilled in communicating needs. They may also have less appreciation and/or knowledge of health risks associated with lack of water supply and sanitation. Poverty also influences demand for water and sanitation, as poor communities have fewer resources to contribute to construction and operation/maintenance in rural areas and to water connection fees and water tariffs in urban areas.

Urban Water Supply and Sanitation

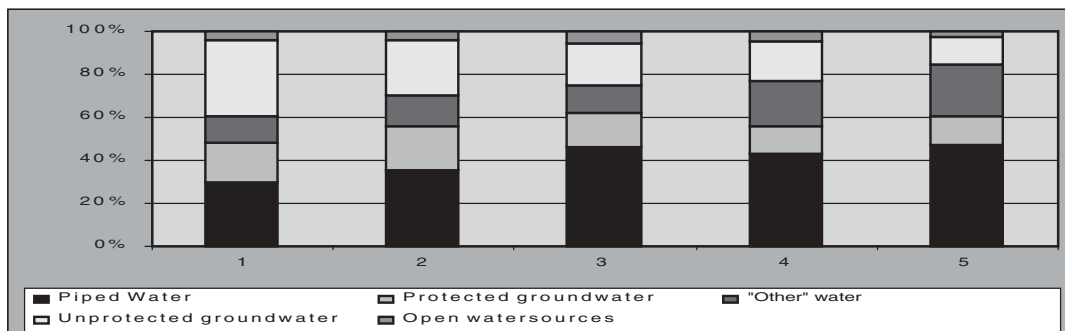
The Water Supply Authority Lao PDR (WASA), responsible for urban water supply, emphasizes the importance of social fairness, quality of services, consumer satisfaction, and financial sustainability in the water sector (Annual Water Sector Performance Report 2003).

There are more than 140 urban centers in Lao PDR, corresponding to district capitals. Half of these centers have a population less than 4,000–5,000. In addition, there are many rural villages with urban characteristics. Nearly 60 percent of the urban population resides in the 18 provincial centers, of which more than three-fourths live in the largest five.³⁷

Nearly 75 percent of urban households have improved water supply, while 25 percent continue to rely on unprotected well water and open water sources. However, according to a 2002 report entitled *Small Towns Water Supply and Sanitation Initiative in Lao PDR*, more than 100 of the district centers do not have a piped water supply with house connections.

By household living standard, 60 percent of the poorest urban households and more than 80 percent of the richest urban households have improved water supply (Figure 3.5). The disparity is, however, larger for piped water supply

FIGURE 3.5 Urban Household Water Supply by Living Standard Quintile



Source: Estimated from LECS III (2002/03). Note: Improved water supply is here defined as piped water supply, protected groundwater, "other" water (mainly gravity-fed systems), and rainwater (1 to 2 percent of urban households; not included in the figures above). Note: Living standard quintiles are consumption-based estimates from LECS III, with quintile 1 being the poorest households.

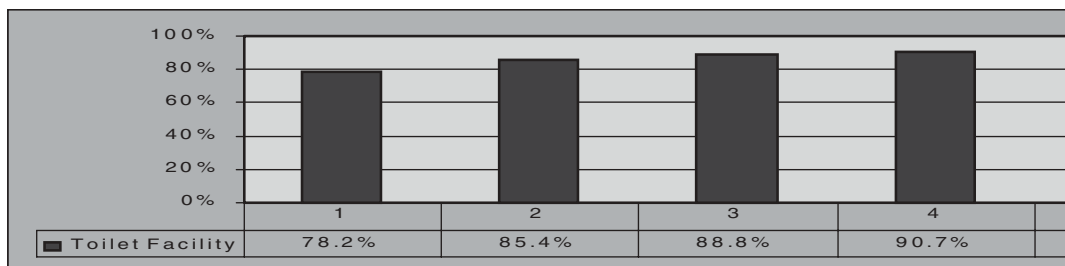
with a house connection. Nearly 30 percent of the poorest households have house connection, while more than 45 percent of the richest have connection.

Over 90 percent of urban households have basic sanitation facilities. Nearly 80 percent of the poorest households and more than 95 percent of the richest households have basic sanitation (Figure 3.6). Quality and hygienic safety of these facilities vary substantially within and between urban areas and across levels of living standard.

A Look at Two Small Towns

A PEN study was carried out in Phongsaly and Lamam towns to gain a better understanding of the needs and priorities in the water and sanitation sector for the poor in small towns in Lao PDR (Box 3.2). The towns are provincial capitals of two of the poorest provinces in the country, and have populations less than 10,000. Both towns have a piped water supply network serving a majority of the households, but no sewage network.

FIGURE 3.6 Percent of Urban Households with Toilet Facility by Living Standard Quintile



Source: Estimated from LECS III (2002/03). Note: Living standard quintiles are consumption-based from LECS III, with quintile 1 being the poorest households.

BOX 3.2

The Urban Research Institute (URI) in Vientiane implemented a study on poverty and urban water supply and sanitation in Phongsaly and Lamam towns.* The study assessed types of household water supply and sanitation facilities, piped water connection coverage, user satisfaction, and factors influencing demand for piped water supply and improved sanitation in poor and non-poor households. A specific aim of the study was to identify policies and interventions to promote equitable access to water and sanitation services that provide health protection and improved living conditions for poor and vulnerable households.

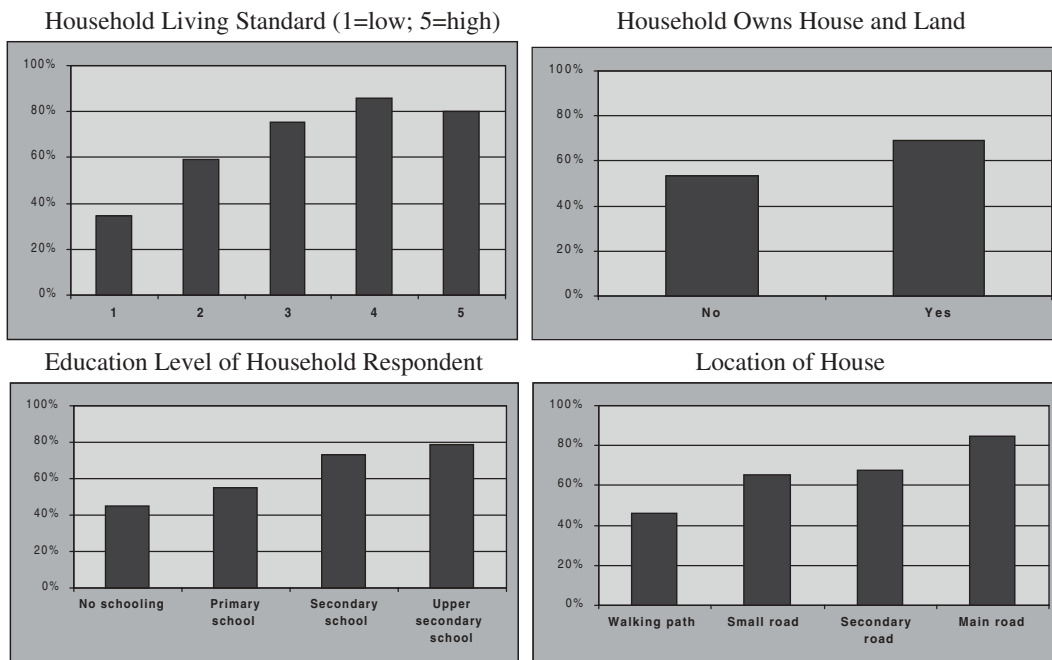
The study included a survey of about 550 households, questionnaire interviews with the district water utilities (Nam Papa), and interviews with district authorities and community leaders. Six out of nine urban villages were surveyed in Phongsaly town and six out of six in Lamam town. Asset scores and self-reported living standard levels were used to identify poor households.

*URI. 2006. Water Supply and Sanitation Situation in Relation to Poverty in Two Urban Districts, Lao PDR. PEN report prepared by URI. Vientiane.

Piped water connection. In Phongsaly, the piped water connection rate is less than 40 percent for the poorest households but more than 80 percent for the richest. Affordability alone does not explain this disparity. Household education level, land and house ownership, and

location of the house relative to the main road also affects the water connection rate (Figure 3.7).³⁸ The lowest connection rate is therefore among poor households with low education level who do not own their property and who reside along the walking paths.

FIGURE 3.7 Percent of Households with Piped Water Supply in Phongsaly



In Lamam, piped water connections are also associated with living standards and household ownership of house and land. The influence of education levels is weaker than in Phongsaly, and the connection rate is not affected by household location relative to roads.

Piped water user satisfaction. Nearly 80 percent of households in Phongsaly reported satisfaction with the piped water supply. The highest rates of satisfaction were in locations closest to the water distribution point. Only 60 percent of households were satisfied in the villages most far away from the distribution point. Satisfaction is also lower among households reporting that time savings were of high importance in their decision to connect to the piped water supply, and among households reporting that the piped water supply is insufficient to provide their most important water needs. These findings are understandable in light of the low quantity of water that the piped water network is capable of providing in Phongsaly. Most households therefore need to supplement their water demand from other sources, which in most cases is a time-consuming endeavor. Education level also seems to have a substantial influence on satisfaction with the piped water supply in Phongsaly (Figure 3.8).³⁹

In Lamam, more than 85 percent of households are satisfied with the piped water supply, although satisfaction reaches only 60 percent in one of the villages. Households that reported time savings as an important motivation for connecting to the water supply were more satisfied than households for which time savings was of minor importance. This is contrary to the findings in Phongsaly, but is consistent with the substantially higher volume of water supplied by the system in Lamam. The rate of satisfaction is about the same for poor and better-off households, and satisfaction is marginally higher among households with higher education level.

It is not clear why satisfaction with a piped water supply is associated with household education level. One reason could be that more educated households have a higher appreciation for the potential hygiene and health benefits of having convenient access to increased quantity and quality of water.

Water tariffs. Water tariffs in Phongsaly are among the highest in the country. Nevertheless, 85 percent of the poorest households and 70 percent of other households reported that tariffs are reasonable. In Lamam, nearly 50 percent of households—poor and rich—reported that tariffs are reasonable.

FIGURE 3.8 Household Satisfaction and Education Level in Phongsaly

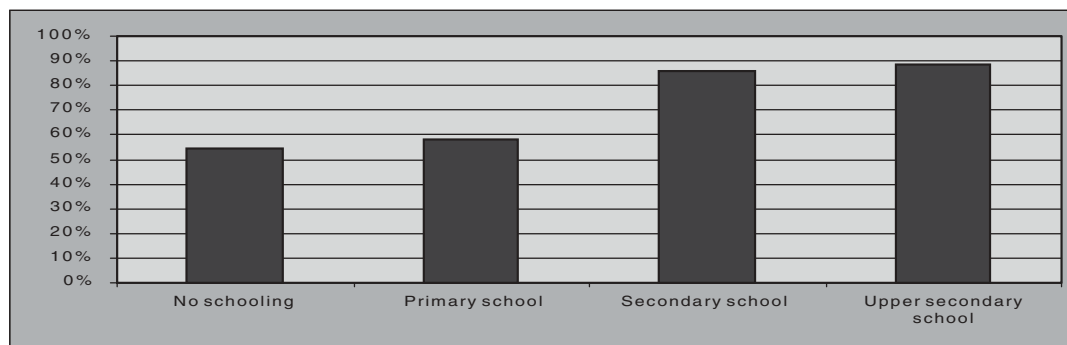


TABLE 3.11 Household Water Bill in Phongsaly and Lamam

	Small user		Large user	
	Phongsaly	Lamam	Phongsaly	Lamam
Per capita water consumption per day (liters)	20	60	100	250
Household water bill (000 Kip per year)	60	130	575	770
Water bill % of household total expenditure	1.1%	2.4%	2.0%	2.7%
Water bill % of household non-food expenditure	5.7%	12.4%	4.0%	5.3%

Note: Calculated based on block tariffs and annual household water consumption data from DCTPC, and urban household expenditure quintiles from LECS III. The lowest quintile (poorest households) is applied in the calculation of water bill as a percent of consumption for “small user” and the highest quintile is applied for “large user.” Urban Vientiane Municipality is excluded to better reflect urban household expenditure and living standards in smaller towns.

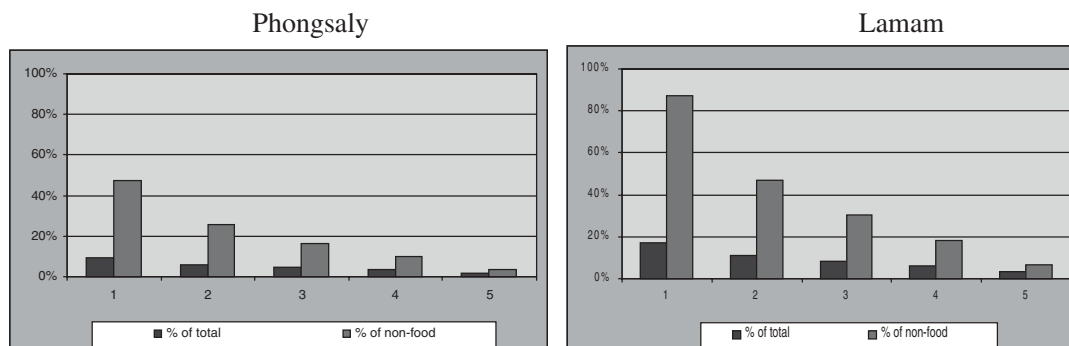
Even though water tariffs per cubic meter in Lamam are less than half the tariffs in Phongsaly, household water expenditure is higher in Lamam. This may explain why fewer households in Lamam report that water tariffs are reasonable. Household water consumption is several times higher in Lamam than in Phongsaly, mainly because water is less expensive and supply is more abundant in Lamam.

Household expenditure on piped water ranges from 1 to 3 percent of total household expenditure on all goods and services, and from 4 to 12 percent of non-food expenditure. A large user spends more than a small user as a percent of the household’s

total expenditure, but less than a small user as a percent of non-food expenditure (Table 3.11).

Water connection fee. The household water connection fee in Phongsaly is Kip 500 thousand (nearly \$50), and Kip 900 thousand (nearly \$90) in Lamam. In Phongsaly, this is nearly 10 percent of annual household expenditure on all goods and services for the poorest households, and 2 percent of total expenditure of the richest households. As a share of household non-food expenditure, the connection fee is 47 percent for the poorest households and 3 percent of the richest households (Figure 3.9). In Lamam, the

FIGURE 3.9 Connection Fee as Percent of Annual Household Consumption



Note: 1 is lowest living standard quintile and 5 is highest.

water connection fee is as much as 87 percent of annual non-food expenditure for the poorest households and 6 percent for the richest households. This may explain why Lamam has a lower connection rate than Phongsaly.

In Phongsaly, 75 percent of the households without piped water, but with network available in their section of the town, stated that the high connection fee was the most important reason for not connecting to the piped water supply. In Lamam, all households without piped water supply reported that the high connection fee was the main reason for not obtaining a connection.

Basic sanitation. More than 95 percent of the surveyed households had toilet facilities in Phongsaly, ranging from 90 percent among the poorest households to 100 percent among the richest households. In Lamam, nearly 80 percent of surveyed households had toilet facilities. Less than 45 percent of the poorest households had toilet facilities, compared to more than 95 percent of the richest households (Figure 3.10).

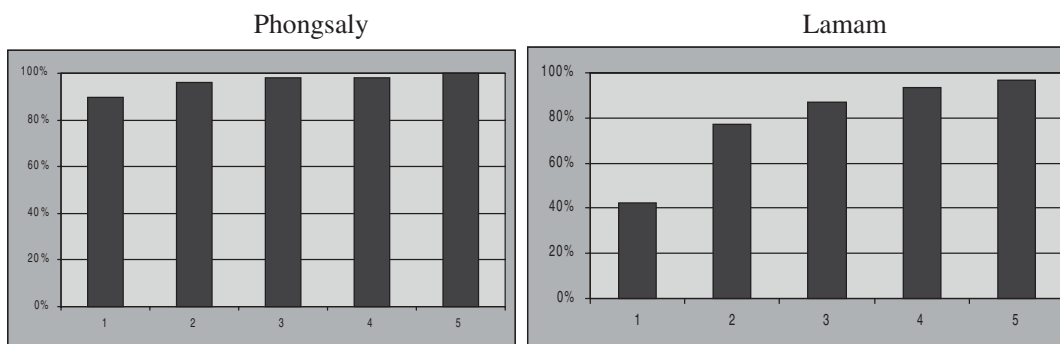
Living standards, education levels, and the presence of elderly family members in the household explain much of the difference in the type of toilet facilities in households in Phongsaly. Pour-flush toilets were much more frequent in richer households, and dry pit toilets more fre-

quent in poorer households. Education levels also have some influence on the type of toilet. Households with higher education had flush toilets more frequently than households with low education.⁴⁰ Pour-flush toilets were much more frequently used in households with elderly than in households without elderly household members. In contrast to factors influencing piped water connection, the location of a house in relation to the type of road and ownership of house and land were not found to influence households' choice of toilet facility in Phongsaly.

In Lamam, four factors were identified that influenced whether households had a toilet facility and the choice of facility. Education level was found to have a larger influence in Lamam than in Phongsaly. House location also matters. Households living away from main roads and along walking paths are less likely to have a pour-flush toilet with septic tank or to have a toilet at all. Households not owning a house and land had a pour-flush toilet with septic tank less frequently.

Vulnerable groups. Incidence of diarrheal illness, and mortality from diarrheal illness, is generally highest among young children and elderly individuals. Piped water supply and sanitation facilities, which makes it easier to practice good

FIGURE 3.10 Percent of Households with Toilet Facility



Note: Lowest living standard=1 and highest living standard=5

hygiene, are therefore particularly important for households with young children and elderly.

In both Phongsaly and Lamam, the piped water connection rate is about the same for households with children or elderly as in households without children or elderly. With respect to basic sanitation in Phongsaly, households with children have the same type of facilities as households without children. Households with elderly individuals, however, more frequently have pour-flush toilets than households without elderly individuals. In Lamam, households with children and elderly are less likely to have a pour-flush toilet and more likely not to have a toilet facility.

Sustainability of Rural Water Supply and Sanitation

Over the last decade, there has been significant progress in providing improved water supply and sanitation systems to the rural population in Lao PDR. Water and sanitation village committees were promoted to improve the sustainability of these systems and community and household hygiene. The water and sanitation systems have, however, not been free of problems. The Ministry of Health (MoH), which is responsible for rural water and sanitation, was therefore interested in a study on factors influencing the non-sustainability of rural water supply and sanitation. Such a study was included as a PEN study, with a particular focus on poverty.

A sustainable water supply and sanitation system is defined as the system providing an acceptable level of services throughout its design life. This includes acceptable water quality, quantity, and continuity, and the physical reliability of the system to deliver services. To this definition should be added healthy hygienic conditions of the system, and a community and household hygiene that helps provide the maximum health benefits of the system.

The PEN study was carried out in 32 villages in four provinces in the North and South of Lao PDR under the leadership of the Department of Hygiene at the Ministry of Health (Box 3.3). The water supply consisted of gravity-fed systems (GFS) in 23 villages, and of bore holes in nine villages (Table 3.12). More than 60 percent of the water supply systems had experienced breakdowns in the prior 12 months, and 30 percent of the systems had more than five breakdowns. In nearly 40 percent of the cases, it took more than five days to repair the systems. The perception of households and village leaders and committees was that poor management was an important factor in the breakdowns. About 75 percent of village leaders and committees stated that poor management was one of the causes, and 35 percent of households stated that poor management was the main cause of breakdowns (Figure 3.11).

The sanitary inspections of the gravity-fed water supply systems found that proper maintenance and precautionary measures to prevent the

BOX 3.3

The Department of Hygiene and Prevention at the Ministry of Health implemented a study on sustainability of rural water supply and sanitation in four poor districts in Lao PDR.* The study set out to identify factors influencing non-sustainability, looking at the quality of community management, community participation, inspections and maintenance, and community and household hygiene. Survey questionnaires were developed and administered in 32 villages to over 600 households, 32 village committees or village leaders, and several district offices. Sanitary inspections were conducted for all the water systems, 100 latrines, and more than 250 households.

*Ministry of Health. 2005. Factors influencing the non-sustainability of improved water supply and sanitation programs in rural areas in poor provinces in Lao PDR. PEN report prepared by Environmental Health Division, Department of Hygiene and Prevention, Ministry of Health, Vientiane, Lao PDR.

TABLE 3.12 Study of Rural Water Supply and Sanitation Sustainability

Province	Phongsaly	Oudomxay	Sekong	Attapeu
District	Notou	Namor	Kaleum	Phouvong
Number of Villages	8	8	8	8
Number of Households per District	156	160	147	160
Type of Water Supply System in villages	GFS	7 GFS 1 bore hole	GFS	bore holes
Number of Latrine Inspections	45	40	0	15
Household Hygiene (number of households per district)	64	64	64	64

Notes: GFS=gravity fed system

risk of water pollution or to keep good hygiene conditions were inadequate in more than 30 percent of cases. This included accumulation of stagnant water around the stand post, risk of pollution through faulty pipes, unscreened and unfenced water intake installations, and damages to stand post platforms. Risk of pollution from upstream human settlements, farm animals, and crop production was also identified, but much less frequently (Figure 3.12).

Sanitary inspections of 21 bore holes in the nine villages with bore holes also found conditions in need of improvement. Inadequate fencing around hand pumps to keep out animals, stagnant water accumulations, and other nearby sources of pollution were observed in more than 40 percent of cases. Latrines within 10 meters of the hand pump were also found in a few cases (Figure 3.13).

Soap was available in only 6 out of 100 latrines, and water tanks were absent in 60 percent of the

FIGURE 3.11 Water Supply (WS) Break-Downs

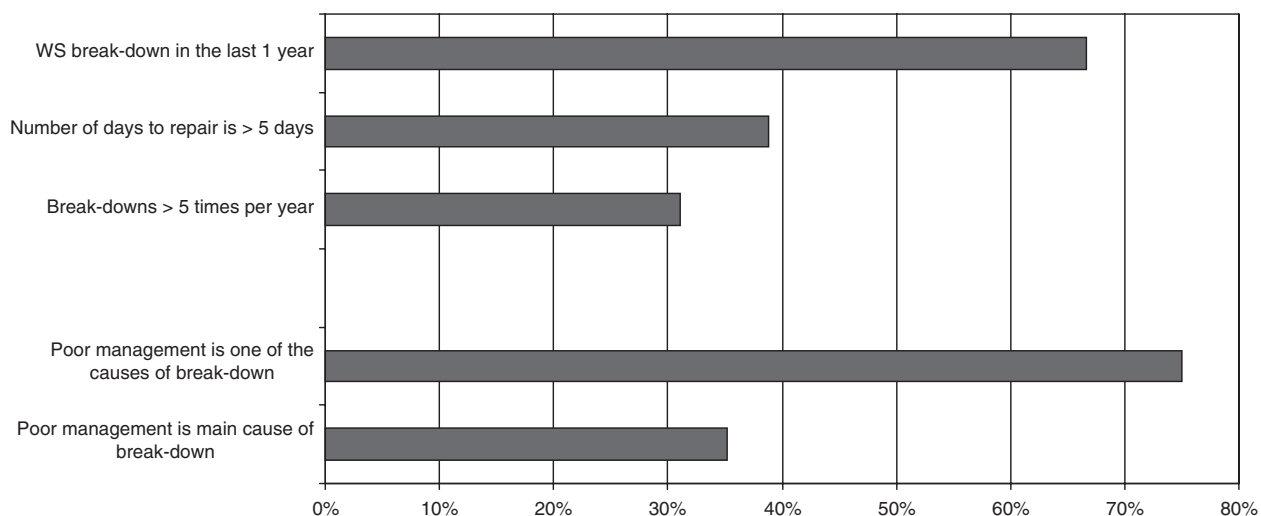
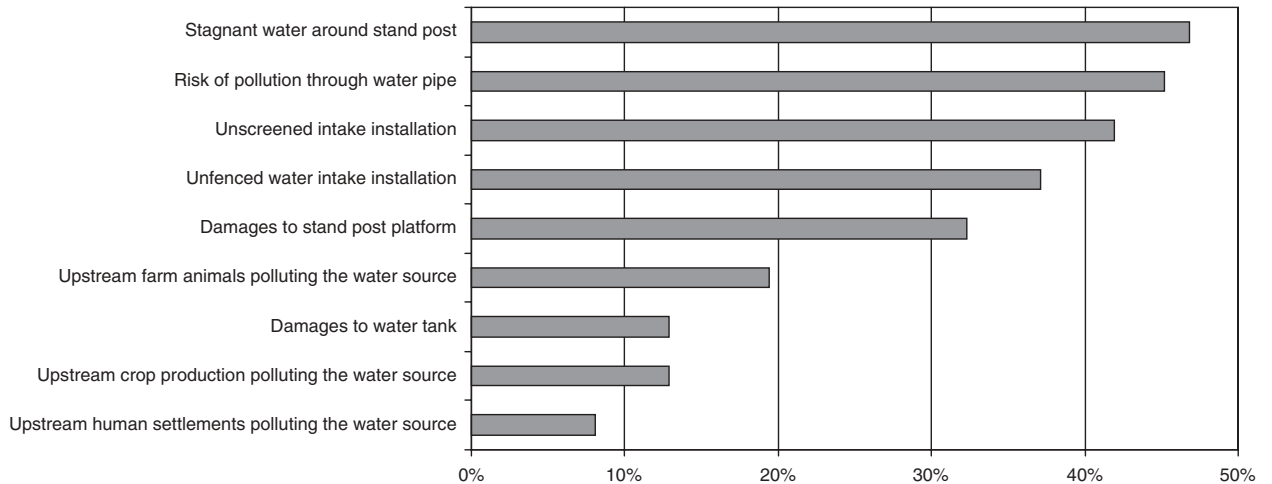


FIGURE 3.12 Sanitary Inspections of the Gravity Fed Water Supply Systems



cases. Cleanliness was unsatisfactory in 40 of the latrines, and 20 to 30 of the latrines suffered from poor physical conditions (Figure 3.14).

Several factors were associated with water supply breakdowns and frequency of breakdowns in the 32 villages. Some of the most important factors included low demand responsiveness; no financial fund for proper operation and maintenance and repairs; no regular inspection of systems; and low education levels in the

village. Villages with ethnic minorities seemed also to face more difficulties in avoiding breakdowns, and so did poorer villages (Table 3.13).

Demand for the water supply systems originated from the villagers in nearly 70 percent of the cases, or the village in nearly 95 percent of the cases. More than 90 percent of households provided labor and materials. Post-project monitoring took place, however, in only 55 to 60 percent of the cases, and regular sanitary inspections of the

FIGURE 3.13 Sanitary Inspections of the Bore Holes

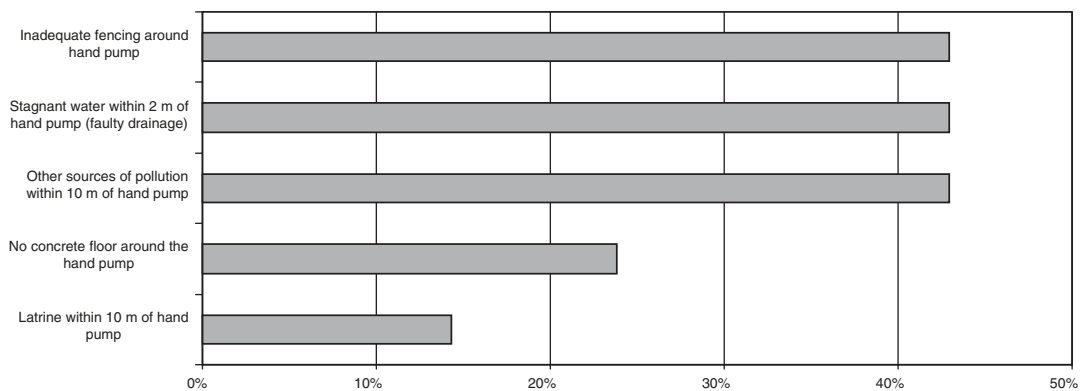
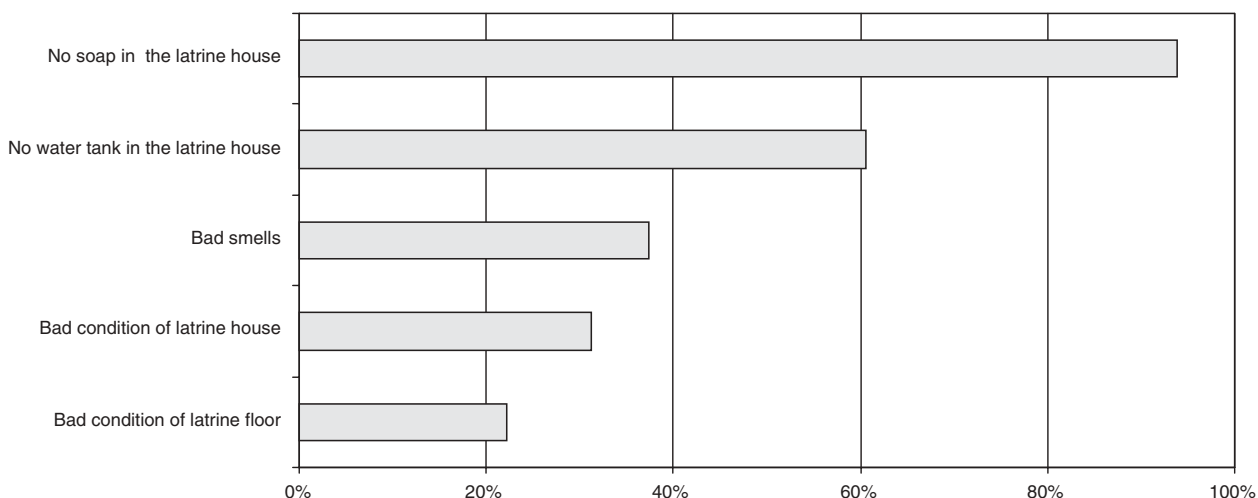


FIGURE 3.14 Household Latrine Inspections



systems were performed in less than 40 percent of the villages. The poorest performance was with respect to having a well-functioning water and sanitation village committee, training of village committees, and household collections for an operations and maintenance fund (Figure 3.15).

Discussion

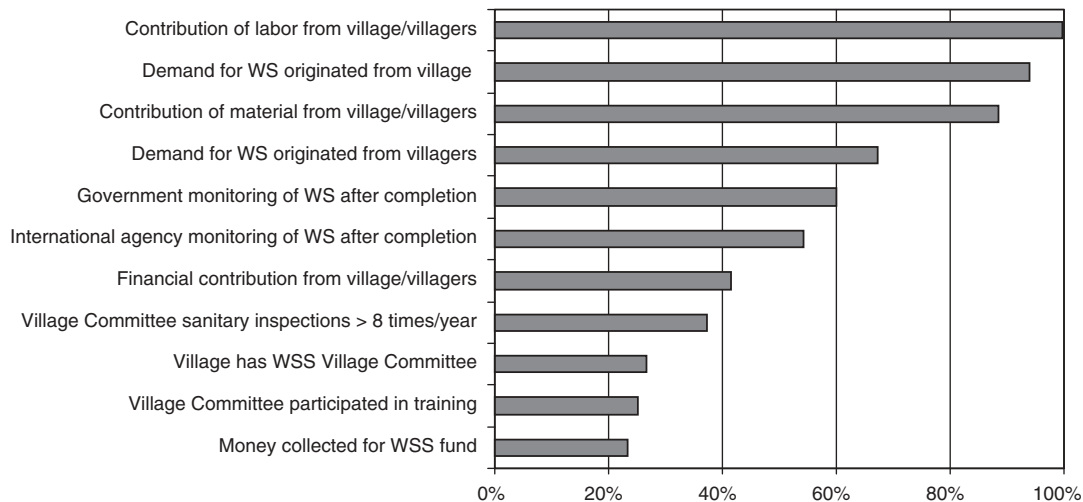
Over the last decade, there was significant progress in providing improved water supply and basic sanitation. The poor, however, lag far behind, and no relative gains were achieved. Four factors explain much of the low coverage rates in

many poor communities: rural location, no village access to a road, illiteracy or low education, or UXO contamination. The poor have lower coverage rates of improved water supply and basic sanitation in urban areas too. Low education and unaffordability of services explain some of this disparity. The study in Phongsaly and Lamam confirms that these factors are important in small towns too, pointing to the high water connection fees and low education levels as the main reasons for low connection rates among poor households. Other factors include households not owning their property or a location away from main roads.

TABLE 3.13 Factors Associated with WS System Breakdowns

- Low demand responsiveness (e.g. village participation)
- No financial fund for proper O&M and repairs
- No post-project monitoring by government and international agencies
- No regular inspection of WS system
- Low education level
- Ethnic minorities
- Poverty

Note: Factors were statistically significant at 95 percent level (Chi-square).

FIGURE 3.15 Community Participation and Water Supply System Management

Provision of rural water supply and sanitation will need to be further invigorated if equity in access to services is to be achieved. Particular attention is needed for communities with no access to a road and in areas with high UXO contamination, as these communities are among the poorest in the country. Sustainability of services for these communities is an important consideration. They tend to have higher illiteracy or lower education levels, pointing to a strong need for developing capacity for sustainable management of water supply and sanitation services.

Poor rural communities seem to be more inflicted with water supply system breakdowns than better-off communities. Inadequate management is most frequently reported as the main cause or important cause of these breakdowns. Poor communities are also less likely to establish village funds for maintenance and repairs. Hygiene improvements are also much needed to fully benefit from improved water supply and sanitation. This includes regular inspection and proper hygiene maintenance of water supply systems, appropriate community behavior in relation to water use, and improved household and personal

hygiene. These factors all point to the need for increased emphasis on community capacity building with proper management training, community participation, information and awareness campaigns, and instituting procedures to establish village funds for maintenance and timely repairs.

In urban areas, the household connection fee is of critical importance. Its high level is one of the main reasons for poor households not obtaining a water connection. The fee is a substantial share of poor households' annual expenditure on all goods and services and non-food expenditure. As financial sustainability of water agencies is an important objective of the government, any policy to adjust the connection fee would need to strive to be revenue-neutral.

Household education level is an important determinant of demand for improved water supply and basic sanitation. Information and public awareness programs about the benefits of improved services—such as opportunities for improved household hygiene and potentially better water quality—can therefore be an important instrument for encouraging household connections. This is particularly important among

poor households, because they generally have less education. Public awareness programs should also target households with young children and elderly household members. These groups are more at risk of disease.

Satisfaction with the piped water supply system was found to be higher among households with higher education levels. More educated households may appreciate the value of having piped water, just as their demand for piped water is higher than households with lower education levels. Public awareness programs communicating the values of having improved water supply may therefore also help increase satisfaction in addition to increasing connection rates.

Poor households in urban areas are also affected by network availability. Piped water is sometimes not available in the area of the town where the poor live. This is the case in some areas of both Phongsaly and Lamam towns, and especially for households living along walking paths and away from main roads. As these households tend to be poorer than other households, it is important that planning of network expansions should consider equity.

For new water and sanitation projects in small towns in Lao PDR—and for network expansions and service improvement in towns with existing piped water supply—an increased emphasis on a participatory approach, and information and awareness campaigns in project preparation can help enhance user satisfaction, ensure appropriate service levels, allow a tariff structure and connection fees that promote equity, and help ensure that household expectations are realistic and enable households to make informed decisions with their scarce financial resources, particularly in poor communities.

OTHER ENVIRONMENTAL ISSUES

Indoor Air Pollution

More than 95 percent of the population in Lao PDR uses fuel wood for cooking (LECS III). Lit-

tle is known about the level of exposure to fuel wood smoke and associated health effects in Lao PDR. Initial research by Laotian institutions⁴¹ seems to confirm concerns raised by WHO that eye and lung irritation from fuel wood smoke appears to be a substantial issue, especially among women and young children.

Poor people do not have sufficient funds to buy simple energy saving wood stoves. About 95 percent of the non-poor population and as much as 98 percent of the poor population are using wood for cooking. Similarly, 98.7 percent of all households are using wood for cooking in the group of poorest districts compared to 80.9 percent in the group of least poor districts. The poor are, therefore, likely to be disproportionately affected by indoor air pollution. However, the number of people affected depends on factors such as indoor-outdoor cooking practices, type of housing and ventilation, and type of fuel wood consumed.

Malaria

According to WHO data, the total number of confirmed malaria cases declined from 80,000 in 1996 to 27,000 in 2001. Based on regression analysis of province-level LECS III data, an estimated 1 to 2 percent of the poor and 0.2–0.4 percent of the non-poor were affected by malaria. This, however, only relates to confirmed cases of malaria and is likely to underestimate the number of actual cases.

A substantially higher number of people may be also affected by the threat of malaria in the sense that they may restrict their activities during the peak malaria season to avoid contracting the disease. The PPA (ADB 2001) states that 64 percent of participating villages reported malaria to be a main health issue. While six years of data are insufficient to draw firm conclusions about trends, it appears that the non-poor have benefited more from the reduction in annual malaria cases during the 1996–2001 period: 72 percent of malaria cases are estimated to have occurred among the poor in 1996, a figure that increased to 80 percent in 2001.

Natural Disasters

The impact of floods and droughts on the poor versus the non-poor was estimated through a regression analysis using 1995, 1996, 1997, and 2002 data from the Natural Disaster Management Office in Lao PDR.⁴² The results obtained point to a strong indication that floods largely affect the non-poor, while drought and other disasters largely affect the poor. It also seems likely that the number of poor affected by drought is higher than the number of poor affected by floods, even though the area affected by flooding is substantially higher than the area affected by drought.

POVERTY-ENVIRONMENT IN THE NATIONAL CONTEXT

The findings from the PEN focus studies in the North and the South, along the nationwide analysis, are broadly relevant to upland districts, remote border districts along the Vietnamese border and the mountainous sections of the Chinese and Cambodian borders, districts with a high share of ethnic minority people, and districts with high UXO contamination. A large percent of districts in Lao PDR and all 46 priority districts share at least one of these criteria (Table 3.15).

The natural resource management PEN studies, although located in marginal districts, shed light as a whole on the set of policies through

TABLE 3.14 Estimated Number of Poor and Non-Poor Affected by Natural Disasters

	Non-Poor	Poor
Affected by flood (number of people)	149 000	16 000
Affected by flood (percent of people)	5.1%	1.0%
Affected by drought (number of people)	28 000	5 000
Affected by drought (percent of people)	1.7%	0.2%

Note: Figures are based on 1995 population and do not take into account population growth between 1995 and 2002.

which the Lao PDR government seeks to support natural resource conservation in its upland areas. The government has set impressive targets: stabilization of shifting cultivation and eradication of opium production. The land use planning and land allocation policy is a main instrument in the stabilization of shifting cultivation. The “focal area” policy, whereby government efforts focus on a small number of villages closer to the road network, was first designed as the rural development policy of Lao PDR. It is presented as the policy for community-driven rural development in poor districts in NGPES.

Village consolidation is proceeding at a steady pace. In 2003, the number of villages was down to less than 11,600 villages or 74 percent of the number of villages in 1997.⁴³ Although the datasets clearly indicate that the policy has been implemented more rapidly in lowland areas, it is

TABLE 3.15 Number of Districts Sharing PEN Focus Study District Criteria

Districts	Upland 1/	Remote Border Districts	Ethnic Minority People Above 50 %	Mon Khmer People Above 43%	Villages with High UXO Contamination Above 15%
Lao PDR	74	70	78	39	37
NGPES priority poor districts	33	24	42	25	18

1/ Defined as districts with maximum elevation above 500 m.

also taking place in upland areas, often in combination with the other rural development policies. The PEN studies provide evidence from three different perspectives and lead to a single conclusion: while these policies may well reflect a sound vision for the longer-term future of the uplands, their rapid pace of implementation runs counter to their stated objective of poverty reduction, and has achieved limited gains in terms of resource conservation.

The Mon-Khmer ethnic groups have a special position in the analysis of poverty and environment linkages. They have long been recognized as indigenous groups with a strong tradition of sustainable rotational agriculture. It is increasingly understood that they face specific poverty issues. The PEN study findings appear to have high relevance for the Khamu people in the northern region and the various small groups along the Vietnamese border in the South.⁴⁴

The poverty and environment challenges facing the Mon Khmer people in the South are reflected in the PEN focus studies. They often live in villages with high UXO contamination. They live in sparsely populated, highly forested areas, in which the national policy framework is conducive to proactive resettlement. Yet the PEN focus studies tell vivid stories of communities that are adjusting, diversifying their livelihoods, entering the market economy, and looking ahead at a more community-based management of local natural resources. Innovative solutions are needed to address poverty and environment jointly in these circumstances, and the PEN studies only provide some initial insights about such solutions.

Policy Implications and Recommendations

The following section provides some policy implications and recommendations that emerge from the PEN study. While many of these recommendations are not necessarily new, the

PEN study provides further evidence of their importance.

Rural water supply & sanitation. Five key recommendations arise from the PEN study to achieve equity in access, sustainability of services, and health protection of the poor in rural communities:

- Rural communities without access to roads and in areas with high UXO contamination are disproportionately lacking improved water supply and sanitation. These are among the poorest communities in Lao PDR. A strategy to reach these communities needs to be developed. The strategy will need to take into account village consolidation plans and carefully evaluate cost and maintenance implications of water supply options for these communities.
- Sustainability of water supply and sanitation services is essential for achieving equitable access and health protection of the poor. Establishment of well-functioning village committees therefore needs to be further emphasized, and periodic assistance might be needed to ensure their continuity and efficiency. This is particularly important in poorer communities, which seem to have more problems with water supply system breakdowns.
- Communities with high illiteracy or low education are more likely to not have improved water supply and basic sanitation. Particular attention is required in developing management capacity in these communities. This includes proper training in water supply system management, developing mechanisms for community participation, establishing regular inspections and maintenance procedures, and strengthening of monitoring and evaluation of water and sanitation projects.
- Village funds are essential for proper system maintenance and timely repairs. Building commitment and procedures to institute a fund, even if gradually, therefore needs to be further

emphasized, even in the poorest communities. Further consideration should also be given to evaluating system options in light of maintenance and management requirements.

- Good community, household and water supply system and latrine hygiene is essential in order to fully benefit from improved water supply and sanitation. Hygiene promotion programs therefore need to be developed and implemented. Improved hand-washing and point-of-use drinking water disinfection are particularly effective in protecting health (Fewtrell and Colford 2004).

Urban water supply & sanitation. Availability of improved water supply and sanitation is much more widespread in urban than rural communities. However, much is still to be achieved in small towns, especially for the poor. Three priority recommendations have been identified:

- Equitable access to piped water supply in urban areas requires a review of water connection fees. The fees are unaffordable for many poor households. A revenue neutral policy change could be considered whereby water tariffs are raised to compensate for a reduction in connection fees. This would prevent compromising the financial viability of water agencies and quality of services.
- Network expansions should be equitable so that the poor are not the last households to receive water supply. This implies that social considerations receive an equal footing with financial and technical considerations in network expansion. Particular attention is required for so-called “temporary” housing and settlements further away from main roads.
- Affordability is not the only reason the poor do not have water connections or basic sanitation. Education level is equally important. Information and public awareness of the benefits of improved water supply and sani-

tation is therefore an important ingredient in achieving equity. In planning new piped water supply systems in other towns, understanding perceptions of these benefits is therefore a prerequisite.

Transport. The PEN road study identified four recommendations for poverty reduction and sound environmental management in Lao PDR:

- The NGPES’s focus on ensuring all-weather access roads to all district towns is relevant, but policy and technical decisions to help improve the local road network beyond that stage need to be taken now. A village road network will have substantial poverty reduction impact, provided an appropriate prioritization of villages to be served first is ensured. This will require long-term planning and management. Experience from donor-supported pilot projects deserves to be summarized and mainstreamed. Risks of negative environmental impact may be limited overall, but should remain a concern in and around areas of environmental value. Confirming local responsibilities in natural resource management appears to be a viable and efficient option.
- A comprehensive and up-to-date monitoring system of the local road network at the national level is a key tool to manage the poverty and environmental aspects of rural road development. There is room for substantial improvement. A combination of improved database tools and of more transparent information flows between national and local levels of government is needed.
- There is an urgent need to recognize the risks and opportunities of the involvement of private enterprises from various sectors in road construction in Lao PDR’s many border districts. The capacity of enterprises to invest in roads is an opportunity in terms of poverty reduction. The government has an important role in mon-

itoring environmental impacts at the national level. Enterprises need to be encouraged to select sustainable road construction technology, so that the roads create a long-term poverty reduction effect. This objective may require the creation of financial incentives.

- Narrow tracks are more cost-efficient and environmentally friendly than roads. Building tracks instead of roads may attract more interest, as small tractors for farmers and motorbikes for government staff visits to villages become more widely available. It also remains an option worth investigating in the near future.

Agriculture and forestry. The PEN study provides the basis for two recommendations related to NTFPs:

- Systematic monitoring of NTFPs in terms of resources, products, cultivation, and markets is a necessity in order to better manage risks of resource decline and market collapse. Both would disproportionately affect the poor. Making cultivation of NTFPs a fully viable and recognized economic activity is also needed in that regard. This objective will require not only continued applied research but also improvements in the legal and policy framework.
- The land use planning and land allocation policy, as stated in NGPES, needs to be made more appropriate to the poverty reduction needs of upland villages. The high motivation of local communities to better manage local resources is an opportunity. Mainstreaming successful local pilots in community participation can help take advantage of this opportunity. NTFP harvesting and marketing are an ideal entry point for overall community forest management in areas where NTFP collection for sale remains an important income source.

Cross-sectoral interventions. The comprehensive policy of the Government of Lao PDR for its upland regions, which includes stabilization of

shifting cultivation, development of larger communities (preferably along roads), and focus of government efforts on these communities, may be an appropriate vision in the very long term. However, all the PEN studies provide evidence that the current high pace of implementation of this policy is counterproductive, both in terms of sustainable poverty reduction and environmental protection. A slow, gradual transition in the land use systems of upland communities appears to be a much more appropriate option. The Government of Lao PDR should use this increasing evidence provided by its researchers and donor-funded projects to turn to more people-centered, service-oriented ways of supporting communities that wish to migrate and/or intensify their land use practices. Providing support to communities off the road is a necessity, if this is to be achieved. This is not an easy task, and innovative programs will be needed.

The UXO study demonstrates that active donor contribution to UXO decontamination should be encouraged. UXO decontamination is a win-win solution in terms of poverty reduction, improved environmental management, and providing safe water supply and sanitation. Decontamination efforts will, however, require a very long period of time, and in the meantime, all coping options for local communities should be supported. In southern Laos, the incompatibility of meaningful support for UXO-affected communities with a proactive resettlement policy must be recognized and addressed. Diversified community initiatives, with or without migration and inside or outside of agriculture, deserve careful attention and support.

Any joint solution in terms of poverty reduction and environmental protection merits careful geographical targeting and improved coordination between stakeholders, especially more intensive community participation. Table 3.16 provides a summary of PEN study findings related to each recommendation.

T A B L E 3 . 1 6 Lao PDR Summary of Priorities for Programs with Joint Positive Poverty Reduction-Environment Impact

Development areas	Program priority	Geographical targeting	Coordination needs between sectors and agencies
All sectors	Integrated livelihood investment program in priority poor upland districts Support to diversified development strategies in UXO-affected districts <ul style="list-style-type: none"> • Diversified income generation including livestock and off-farm • Slow transition out of swidden agriculture Community participation in natural resource management: <ul style="list-style-type: none"> • More participatory land use planning allowing for slow transition out of swidden agriculture • NTFP harvesting and marketing used as an entry point in community resource management Sustainable NTFP production: <ul style="list-style-type: none"> • Comprehensive monitoring system for NTFP production and markets • Policy statement, legal framework and applied research promoting cultivation 	All villages within districts, both along roads and away from roads Districts along Vietnam borders, with a focus on Mon-Khmer villages in the South Uplands districts Northern region for NTFPs	All sectors, district government, participation of village communities, NGOs Lao-UXO program, district government, participation of village communities, NGOs
Agriculture & forestry			Agriculture & forestry with transport District government, participation of village communities
			National government District governments Agriculture & forestry department Research organizations (continued)

TABLE 3.16 Lao PDR Summary of Priorities for Programs with Joint Positive Poverty Reduction-Environment Impact (Continued)

Development areas	Program priority	Geographical targeting	Coordination needs between sectors and agencies
Health	<p>Rural clean water & sanitation services:</p> <ul style="list-style-type: none"> Improving the sustainability of services in poor communities that already have services Community and household hygiene promotion programs Targeting of service provision to poor, marginalized and disadvantaged communities (the ones that are least likely to attract services on their own) <p>Urban clean water & sanitation services:</p> <ul style="list-style-type: none"> Review of water network connection fee in small towns Public awareness campaigns to increase demand for improved water supply and sanitation in poor households Due consideration to equity in network expansion planning 	<p>Poor districts in the North and South and along the border region to Vietnam</p> <p>Small provincial & district towns</p>	<p>Namsaat, Ministry of Health and support from national and provincial government</p> <p>WASA, Nam Papa, urban village leaders and community organizations</p>
Transport	<p>Mainstream basic road access prioritization and monitoring approach into national road construction program</p> <p>Regulatory framework and monitoring system for enterprise-based road construction</p>	<p>Marginal districts Especially border districts</p> <p>Border upland districts</p>	<p>National, provincial, and district levels with village community participation</p> <p>Agriculture and forestry for accompanying community-based natural resource management</p> <p>National, provincial, and district levels with enterprises</p>

Costs of Implementation

Implementation of the recommendations proposed above involves various levels of costs. Some costs can be expected to be relatively modest, such as monitoring, awareness and information programs, and hygiene improvement programs, but do nevertheless require sustained commitment and human and logistic capacity in order to be effective and sustainable. Other interventions such as water supply and sanitation and rural roads involve capital investments. The level of these investments depends, among other things, on service level. While it is difficult to provide exact estimates of investment requirements, some figures are available to provide a plausible cost range for provision of rural and urban water supply and sanitation.

Available capital cost estimates in Lao PDR for rural water supply are on the order of US \$10 per capita, which include construction materials and construction of facilities. In addition, communities generally contribute about 40 percent of local cost in-kind, labor, local materials and cash. External support cost of construction materials for basic sanitation facilities is estimated as low as US \$2 per capita, with communities contributing about 85 percent of local costs. These cost estimates suggests an overall investment requirement of US \$22 million to reach an 85 percent rural coverage rate of improved water supply and basic sanitation in Lao PDR by 2020 as targeted by the NGPES. This cost is in addition to local community contributions of labor and local materials.

There is more uncertainty as to the cost of providing urban water supply and sanitation. A priority is provision of improved water supply to small towns which lag behind main urban centers. The historic per capita cost of urban water supply in Lao PDR is about US \$135. This however is likely to be substantially higher than what is required for small towns. The cost in small towns in Vietnam and Cambodia are estimated at US \$23–40 per capita, while the capital cost of small-

scale independent providers in a few towns in Lao PDR is in the range of US \$5–15. A range of US \$10–40 per capita suggests a total investment requirement of US \$6–23 million to provide all remaining small towns, i.e., about 85 towns, with improved water supply by 2020, reflecting a small-town population growth rate of 3.5 percent per year.⁴⁵

While significant resources are required to implement many of the proposed recommendations from this PEN study, the effectiveness and sustainability of implementation clearly also depend on provincial and local government commitment, capacity and contributions; programs to raise awareness and capacity, and for making informed choices in local communities; and demand by these communities and local authorities for programs that addresses poverty reduction and natural resource management and provides environmental services such as water supply and sanitation. Factoring in these conditions for effectiveness and sustainability is needed in regional poverty reduction targeting, such as for the Government's 46 priority districts and other districts in need of poverty-environment interventions and programs. In this context, as part of the PEN study, a research paper on the economics of regional poverty-environment programs with application to Lao PDR was prepared to shed some light on central government or donor allocation of resources to provinces and local communities. The paper takes into account trade-offs between multiple objectives, and differences in investment and administrative costs across regions within a country.⁴⁶

Endnotes

1. Lao Expenditure and Consumption Survey 2002/03 (LECS III) and 1992/93 (LECS I).
2. One of the districts, in Vientiane Municipality, has "graduated" and there remain now 46 priority districts.
3. The district poverty data are from ADB (2001), based on poverty incidence in 1998 from LECS II.
4. Forest data are from satellite imagery for the period 1993–97. These data were the most recent consistent

- data available at the time of the PEN analysis presented in the this report.
5. This does not include land in fallow/re-growth, but only cultivated land.
 6. Linkages between reliance on open unprotected surface water and health effects are discussed in the water and sanitation section.
 7. Access to roads is measured as the percentage of villages with main or secondary roads within 6 kilometers.
 8. Poverty incidence is from LECS II as reported in ADB (2001).
 9. It should be noted that the data on malaria incidence reflect confirmed cases. From the surveys in ADB (2001) households do report however that malaria is a major threat to their health.
 10. The results of a regression analysis of the variations in district forest cover in 1997 are provided in the PEN background report for Lao PDR.
 11. All the factors were assessed in a regression analysis using LECS III household data (combined with UXO contamination data). They were all found to be statistically significant. This means that each factor is statistically associated with poverty, after controlling for the other factors. The regression results are available in the PEN background report.
 12. Swiddening is used here as a neutral term when referring to the agricultural practice itself, and the term shifting cultivation is used when referring to the policy.
 13. This is a reminder of the limitations of analyzing poverty at a single level, the district. It might also indicate a lower importance of marketed NTFPs in the priority districts, or a lower interest in this non-official survey.
 14. A wealth indicator was created for each household surveyed based on household durable goods and productive assets.
 15. Households living in villages within a 6 km radius from a road can generally make a round trip to a road within the same day.
 16. NGPES has defined low access as presence of at least trails accessible by cart during the dry season. Donor-funded projects on basic road access had proposed a higher but easier to observe standard of motorable access 10 months per year (WSP civils 2004).
 17. The results are from a regression analysis of district level data, controlling for agricultural land, population density, border location, and regional and topographic district characteristics.
 18. Population growth is high and assessed at 2.5 to 2.8 percent, but strong migration trends from more marginal to less marginal areas result in a stable or even decreasing population in a fair proportion of districts. The 2005 census will provide more accurate population trends.
 19. 15 districts have an urban population of more than 30 percent and may be defined as urban; there is no urban population data for the nine districts created after the 1995 census.
 20. Kaleum borders A Luoi district in Thua Tien Hue province in Vietnam. The timber sector there is active in conjunction with the Da nang port. The newly renovated Ho Chi Minh road passes through A Luoi and this might increase attraction toward villages in Kaleum.
 21. The border in Nhot Ou became an official international border in recent years. It crosses to the fast-growing Simao prefecture, Yunnan province. People in Kaleum go to Saravanh, the next provincial capital.
 22. The survey took place in 72 percent of villages in Lao PDR; 31 percent of surveyed villages were found to be impacted by UXOs.
 23. This was estimated with a district level regression equation by combining district poverty incidence data from LECS II 1997/98 (ADB 2001) and the UXO national survey data.
 24. Even the figure for total land area could not be confirmed.
 25. Village communities have only 32 households on average (20 in the six villages surveyed) and half this number of houses due to extensive occurrence of extended families.
 26. Phouvong, the other PEN study district in the South, is a good example.
 27. Non-agricultural land accounts for more than one-third of total land area decontaminated by the Lao UXO program in 29 districts out of 57 where activities have taken place.
 28. Phouvong, the other district studied in the South, is a national focal area (JICA 2002) where the newly reclaimed lowlands are heavily affected by UXOs.
 29. Population Census 1995 and Lao Expenditure and Consumption Survey 2002/03 (LECS III). Improved water supply is here defined as piped water, protected groundwater, rainwater, and "other water supply." "Other water supply" mainly refers to gravity-fed systems, but it is unclear from the LECS III data if this category also includes any types of unimproved water supply.
 30. In 1995, about 60 percent of the poor and 40 percent of the non-poor used surface water. The change from 1995 to 2003 was therefore 50 percent for both the poor and non-poor, with no relative gain for the poor. The figures for 1995 are estimated from the Census 1995 and LECS II. The figures for 2003 are from LECS III.
 31. Estimated from the Census 1995 and LECS II for 1995 and LECS III for 2003.
 32. Twenty percent poorest and richest as defined by consumption quintiles from LECS III.
 33. From a district-level regression analysis of data combined from the 1995 census, poverty incidence from LECS II, and UXO data from the national survey in 1997.
 34. The preceding analysis is from LECS III 2002/03.
 35. Logistic regression analysis of LECS III household data.

36. Recall that poor households are 50 percent more likely to rely on surface water than non-poor households. However, the results are after controlling for the other factors. Those factors are associated/correlated with poverty. The result (i.e., 15 percent) is therefore lower than the “uncontrolled” result (i.e., 50 percent).
37. WASA, DHUP, and URI. 2002. “Small Towns Water Supply and Sanitation Initiative in Lao PDR.” Prepared with support from WSP-EAP.
38. These results are from a regression analysis of the household data from the URI survey.
39. This result is from a regression analysis of the household data, controlling for household location and importance of time savings.
40. After controlling for living standard.
41. Lao Women’s Union Gender Resource Information and Development Center, 1999.
42. The following equation was estimated, one for floods, one for drought:

$$N = a + b_p \text{POP}_p + b_{np} \text{POP}_{np} + e$$

where N is number of people affected, and POP_p and POP_{np} are number of poor and non-poor respectively in each province affected by flood or drought. The constant (a) was restricted to zero in the regression to reflect that N will be zero if there are no poor or non-poor people. As the data contained no information on the number of people affected, a conversion from hectares damaged to affected people was undertaken based on agricultural land per household and average household size. This conversion provides an order of magnitude. Two regression equations were also estimated with slope dummy variables for provinces that were not affected by flood or drought, little affected and medium affected. The estimated coefficients from these equations allow for an estimate of the number of poor and non-poor affected by flood or drought across the country.

43. This was the newly reported number of villages for the next population census. An even lower number of villages, 10,700, was reported in 2003. The reason behind this difference between 2003 and 2005 is unclear.
44. Similar or closely related groups live on the Vietnamese side of the border. Several of them are officially recognized as ethnic groups with special difficulties in Vietnam (chapter 5).
45. The cost estimates of rural and urban water supply and sanitation in Lao were provided by Thomas Meadley, World Bank, Vientiane Lao PDR.
46. See Buys et al (2004). The Economics of Regional Poverty-Environment Programs: An Application For Lao PDR. Prepared for EASEN, World Bank.

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Poverty and Environment in Vietnam

INTRODUCTION

In 2004, some 15.6 million people in Vietnam—19 percent of the population—were still living below the poverty line despite the impressive poverty reduction gains made in recent years. This is equivalent to 80 percent of the total population of Cambodia and Lao PDR. The Government of Vietnam faces the challenge of continuing its poverty reduction efforts while ensuring preservation or restoration of environmental resources. Are there win-win policy options and interventions that can jointly address poverty and environment? How can a donor community that supports the government's growth and poverty reduction strategy best contribute to these win-win solutions? These are the questions that the PEN research seeks to answer.

The PEN research is a collaborative effort between a World Bank team and three ministries, two of which are cross-sectoral agencies (Box 4.1). This enables the research to encompass policies and programs with a multi-sectoral scope. Land administration and sustainable development are two of these horizontal areas. As part of the strengthening legal framework in Vietnam, the land law is in a process of finalization in the form of a "code." The Cau River basin is the first area selected for a pilot sustainable development program under the national Agenda 21 program.

The methodology of the PEN research, just as in the two other countries, starts with observing correlations between poverty and environment indicators through mapping and correlation analysis. Local quantitative and qualitative research on specific issues is carried out to shed light on some of the causes behind these correlations. Evidence collected at various levels was then combined to answer the specific research questions defined in each problem area. The national research groups have provided significant help in assembling national datasets. They have carried out all local research activities.

Vietnam is a highly diverse country, and the PEN research covers as much of this diversity as possible. Poverty and environment linkages in Vietnam can be structured into two broad categories, environmental health and natural resource use. Diverse poverty issues and environmental issues are at stake in each of these two categories. The scope of the PEN research encompasses the rural, urban, and industrial sectors. In the rural sector, the research targets "poverty pockets," geographical areas trapped in very high poverty rates and deep poverty. It also covers the various policy tools of the national policy framework (Box 4.2).

A set of five detailed research areas remains insufficient to cover the diverse dimensions of poverty and environment in Vietnam. The spe-

BOX 4.1 PEN Research Partners in Vietnam

- The Ministry of Natural Resources and Environment is in charge of both the environment and the management of land and other natural resources. MoNRE was the PEN research partner for detailed research on industrial pollution and on land administration.
- The Ministry of Health was the PEN research partner for detailed research on water supply & sanitation.
- The Ministry of Planning and Investment is in charge of comprehensive advice on socioeconomic development strategies, programs, and plans. MPI's National Office for Sustainable Development was the PEN research partner for detailed poverty and environment analysis in the Cau River basin.

The following groups have undertaken research activities: the expert group at Hanoi Medical College for water supply & sanitation; the Research Center for Energy & Environment for industrial pollution; the Center of Occupational and Environmental Health of the Vietnam Association of Occupational Health and the University of Economics, Ho Chi Minh City, for pesticides; TECOS under MoNRE for land administration; and the Socio-Economic Development Center for the Cau River.

This chapter includes an analysis of the databases assembled by the research partners, while the discussion on searching for causes behind poverty and environment correlations is largely based on the national reports by the research groups.

cific issues of protected areas are largely left aside, and so is the detailed analysis of natural resource use and poverty in the lowlands, which is a lower priority compared to the uplands. Field observations mostly also leave aside border areas and the Central Highlands. The national datasets, however, allow drawing conclusions on a broader scale after careful analysis of the relevance of the case studies in the national context.

The PEN research uses a large recent data set, the National Health Survey, and has itself produced a new database by pooling together statistical data from different administrative lines. Some important datasets have, however, remained outside of the scope of the study. District-level data was assembled whenever possible. Since provinces normally assemble district data but only provide province-level data to the

BOX 4.2 Detailed PEN Research Areas and Policy Framework**Environmental health and poverty**

Water supply, sanitation, and poverty: a national analysis of the recent Vietnam National Health Survey. *Policy framework:* sector policies and area-based programs in health, agriculture, and rural development.

Industrial pollution and poverty: a set of case studies combined with analysis of the National Health Survey. *Policy framework:* 1/ national remediation program for large polluting industries; 2/ regional remediation program for household-based polluting industries in the Red River Delta; and 3/ strengthening of the legal framework in the urban sector.

Pesticides, health, and poverty: a case study on pesticide use in the Mekong River Delta. *Policy framework:* national program for the reduction of agricultural inputs.

Natural resource use and poverty

Land administration, environment and poverty: a case study in three provinces on the impact of the new land law in rural upland regions combined with the analysis of a national land use database. *Policy framework:* strengthening of the legal framework in the rural sector.

Integrated poverty and analysis research

Poverty and environment in the Cau River basin: a case study in two provinces on natural resource use in the upstream section of the river basin and environmental health in the downstream section. *Policy framework:* National Agenda 21 program.

BOX 4.3 National Data Sources for PEN in Vietnam

The Vietnam Living Standard Surveys (VNLS) are large-sample household surveys designed to measure trends in poverty and associated factors. The most recent was released in 2004. Previous surveys were carried out in 1997–98 and 1992–93. The surveys are representative at the province level. Small-area estimation techniques use correlations between poverty and statistical data available at more local levels in order to assess poverty down to the commune level. Unless otherwise indicated, all poverty data in the report are from these sources.

The Vietnam National Health Survey (VNHS) carried out in 2001–02 provides a unique opportunity to assess the impact of poverty and various other factors on environmental health in Vietnam. The survey covers 36,000 households and 150,000 individuals in all provinces. It includes information on drinking water supply, sanitation, household behavior, water pollution sources, prevalence rates, and indicators of severity of diseases in all age groups, as well as living standards, education levels, and housing characteristics. Unless otherwise noted, this survey is the source for all national analysis in water & sanitation and health.

The PEN II land use database was assembled by TECOS from datasets provided by CEMMA, GSO, MoNRE's 2000 and 2003 land census, land use and detailed land allocation statistics, the Ministry of Transportation, and the Center for Hydro-Meteorology and Environmental Network. Unless otherwise noted, all variables in the natural resource analysis use this database.

Additional GSO datasets. Unless otherwise noted, all industrial output data is directly compiled from GSO data. GSO also contributed critical datasets to complement other sources.

Reliability of statistical data. The research teams have carefully crosschecked data for quality. Some variables, often in relation to more remote provinces or districts, remain unreliable. While absolute quantitative values for specific locations may be questionable, the datasets provide solid information regarding overall trends in time and in geographical distribution.

national level, this has occasionally required manual transcription of district information. At the local level, a complicating factor in rural surveys was the dual administrative levels of commune and village. Statistical data is available only at the commune level, while poverty issues and environment issues tend to differ among villages within a commune. We used the village level when defining samples.

4.1. NATURAL RESOURCE USE AND POVERTY

Key findings

- Issues of sustainable natural resource use are linked to poverty in the uplands, not in the lowlands.
- There is a mechanical correlation between poverty, fragile soils and location or loss of forest resources that is largely due to

association of uplands with high poverty incidence.

- Trends in forest resources are a combined outcome of how local governments, forest enterprises, migrants and households, especially ethnic minority groups, interact locally.
- Legal framework improvements, especially in land administration, are one of the leverage points that have potential to improve sustainability of natural resource use and reduce poverty, but the poorest communities are largely by-passed by these improvements.
- Three questions are equally relevant to identify win-win poverty and environment policy options: where and how are the poor disproportionately affected by resource decrease or degradation? where and how are they at risk of natural disasters? and where and how are is their lack of access to the local resource base an issue?

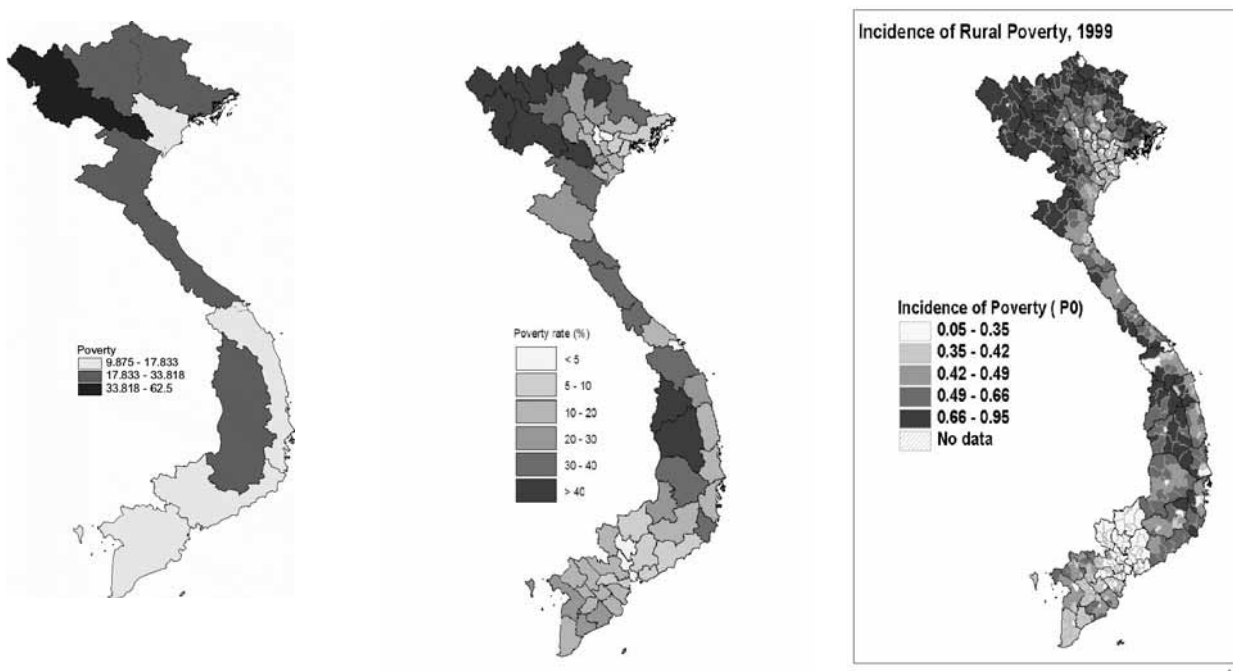
4.1.1. Geographical Dimensions

The distribution of poverty in the country, when defined as the percentage of population living below the poverty line, is strikingly similar to a map of elevations (Figure 4 in chapter 1). Poverty reduction in Vietnam has been very rapid over the last decade. Poverty incidence had already declined to 36.5 percent in 1998–99 and further declined to 19 percent in 2003–04. According to the latest poverty update of the World Bank, poverty incidence in Vietnam in 2004 is only a third of the poverty incidence recorded in 1993. Variations in poverty incidence remain across provinces, ranging from 0 percent poverty in Ho Chi Minh City to a maximum of 74 percent in Lai Chau Province, the northwest province that borders Laos. Provincial average per capita expenditure also varies substantially.

Correlation of the spatial distribution of poverty is visible at all available levels of analysis: region, province, district, and commune (Maps 4.1). Historical processes, through which the administrative units in Vietnam have been delineated, have generally followed an upland/lowland limit. Recent changes in administrative units are often reinforcing this trend. Thai Nguyen Province in the Cau River basin in northeastern Vietnam, for example, was divided into two provinces: an upland province, Bac Kan, and a midland province, Thai Nguyen. The same is often observed when larger districts are divided into two.

The large majority of the poor in Vietnam live below 500 meters of elevation (Figure 4, chapter 1). This is an effect of the extreme imbalance of population densities between the lowlands and uplands (Map 2, introduction). Almost half of Vietnam’s population was concentrated in 1999

MAPS 4.1 Poverty Incidence at Various Levels



Left: overall poverty, regional level (2004); center: overall poverty, province level (2004); right: rural poverty, district level (1999).

in the 24 small, flat lowland provinces around Hanoi and HCM City, constituting only 16 percent of the total land area of Vietnam, with a 28 percent average poverty incidence. Correlation of poverty incidence with elevation is however not visible when looking at mean elevations within administrative divisions. Elevation alone is not significantly correlated to poverty at district level (IFPRI & IDS 2003) or province level. There are lower elevation areas or more fertile areas within most upland or hilly provinces and districts. High-elevation plateau regions in the Northeast and in the Central Highlands regions also have a mix of high and medium overall lower poverty incidence.

Association of high poverty incidence with elevation implies mechanical linkages between poverty and forest resources and between poverty and fragile lands. Correlation does not imply that causal relationships between these factors are at play. There is nevertheless a striking association between poverty and these indicators. At the provincial level, provinces around Hanoi and HCM City have about 60 percent of their land cultivated. Only about 6 percent of land is forest land in these two regions, compared to the national average of 34 percent. Hilly and mountainous provinces have 90 percent of Vietnam's forest land. A comparison of district-level poverty and environment indicators between categories of districts defining officially lowland and upland districts confirms this contrast (Table 4.1 and Map 4.2). It also shows the importance of hilly and mixed districts alongside higher elevation areas in poverty and in forest resources.

Many of Vietnam's high elevation areas can be described both as environmentally fragile areas and as poverty traps. Forest resources are spread across mountainous and hilly areas. The Cordillera, with its ridge forming most of the border between Vietnam and Laos, is a rich area of biodiversity (Map 3, introduction). Almost all protected areas are located in the high elevation regions. Mountainous districts have 55 percent of "commercial forests" and 51 percent "environmental forests" (Box 4.4). They are also home to

TABLE 4.1 Poverty and Environment Indicators in Lowland, Upland, and Other Districts

District category 1/	Lowland	Hilly & Mixed	Mountainous
Number of districts	282	195	134
Mean elevation (m)	45	441	925
Number of poor (M people, 1999)	12.4	10.5	5.0
% poor	28	43	62
Rural density (inhab/km ²)	418	185	45
% ethnic minority people	4	15	61
% agricultural land	65	24	12
Paddy per rural capita (m ²)	958	471	549
% of area with slope < 8°	98	59	32
% of area with slope > 30°	0	3	8
Forest land area (M ha)	1.6	4.4	5.6
% forest land in land area	22	38	37

1/ CEMMA defines six categories of districts. In addition to lowland and mountainous districts, other categories include partly hilly districts (80 districts), hilly districts (73), hilly and mountainous districts (39), and partly mountainous (3).

47 percent of Vietnam's 10.5 million ethnic minority people.¹

The severity of poverty (or poverty depth) is substantial in districts with highest elevation (IFPRI & IDS 2003). Poverty rates have decreased significantly between 1999 and 2004, but more slowly than elsewhere. The six provinces with more than 50 percent of the poor population in 2004 are the three provinces of the Northwest region, the three mountainous border provinces in the Northeast region, and Bac Kan Province in the Cau River basin. The three provinces with 40 to 50 percent of the poor population in 2004 are the Central Highland provinces other than Lam Dong (the more developed province recently incorporated into the region).

Communes in upland areas often have scattered villages with contrasting issues poverty and natural resource use. The commune is the lowest administrative level, but each commune is comprised of several villages. Remote villages in these areas are typically home to more disadvantaged ethnic groups. Forest resources also tend to be con-

BOX 4.4 Forestry Indicators and Databases

Forest cover rate is a widely used indicator in Vietnam, and one of the Millennium Development Goal indicators. The Government has a strategic goal to recover a 43 forest cover rate (Poverty task force 2003). There are three ways of defining forest cover rate.

- Under the land administration in MONRE, the land census defines forest land and its sub-classifications. This classification is for zoning purposes only.
- MARD regularly carries out forest inventories of forested areas.
- FAO data provides actual forest cover from satellite images.

Coupling the MoNRE and MARD databases could provide data on the percentage of land zoned as forest land that is actually under forest cover. In practice the datasets are difficult to reconcile. Trends indicated by the different data sources are equally difficult to reconcile. FAO indicates that deforestation in Vietnam may have been as high as 2.3 percent per year from 1980 to 1990, while forest cover increased marginally from the mid-1990s. The 1994–99 forest land data indicate that deforestation in Vietnam continued at about 1.3 to 1.4 percent per year. The datasets are best used to assess geographical patterns, not trends over time.

BOX 4.4 (continued) Land Census Definitions

Plantation forest	Special use forest	Protection forest	Production forest
Natural forest	Plantation special use	Plantation protection	Plantation production
	Natural special use	Natural protection	Natural production
Equivalent forest management regime			
Plantation forest	<i>Environmental forests:</i>	<i>Environmental forests:</i>	Commercial timber plantation
Natural forest	Protected areas	Watershed protection	Natural forest with on-going commercial exploitation

centrated in some of the villages—often a legacy of the state forest-farm zoning system. Mountainous provinces have more villages in each commune. The Northwest, Northeast, North-Central coast, and Central Highland provinces have 10 to 11 villages per commune, whereas other regions have 4 to 7 villages per commune. This figure reaches 14 in Sonla and Tuyen Quang provinces. The number of villages has increased between 1995 and 2000 by 17 percent in the Northwest region and by 41 percent in the Central Highlands, which indicates active in-migration.

The lowlands have their own environmental threats, but most natural resource management issues do not appear to impact the poor disproportionately. Aquaculture and fishing in the lowlands have developed at a rapid pace, and increased protection of the marine resources has not followed. In 2003, there was only one

protected wetland area in Vietnam. Coastal and marine degradation was assessed as a medium level poverty-environment priority. The linkage between fisheries and poverty, however, is not very strong. A regression analysis of provincial fishery employment in relation to poverty incidence carried out at the beginning of the PEN research has found that around 2.6 percent of the non-poor and only 0.5 percent of the poor are employed in this sector. Typhoons and floods are an exception, since they affect a number of poor coastal provinces.

4.1.2. Forest Resources and Poverty

Deforestation mostly takes place in poorer provinces (Table 4.2). This is partly a simple consequence of the geographical superposition of the forestry sector and forestry.

Several indicators point to an important contrast in linkages between poverty and forestry resources between the northern regions and the central regions. During 1994–99, half of the provinces experienced a net increase in forest land area, with a total increase of 1.14 million hectares, or 11 percent of the 1994 forest land area. The largest losses of forest land were in regions with high poverty incidence. Loss of forest land in the central third of the country—starting from Quang Binh Province—continued throughout the 1990s and totaled about 1.25 million hectares from 1994 to 1999. Poverty rates in all these provinces except one are well above the Vietnam average. Conversely, poverty incidence has been associated with an increase in forest land area in the northern part of the country during the same period (Map 4.4). This fact points to an absence of proof that the poor are one of the causes of deforestation or that they are poor because they are significantly affected by deforestation. It is however clear that in the poor provinces, the poor do not benefit enough from forestry resources, whether they are logged or protected, to raise their incomes above the poverty line.

Forest types also differ between the northern and central regions, largely in association to the structure of the State forestry sector. “Environmental forests” are largely dominant in northern upland areas, while natural production forest—an indicator approaching land zoned for commercial forestry—is nearly absent in the North but remains important in the central regions (Maps 4.2). There is concentration of natural production forest in the central third of the country. In 2000, 682 SFEs were managing 5.5 million ha, or 17 percent of the total land area in the whole country, and undertook a mix of watershed management and commercial logging activities (MoNRE 2000). Starting in the early 1990s, the SFEs that were in charge of management, exploitation, processing, and distribution of the country’s forest resources have undertaken a reform process. Enterprises discontinuing commercial operations to put the

TABLE 4.2 Disparities in Provinces with Decreasing Forest Land in 1994–99

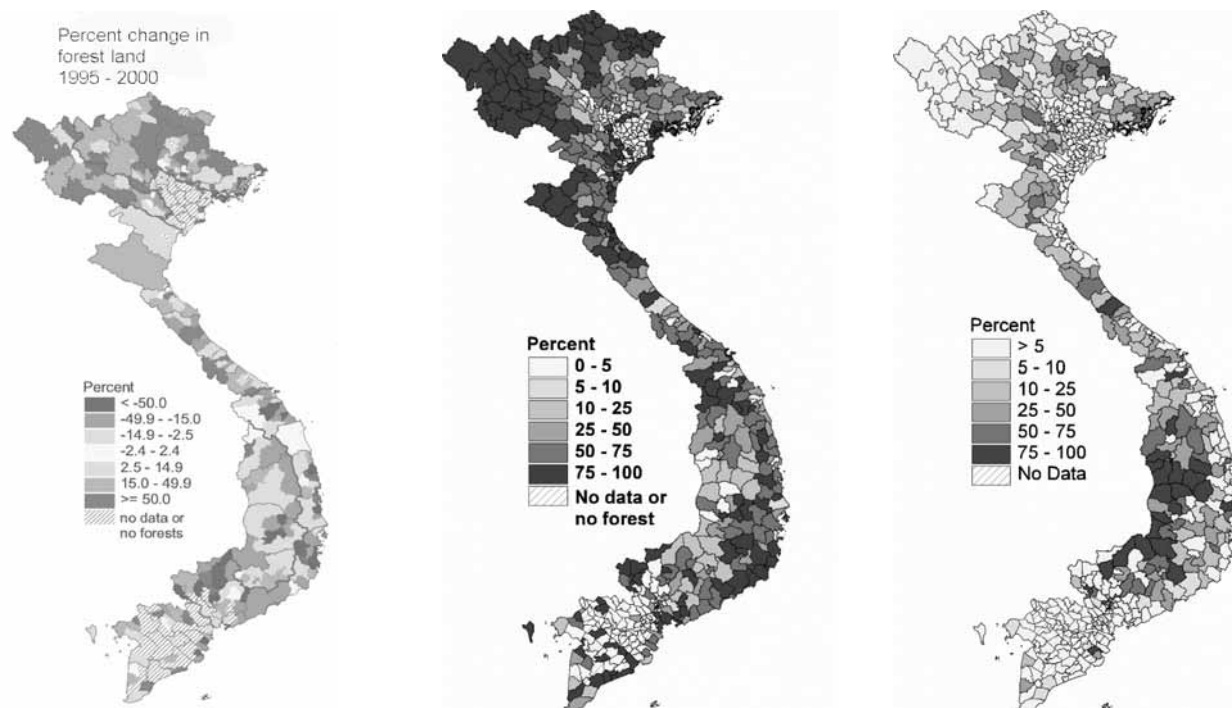
Poverty incidence in provinces (1999)	Provinces with 0–30% poverty incidence	Provinces with 50–80% poverty incidence
Number of provinces	11	14
Loss of forest land (hectares per 1,000 people)	13	145
Loss of forest land (% of total land area)	4%	9%
Loss of forest land (% of natural forest area)	25%	20%
Gross forestry output (m ³ per 1,000 people)	15	106

forest they manage under the protection of forest management boards are more prevalent in the northern regions, while those that have become fully commercial SFEs are more present in the central regions. This trend is continuing in subsequent changes in forest land between 2000 and 2003.

While less than 20 percent of forest land is allocated to enterprises in most districts in the North, this proportion is higher than 40 percent in around 106 districts, most of them located in the Central regions (Map 4.2). More than 40 percent of total land area is allocated to forestry enterprises in 21 districts in these regions. The land census records allocation of forest land to various categories of stakeholders. In 2000, 3.5 million ha of forest land, or 31 percent of the total land zoned for forestry, were allocated to enterprises, just twice the percentage of forest land allocated to households. By 2003, the proportion of forest land allocated to households had increased to 22 percent, while forest land allocated to enterprises was unchanged. Allocation of forest land to enterprises has decreased in 20 provinces, but has continued to increase in 18 provinces.

Finally, dominant types of ethnic minority groups differ in the northern and in the central regions. CEMMA defines 54 minority national-

MAPS 4.2 Regional Contrast in the Forestry Sector



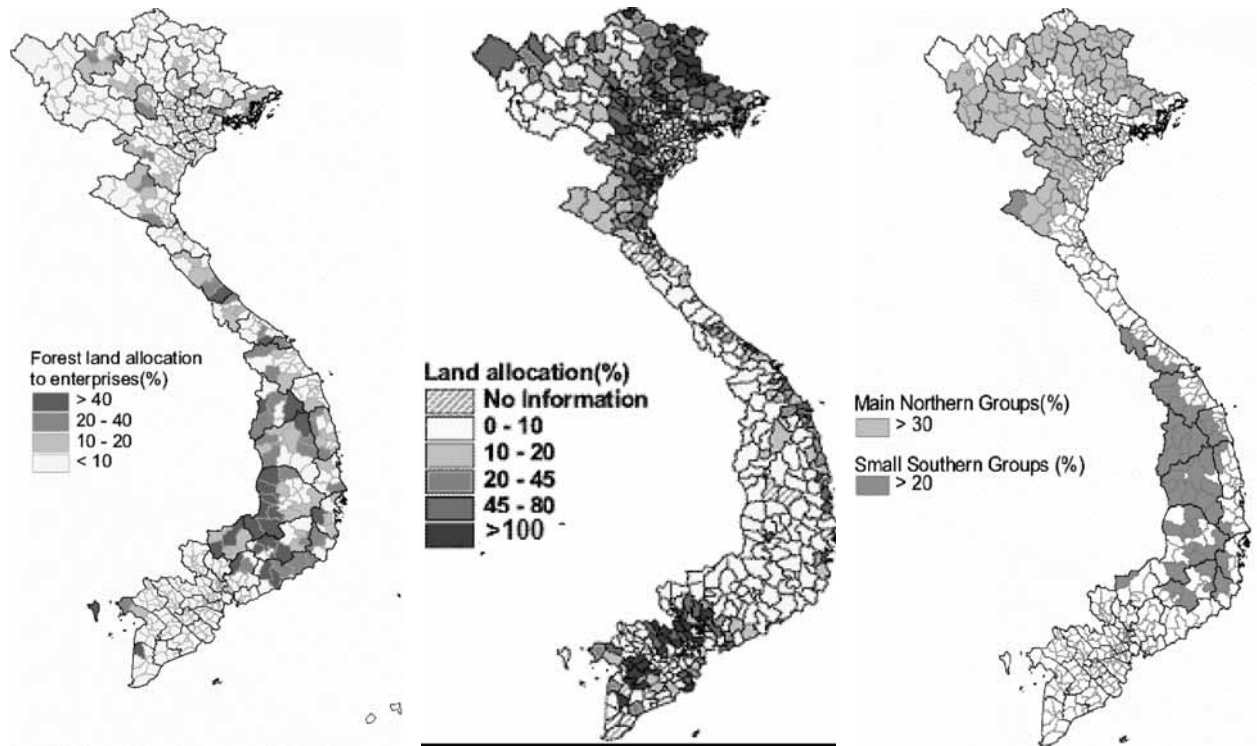
Left: change in forest land area (1995–2000). Center: Percent of protection and special use forest in forest land (2000). Right: Percent of natural production forest in forest land (2000).

ities. There is no widely accepted grouping of the 54 groups into broader categories. We make a tentative grouping can based on ethno-linguistic groups (Khong Dien 2002). If a “small southern groups” category is defined by including 24 Mon-Khmer and Malayo-Polynesian groups, a “main northern groups” category (including the four main Thai family groups and the Muong) and a “small northern groups” category (including small Tibeto-burman group), a picture with largely disjointed regions of residence appears (Map 4.3). There is an apparent paradox between the fact that the small southern groups, which have traditionally been described as having more sustainable systems of rotational agriculture, live in deforestation areas, while the northern groups live in reforestation areas.

4.1.3. Soil Resources and Poverty

In almost all upland areas, there is a trend among subsistence farming systems toward intensification with the opening of new paddy fields and an increase in multiple cropping in the paddy fields. From 2000 to 2003, paddy area in Vietnam decreased overall by close to 246,000 hectares, or 6 percent of the total paddy land area, but it increased in 21 of the country’s 62 provinces, all located in the upland northern and central upland regions. All provinces in the Northwest and Central Highland regions increased their paddy area. The increase reached 28 percent in Lai Chau Province, which has the highest rate of rotational agriculture in the country. Of the 36 provinces that had an increase in the cropping index in

MAPS 4.3 Forest Land Allocation and Ethnic Minorities



Left: forest land allocated to enterprises (percentage of total land area, to update to percentage of forest land) (2000). Center: forest land allocated to households. Right: districts with high share of "main Northern" and "small Southern" ethnic groups.

paddy fields, 16 are in the three upland regions—the Northwest, Northeast, and Central Highlands. This indicates that household land use systems in the North and in several Central provinces are mostly on a virtuous path of intensification; that is, away from rotational agriculture toward more sustainable systems centered on paddy fields. How much the poorest communities and households benefit from these improvements is however limited by the fact that poorer communities and households generally have fewer or even no paddy fields.

Migration makes linkages between agriculture indicators and poverty and environment much less visible. In the Central Highlands, the region with highest in-migration, the rural population

of 3 million farm close to 550,000 ha of rubber and coffee, an 80 percent increase from 1995. The impact of subsistence farming on poverty and environment in the region is limited compared to this large-scale development of perennial crops. Subsistence farming is however changing fast. The increase of paddy area in Kontum Province reached 37 percent between 2000 and 2003.

Linkages between degradation of fragile soils from farming activities and poverty have been discussed over many years in Northwest Vietnam, the region with highest area of sloped farmland. They remain difficult to quantify. All provinces in the three upland regions, as well as in the North-central coast region, have fewer paddy fields than sloped farmland (Map 4.9c). This

proportion reaches five in Lai Chau and eight in Sonla. Flood events are geographically associated with cultivation of sloped land. The Black River basin was the main area in Vietnam where three or more flood events were recorded in 2002 and 2003. The Black River has been at the center of forest rehabilitation policies in the 1990s. It is also a region where maize is being developed on a broad scale for the feed industry. The three Northwest provinces alone, with only 3 percent of rural population in Vietnam, grow 15 percent of the national area of maize. The area of maize in these three regions grew again by 22 percent between 2000 and 2003. While commercial monoculture of maize on steep slopes has been documented to generate erosion, there is also field evidence that maize introduced in rotational agriculture beside upland rice can improve overall sustainability of the rotation.

Whether related to human activity or not, the natural disasters in Vietnam are often located in areas with a high proportion of poor. In addition to floods in the Black River basin and other basins in the North, the poor in the Central coastal region are impacted by typhoons and subsequent

floods. There were 23 coastal districts with poverty incidence of 50 percent in 1999.

4.1.4. Land Administration, Natural Resource Use and Poverty

The geographical linkage between land allocation to poor households and other stakeholders indicates how important land administration is in understanding the poverty and environment nexus in Vietnam. The national legal framework for land administration has been modernized extensively in the past decade. A land law was created in 1987 and was partly or fully updated three times. The latest version of the land law—implemented in early November 2004—is a key version, since the following one planned for 2008 would be a long-term land code.

The 2004 land law, although primarily designed to resolve urgent land administration issues in urban and lowland rural areas, addresses, two broad fields of special relevance in poor upland areas, land titling and land use planning (Table 4.3). National stakeholders expect the law to be an instrument to speed up the allocation of

TABLE 4.3 Transition Stages in Land Administration in Vietnam

	1. Early transition	2. Mid transition	3. Late transition
1. Land tenure	Allocation of land use rights <i>Forestry land: not completed</i>	1.2. Issuance of Land Tenure Certificates <i>Agricultural land: just completed</i> <i>Forestry land: starting</i>	1.3. Fully transferable land titles <i>Urban land: new Law</i>
2. Land use planning	2.1. Decreasing weight of plan targets, increasing mapping and participation <i>Upland areas: ongoing</i>	2.2. Shift from control of productive use categories to control of use transfer categories <i>New Law: controls transfers out of paddy and environmental forest</i>	2.3.1. Local plans managed by community authorities to regulate land market <i>Urban areas: starting</i> 2.3.2. "Unused land" category cancelled <i>Not started yet</i>

In italics: stages for different areas and types of land at the start of the 2004 land law.

Source: summary of stakeholder interviews

BOX 4.5 A Land Administration Survey in Six Upland Districts

Are land administration instruments an appropriate and viable answer to natural resource use linkages to poverty and environment? How does conversion of land uses, especially paddy fields and forests, affect poor households versus non-poor households and what is its impact on the environment? Can the environmental and social impacts of the new law be monitored, and how?

A survey carried out in three upland provinces where implementation of the new law started earlier—Tuyen Quang in the Northeast region, Nghe An in the North-central coast, and Binh Dinh in the South-central coast—was undertaken to answer these questions. One poor commune was surveyed in each of six contrasted districts in terms of land use trends and structure of the forestry sector. Implementation of the land law was reviewed at district and commune level through statistics and local interviews. A 174-household survey allowed a poor-non poor comparative analysis using poverty scores based on household assets. Aerial photographs allowed the research team to compare actual land use with reported data.

A survey fully or partly based in the lowlands, the main area targeted under the new law, was initially considered but rejected in favor of comparative analysis of various upland areas for two reasons. First, global research indicates that land use transfers from agriculture to urban or industrial uses have no net impact on poverty, since farmers move from agricultural to manufacturing jobs. Second, ongoing studies are focusing on lowland issues with poverty and environment implications: land consolidation, and loss of paddy areas to aquaculture.

The full report of the national research team is available on a separate CD Rom (TECOS 2005).

formal titles on forest land, the land category where this process is lagging behind. The new law also introduces for the first time a controlled transfer of paddy areas and of “environmental” forest land to other uses through land use planning.

Limited reliability of quantitative data on land use and land administration is an important factor to take into account in the analysis of land administration reform. Discrepancies between the land census and actual land use are well-known in Vietnam. They reach a dramatic level in the six communes surveyed in percentage terms for paddy fields, and in absolute terms for forest land (Table 4.4). Interestingly, there is more forest observed in the photographs than forest reported by local officials.

Limitations in data availability also reflect limitations in access to information on land administration and handling capacity among local cadres in marginal areas. Each commune has at least one staff member dedicated to land administration, but these staff members had not received information about the new land law. Land census statistics are compiled at the district level, but were not available for the commune level. Data on forest land allocation was available at the village

level, but did not match commune-level figures. Two out of the six communes could not report numbers of households with paddy land allocated, while the others simply reported 100 percent, a figure that is not consistent with the survey sample. None of the local officials could recall the 2000 situation for land use rights. Capacity of local staff was assessed on a scale of 1 to 5 depending on their education level and other indicators, with 1 indicating highest capacity. Capacity scores were 2.7 and 3 in less-poor communes and villages respectively, and 3.3 and 4 in poorer communes and villages.

MoNRE is facing difficulties in receiving information from the provinces. Land titling data could only be assembled at province level during

TABLE 4.4 Actual Land Use/Statistical Land Use

	Average 6 communes	Minimum	Maximum
Total land area	+0.4%	-0.4%	+1.2%
Forest land area	+38%	-0.4%	+104%
Paddy land area	+140%	+23%	+296%

the PEN research, not district level, and only 21 out of 61 provinces provided full information. The information gap is highest for forest land titles issued to enterprises. Even data on land titling progress for paddy fields are inconsistent. The datasets remain useful to monitor time and regional trends. Paddy land titling is well advanced in the Northeast and Northwest regions and lagging behind in all Central Highland provinces. Forest land titling is less advanced for households than titling for enterprises. Twenty-eight provinces do not report any household Land Tenure Certificates (LTCs) on forest land, whereas only four provinces do not report any enterprise LTC on forest land.

Conversion from paddy to other uses, the first control point for land use transfers in the new land law, does occur in upland areas, but so far linkages to poverty are indirect only. Paddy land area decreased by 300–400 ha in each of the three surveyed provinces between 2000 and 2003, but in only two of the six surveyed districts with higher population density. Paddy conversion takes place in less-poor communes. We also collected oral testimony regarding the value of paddy fields to both the poor and less-poor upland farmers. Paddy area per capita, from 240 m² in one commune in Nghe An to 750 m² in one commune in Tuyen Quang, is not smaller than the provincial average, but paddy remains an important food security element. Paddy conversion—totaling only 2 ha—was reported in two communes and mostly relates to fish pond development by a few better-off households in one village. Things might change, however. Of the households surveyed, 3 percent indicated their interest in turning paddy fields into perennial crop plantations.

Changes in forest land zoning are actively taking place, albeit at a lower pace than in the 1995–2000 period. Transfers from environmental forests to other uses, which are due to be controlled through land use plans, are limited. Most change relates to gradual rezoning of land zoned as unused, generally rotational land and related fallow. This land is mostly rezoned production

forest land, a small proportion being transferred into agricultural land. Unused land decreased by 60 percent in one of the northern districts between 1995 and 2000. The decrease is slowing down, but was still 10 percent in 2000–2003 in one of the central districts. The forest land domain, already covering at least 40 percent in the communes, and up to 90 percent in one north-central commune, continues to increase.

Forest rezoning creates contrasting local situations. In the northern province, although no rezoning took place in the two communes studied, some other communes have had large land transfers from special use forest to protection forest, bringing income opportunities from forest protection contracts but raising questions of biodiversity protection. Other communes have had a substantial decrease in production forest and an increase in protection forest, reducing opportunities for sloped land development. In Nghe An, land rezoning as production forest is substantial in some communes and negligible in others. In Binh Dinh, forest land is being rezoned into agricultural land in some communes in the Kinh district, while in the ethnic minority district communes rezone land into production and protection forest.

Actual use of sloped land zoned as production forest appears to be unrelated to land allocation or land titling (Table 4.5). Land allocation may have contributed to more decision making in only one surveyed village in Tuyen Quang. In this village, 58 percent of households have forest land allocated, and they are developing orange production, unlike the other village with a state forest enterprise and only 4 percent of households with forest land allocated. It is local rapport—among stakeholders, state forest enterprises, national park staff, and community/households—and the presence or absence of market opportunities that appears to explain why households use or do not use the forest land they have been allocated. The ethnic dimension is a visible factor in this stakeholder rapport. Provincial and district policies also play an important role, for example, with

TABLE 4.5 Specific Uses of Sloped Land in the Six Communes Surveyed

Commune	Uses of sloped land	Important stakeholders	% Poor	Ethnic groups
TQ 1	Orange in village 1	SFE in village 2, with conflict	66%	84% MNG
TQ 2	RA forbidden by local government but practiced	Protected area	87%	53% MNG
NA 1	Tourism: 1 village resettled RA restricted by local government	Protected area	69%	94% MNG
NA 2	RA organized by district with land allocation	District	67%	95% MNG & SSG
BD 1	Cassava, cashew	SFE, without conflict	53%	No
BD 2	RA, cashew	SFE, with conflict	80%	97% SSG

RA = rotational agriculture; MNG = “Main Northern ethnic groups”; SSG = “Small Southern ethnic groups” (see definition in national analysis).

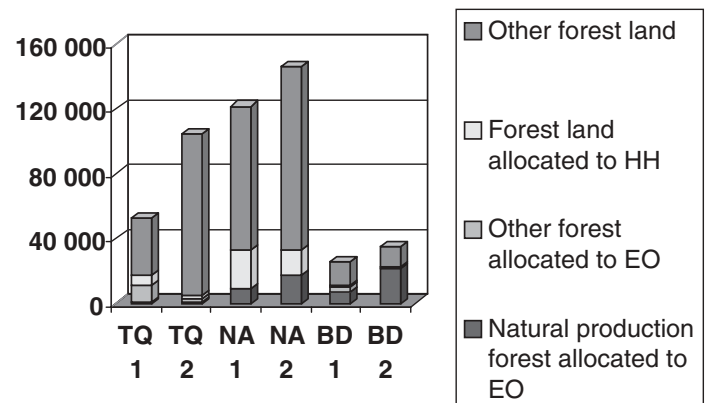
regard to rotational agriculture. One district in Nghe An promotes regulated rotational agriculture on allocated forestland, while the neighboring one restricts it.

Among the three land instruments analyzed—land use planning, land allocation, and land tenure certificates—new procedures for land use plans were found to be largely not taken into account yet. Land use plans have largely remained economic planning instruments used by technical bureaus at the provincial level with limited participation from more local levels. Land use plans are in operation in only four of the six districts surveyed. Only Nghe An, an upland province that is generally fairly advanced in land administration, had land use plans in both districts surveyed. None of the six communes had a land use plan in place.

Progress in forest land allocation is highly dependent on the different provincial policies. Allocation of land titles on forest land has started in the three provinces, although not in the communes surveyed. All households in the Nghe An Province communes have land use rights on forest land or are about to receive land titles, though this land only accounts for 11 to 19 percent of total forest land (Figure 4.1). In Tuyen Quang, proportions of households with forest

land allocated between 4 and 60 percent in the villages studied. In Binh Dinh, no forest land allocation is reported in the villages surveyed. Economic organizations, mostly state forest enterprises, are important stakeholders in the three provinces, albeit at a variable degree. The area of forest LTCs issued to economic organizations is three times that issued to households and six times in Binh Dinh province.

FIGURE 4.1 Allocation of Forest Land in the Six Districts Surveyed



Source: PEN Case Study Database.
TQ = Tuyen Quang, NA = Nghe An, BD = Binh Dinh

No correlation between more secure land tenure and poverty is visible in the survey, either at the household or village level.² Poverty scores of households with and without forest land allocated are equal. While correlation of large areas of forest land to wealth status is a frequent occurrence in Vietnam (see Cau River section), land allocation itself is not associated with less poverty. For the most part, the households surveyed are aware of the possibility of applying for LTCs in the near future. Only 4 percent mentioned administrative difficulties among the reasons why they did not use their sloped land. Land allocation even with formal titles is not perceived as secure land tenure. Only forty-five percent of households indicated they were planning some change of land use on their forest land. Only 19 percent stated they were planning to develop perennial crops. 55 percent said that the issue was insufficient knowledge to do so, and 82 percent that they were not planning to use their land titles to access credit.

The prevalence of large land managers on sloped land, and of agriculture and forestry administration in decision making, suggests that forest land allocation has only created some tenure security when provincial and district governments encourage decision making by the households. When this support is absent, deforested sloped land remains largely under-used, or

can be spontaneously developed with environmental impacts.

Policy implications

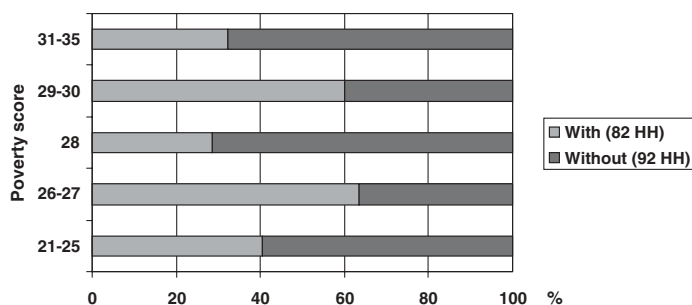
In the absence of innovative approaches to land administration in marginal rural areas, a double-tracked system in the land administration legal framework is being created. Urban areas are accessing a more comprehensive legal framework with the new land law, while poorer, marginal areas may continue to operate largely outside the land administration framework and to lag behind in land administration improvements.

Capacity-building among local cadres is critical to avoiding this risk of a modernized land administration bypassing marginal rural areas, and the new law offers an opportunity for a substantial information and training program. This capacity issue is compounded by the fact that village leaders are legally in charge of handling land use matters. Community participation is recognized in Vietnam as a means to overcome the absence of reliable statistics and to improve local decision making, but local capacity to use these approaches needs to be enhanced as part of an information and training program.

A transition from top-down land use plans to participatory, problem-solving oriented land use plans has the potential to enhance local decision making in poor communities vis-a-vis other stakeholders. Land use plans are also needed to avoid environmental impacts from sloped land development. A balance needs to be found between identifying critical land-use control points, possibly other than those in the land law, and avoiding the detailed directions of land use that still prevail and are in themselves a powerful deterrent to local initiatives. Improved land use planning will require disentangling the discrepancy issue between statistics and actual land use, and modern tools such as aerial photographs and GPS may be an opportunity to do so.

Formal land use titles are a necessary condition for land tenure security, but not a sufficient

FIGURE 4.2 Households with and without Forest Land Allocated by Poverty Level



one. The perception of security is as important as legal land titles in ensuring that title holders can use their sloped land to secure or improve their livelihoods. Land use plans can support this process, and local access of the poor to credit, agricultural inputs, and markets are a pre-condition—still often missing in marginal rural areas.

Monitoring poverty and environment impacts of the Land law can be done through better use of existing instruments and local experience rather than by creating a new monitoring system. The land census, with its detailed information requests on land use types and stakeholders receiving land use rights, is a perfect tool. What is needed is a better dialogue between central level and provinces to ensure that reliable data are assembled and used. The wealth of experience being assembled by provinces and districts through pilot land administration schemes deserves an evaluation process and the exchange and dissemination of lessons learned. Monitoring and evaluation of the land law can only be successful if it incorporates the impact of forestry policy and reform through improved linkages between the two agencies.

4.2. ENVIRONMENTAL HEALTH AND POVERTY

Key findings

Industrial pollution

There has been a trade-off between poverty reduction and environmental quality in the last decade in particular from the non-state sector

The urban poor are disproportionately employed in industry with high occupational health risk and exposure to pollution, particularly in small-scale industry.

Young children and elderly—the age groups most susceptible to health effects from pollution—are disproportionately concentrated in poor households in the urban industrialized areas.

Rural and peri-urban craft industries have rapidly raised household income in craft villages, but with serious pollution and health effects. Non-household labor hired in craft industries is disproportionately from low-income households, and are exposed to serious air pollution and toxic substances. Dug wells, mostly used by low-income households, are at risk of contamination from untreated wastewater generated by craft industries.

Drinking water and sanitation

There is a significant level of inequity in access to safe water and sanitation throughout Vietnam.

Significant numbers of lowland poor using dug wells or surface water are affected by lack of access or pollution of drinking water.

The role of ethnicity in higher incidence of diseases related to water and sanitation is visible but not fully explained.

Pesticide use

Pesticide use has become prevalent throughout Vietnam including in poor provinces.

The poor are more exposed to toxic pesticides than the non-poor.

The poor as aware as the non-poor of the risk related to pesticide use but have less access to information that could help them avoid these risks.

4.2.1. Lack of Safe Water and Sanitation and Poverty

The Vietnam National Health Survey

How do the poor differ from the non-poor in access safe water and sanitation? What is the level of health risk, particularly for diarrheal illness, of various forms of drink-

ing water supply and sanitation in Vietnam? How many people are at risk of illness, especially in relation to the poorer segments of the population? What are the resulting priorities in water and sanitation improvements, and should they have a geographic or socioeconomic focus? These questions can be answered by the National Health Survey database. All data, unless otherwise mentioned, were obtained from a multivariable logistic regression analysis using detailed information for the more than 150,000 individuals in the survey.

Vietnam has achieved impressive gains in water supply and basic sanitation coverage rates. About 80 percent of the population has access to clean drinking water. The two main unsafe water sources—surface water and wells, both of which have high risk of pollution—declined respectively from 20 percent to 10 percent and from 50 percent to less than 35 percent between 1992–93 and 2001–02. At the same time, the share of the population with drilled-well water increased from 5 percent to over 20 percent. While access to water supply and sanitation facilities has improved significantly, it still remains a major issue for the

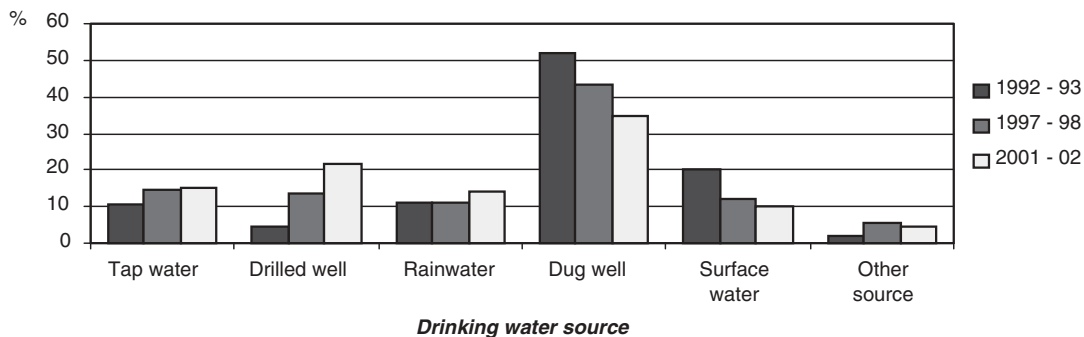
poorest segments of the population, which have much lower coverage rates than the rest of the population. More than 17 percent of the poorest 20 percent of the population use surface water as drinking water, while only 3 percent of the richest 20 percent use surface water.

Beyond this direct link between poverty and access to clean water and sanitation, no obvious geographical linkage between poverty and indicators of environmental health in relation to water supply. The overall difference between rural and urban areas in coverage of clean water supply is limited. The disparity is within rural and urban areas. About 8 percent of people in urban areas and 22 percent in rural areas are without safe drinking water; that is, they use surface water or dug wells with a nearby pollution source.

The disparity between rural and urban areas in access of the poor and the non-poor to toilet facilities is substantial. In urban areas, almost all of the richest households have toilet facilities, while this proportion is 3 percent in the rural areas. In the urban areas, 24 percent of the poorest do not have toilet facilities, while in rural areas this proportion raises to 38 percent.

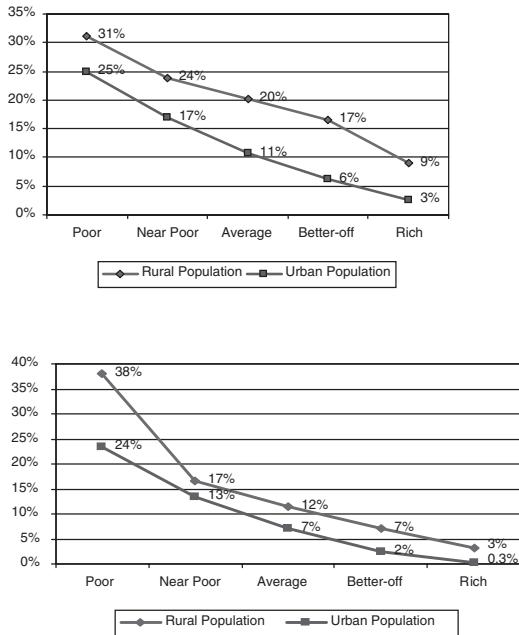
Unsafe water supply combined with low sanitation and poor hygiene behavior is highly

FIGURE 4.3 Drinking Water Supply in Vietnam



Ministry of Health defines clean drinking water as piped city water, drilled well water, rain water, protected mountain spring water, and dug well water without a pollution source within a 7-meter radius. A pollution source is defined as, for instance, a toilet, sewage, or a cattle shelter.

SP10 **FIGURE 4.7** Population without Safe Drinking Water (left) or Toilets (right)



correlated to diarrheal illness in many countries (Curtis and Cairncross 2003; Fewtrell and Colford 2004; Esrey and others 1991). Hand washing alone is often found to reduce diarrheal illness by as much as 45 percent (Curtis and Cairncross 2003). The poor are generally disproportionately affected by disease, because they tend to have less access to medical services (Figure 4.4), less financial resources to pay for quality services, more income losses from illness, and are more often self-employed or work in the informal sector. They often have fewer resources to undertake averting behavior (actions taken by individuals and households to reduce the risk of exposure to health risks). Averting behavior observed in Vietnam includes purchase of bottled drinking water or point-of-use drinking water treatment; use of pesticide protection equipment; residence in less polluted neighborhoods; and hygienic behavior.

Unsafe drinking water sources and lack of toilet facilities are causing substantially higher rates of diarrheal illness. While this finding applies to many countries, a specific feature in Vietnam is that two very different types of unsafe drinking water, surface water and polluted dug wells, continue to be an important source of drinking water (Figure 4.5).

FIGURE 4.4 Percent of Households Living in Commune with Doctor

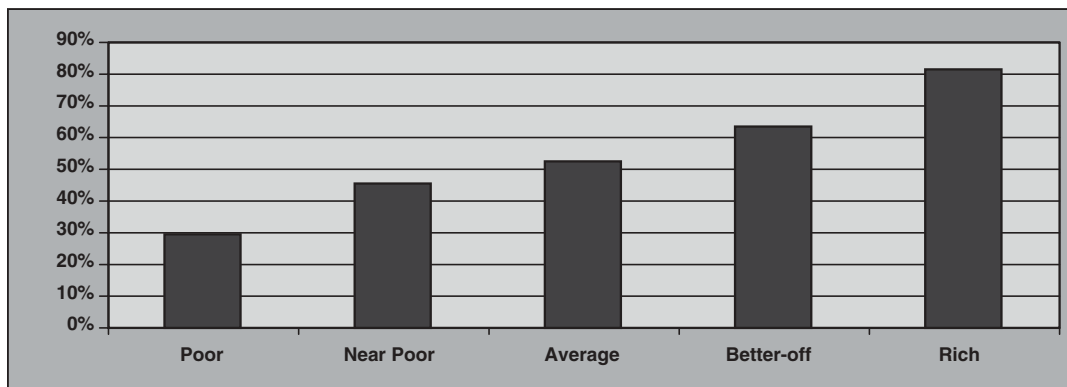
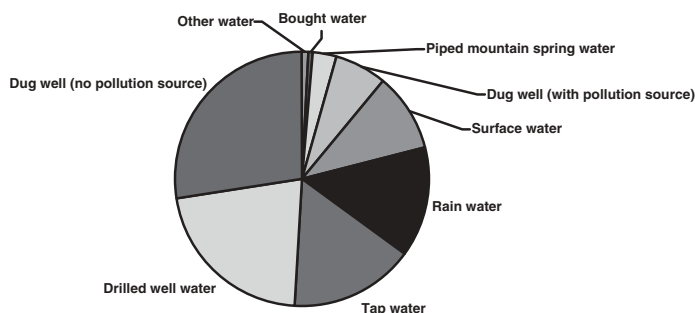


FIGURE 4.5 Population Drinking Water Supply 2001/02



ADI = acute diarrheal illness

Use of surface water is common, not only in marginal areas but also in more developed areas. Surface water is the main water source for more than 50 percent of the population in six Northwest provinces and in the Mekong River Delta. Polluted

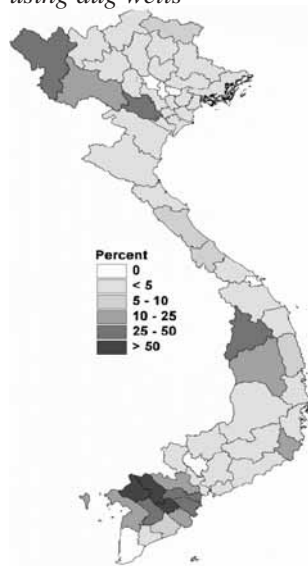
wells are the main water source in various low-land areas, except in the Mekong River Delta. The use of dug wells exceeds 75 percent in some provinces, but is below 5 percent in the Mekong River Delta. There are six provinces with more than 25 percent of the population with a pollution source near their dug well. This figure reaches more than 40 percent in some of the provinces with the highest reliance on dug wells.

The prevalence rate of diarrheal illness varies considerably across provinces. An index of the burden of diarrheal illness, created from the survey data and reflecting both prevalence rate and duration of illness, shows that disease burden is highest in the Northwest and Central Vietnam, as well as in a few of the provinces in the Northeast and the Mekong River Delta. The correlation between the disease burden and poverty incidence is pronounced (Figure 4.6).

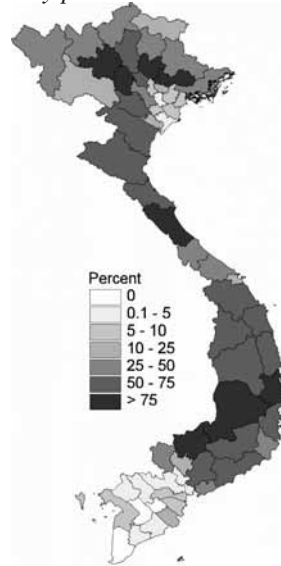
While pollution of water sources may arise from human or other sources, such as sewage and

MAP 4.4 Population Using Unsafe Water Sources

Percent of population using using dug wells



Percent of Population nearby pollution source



Percent of dug wells with surface water

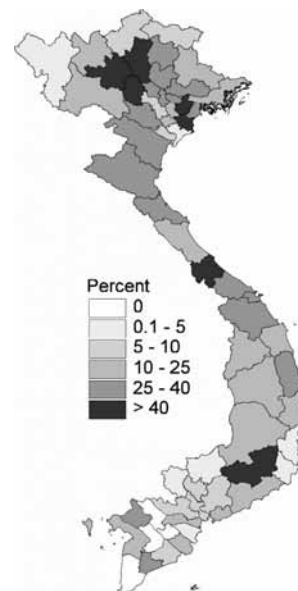
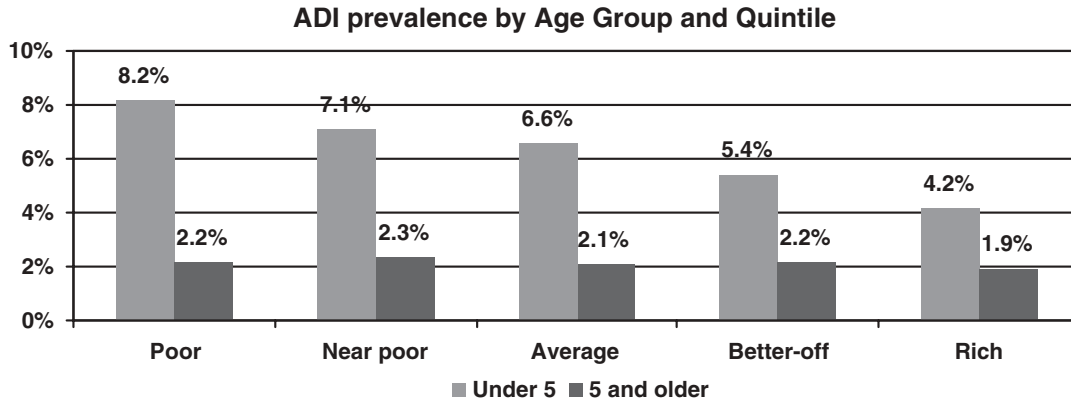


FIGURE 4.6 Prevalence of Diarrheal Illness by Age and Living Standard

ADI = acute diarrheal illness

animal waste, the lack of toilet facilities is associated with both low living standards and higher incidence and longer duration of diarrheal illness. In six provinces in the northern and central parts of the country, more than 50 percent of the population lack toilet facilities.

Poverty is associated with significantly higher diarrheal illness in children, but not in adults. Young children in poor households are at higher risk not only of illness, but also of diarrheal mortality. In the overall population, the use of open, unprotected water sources for drinking water is found to increase the risk of diarrheal illness by 51 percent in children under five years of age and by 33 percent in the population over five (compared to the average for all other sources of drinking water). Children in households having no toilet facility have a 34 percent higher risk of illness than children in households with a toilet facility. There is a 23 percent increase in risk for the population over five. Children under five are substantially more affected by diarrheal illness. At the national level, the diarrheal prevalence rate in children under the age of five is nearly twice as high in “poor” compared to “rich” households. Comparing across age groups, the prevalence rate is almost four times higher in children under

five years than in older children in the poorest households, but “only” twice as high in the richest households. For children under five, the average duration is 3.3 days in the poorest households and 2.8 days in the richest households.

Polluted dug wells are a critical element of the poverty and environmental health linkage. Nearly 35 percent of the population relies on dug wells. Around 20 percent of all dug wells, which correspond to nearly 8 percent of the total population, have a pollution source within a 7-meter radius. Of the population that use dug wells, 27 percent of the poorest people have a pollution source near the well, while only 13 percent of the richest have a pollution source near the well. The risk of diarrheal illness in all age groups is 15 percent higher for individuals using drinking water from dug wells with a nearby pollution source. The risk of diarrheal illness is 36 percent higher for those without a toilet facility compared to those with a toilet facility.

Once households have access to simple facilities for drinking water and toilets, there is no advantage—in terms of environmental health—of moving toward improved facilities. Risk of diarrheal illness between tap water, clean dug wells, drilled wells, rain water, or piped spring

MAP 4.5 Index of Disease Burden and Pollution Sources

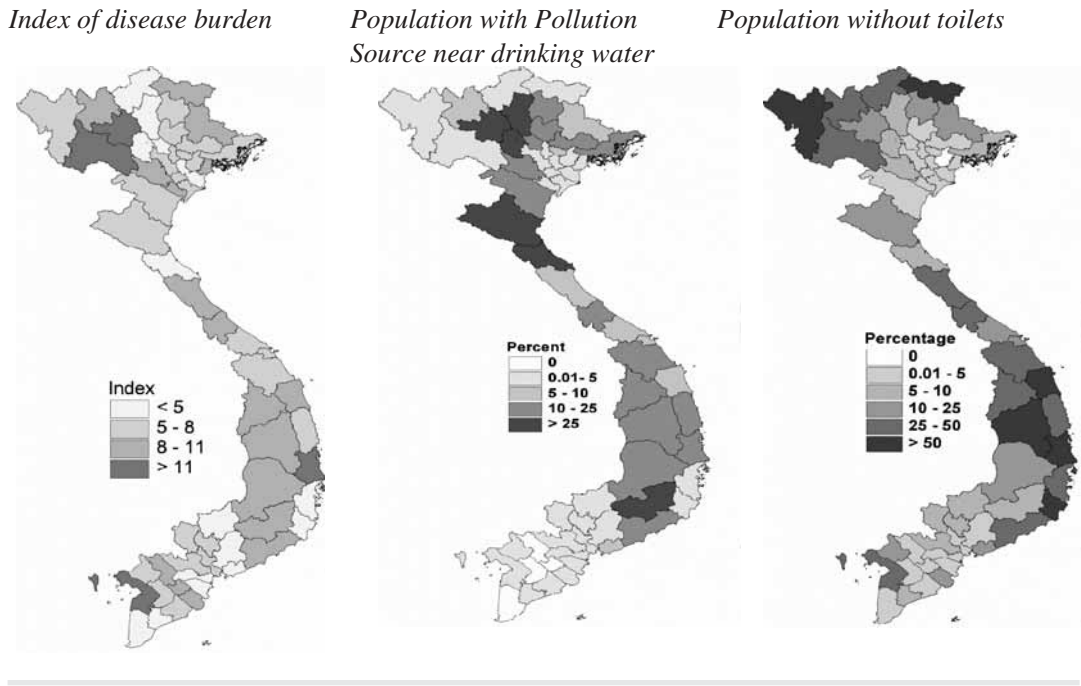
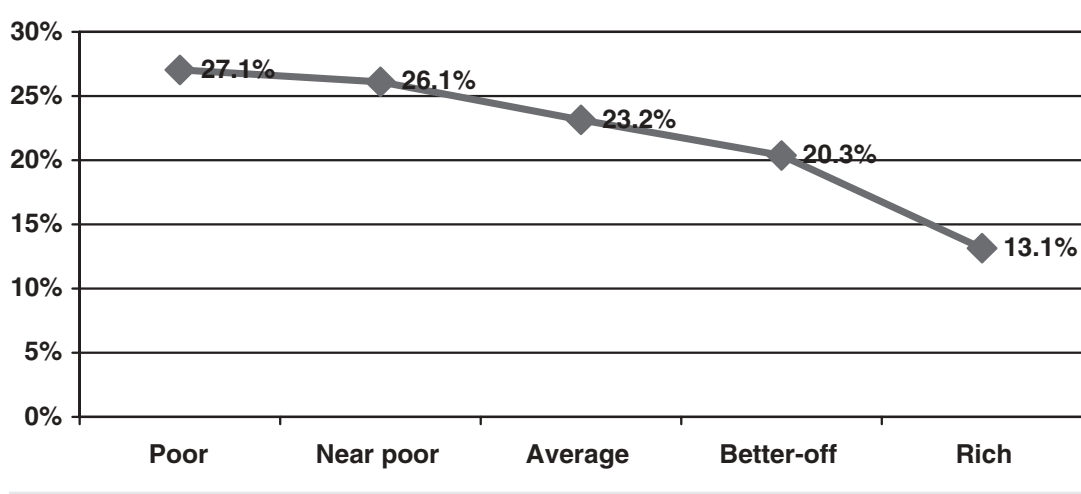


FIGURE 4.7 Population Using Dug Well with Nearby Pollution Source



water is similar. The same applies to types of toilet facilities, such as simple pit latrines, pour-flush, and modern flush toilets except, again, when drinking water with a nearby pollution source is used. This finding is worth noting, since households have high demand to shift to more modern toilets. The use of flush toilets increased from less than 10 percent to over 20 percent, while the category “other toilet,” which includes toilets without safe drainage, declined to less than 10 percent over the last 10 years. This demand continues as the use of simple toilets remains widespread (at over 30 percent of the population) and sharing a toilet is common (a almost 15 percent).

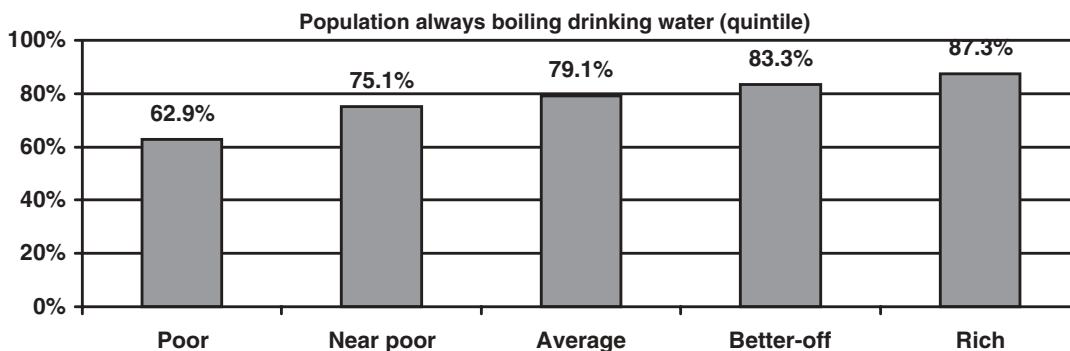
Three options are available to households with a polluted local water source to increase security of their drinking water. These options, by decreasing frequency, are boiling drinking water, the use of rainwater, and chemical or mechanical treatment of water. The poor are less likely to access any of these three options. An overwhelming majority of the population boils drinking water. Nationally, 78 percent of households report that they always boil their drinking water, ranging from well over 90 percent of households in most of the provinces in the Red River Delta and some of the Northeast provinces, to less than 50 percent of the households in many of the provinces in

the Mekong River Delta. 63 percent of the poorest households always boil their drinking water. This is lower compared to 87 percent of the richest households but still a remarkably high proportion.

Rainwater is increasingly used as an alternative to polluted water sources. More than 50 percent of households use rainwater in several of the provinces in the Red River Delta, and in the Mekong River Delta rainwater use ranges from 10 to 30 percent. The poor are less likely to have this option. Only 6 percent of the poorest households are using rainwater compared to 14 to 16 percent of the “middle-income” groups. No elevated risk of illness was found in this study from rainwater compared to other improved or protected sources of drinking water. More than 20 percent of the households report that they apply chemical or mechanical treatment to their drinking water. Of the poorest households, 13 percent report they use such drinking water treatment. About 27 percent of the richest households apply chemical or mechanical treatment to their drinking water.

Behavior, and particularly behavior among ethnic minority people, appears to be a critical factor explaining diarrheal illness. Two factors likely to be associated with behavior are the mother’s education and ethnicity. Children whose mothers have not completed primary education have a

FIGURE 4.8 Boiling of Drinking Water in Relation to Poverty



27 percent higher risk of illness than children with mothers who have completed either a primary or a higher level of education. Similarly, in the population above five years, lack of primary education is associated with a 24 percent higher risk of illness. “Poor” households are more likely than “rich” households to rely on surface water for drinking water, to have no toilet facility, and to have a lower level of education. No such influence is found for the over-5 population.

While mothers in ethnic minority groups are likely to have received less education (if any in some groups), ethnicity in itself is found to explain no less than 44 percent of higher risk of illness among the over-5 population. This finding controls for all factors commonly associated with ethnicity, including education. One possible explanation for the fact that poverty quintile, not ethnicity, is revealed in the analysis for children under 5 is that poverty reflects the influence of ethnicity of parents, as ethnic minority people tend to be poorer than the majority of the population in Vietnam. There is, of course, no simple linkage between ethnicity and behavior. The proportion of house-

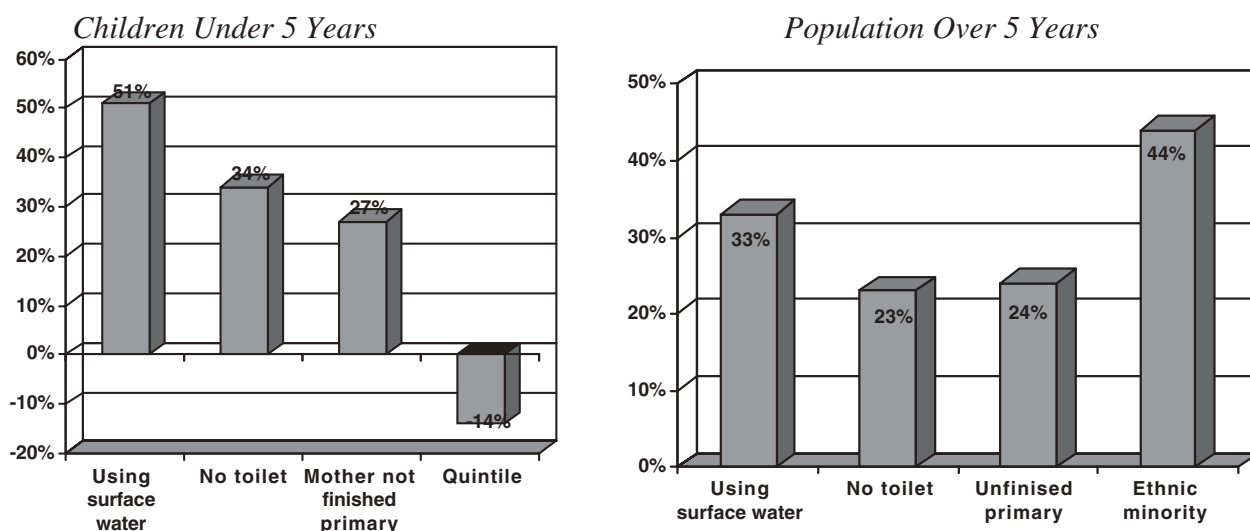
holds that take the risk of not boiling water, although small, is clearly located in the provinces with a high share of ethnic minority population and in the southernmost provinces of Vietnam.

The relative share of behavior and lack of access to improved water cannot be fully assessed. This derives from the fact that, although such a high share of the population boils its drinking water, the use of open, unprotected water sources (such as surface water) is still associated with an elevated risk of diarrheal illness. Insufficient water quantity for hygiene purposes, such as hand washing and domestic cleanliness, is likely to result in increased risk of illness, even if drinking water quality after boiling is of sufficient quality.

Policy implications

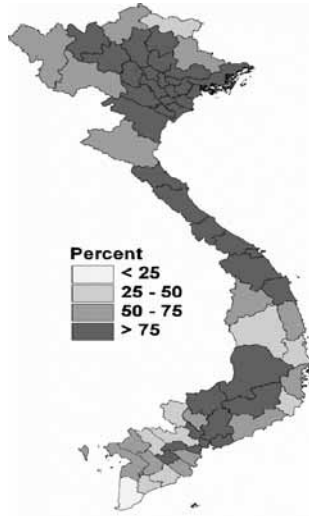
Safe water and sanitation programs face a challenging issue of targeting. Sound policies could simply give priority to providing safe water supply and basic sanitation to all those without these services. In reality, competition to access improved services arises between poor and non-

FIGURE 4.9 Relative Risk of Diarrheal Illness

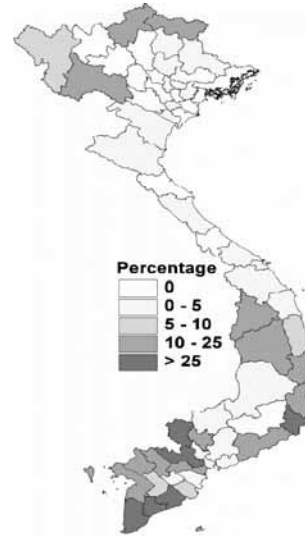


MAPS 4.6 Percent of Households Boiling Drinking Water

Percent of Households Always Boiling Drinking Water



Percent of Household Rarely or Never Boiling Drinking Water



poor households or communities in a context of limited budgets. The 135 program allows targeting at the commune level. Appropriate targeting of poorer villages within these communes is critical.

Pro-poor solutions to the dug-well pollution issue will require affordable technical innovations. Pollution from local domestic and human sources can be addressed through improved waste management. It is not so, however, for diffuse pollution of agricultural and, increasingly, industrial origin. Making sure that the poor have access to affordable alternative solutions to dug wells will be critical.

Improving safe water and sanitation in areas with substantially lower coverage requires close coordination between the agencies in charge of setting up the infrastructure, health services, the organizations in charge of information and education, and in some cases the organizations in charge of ethnic minority affairs.

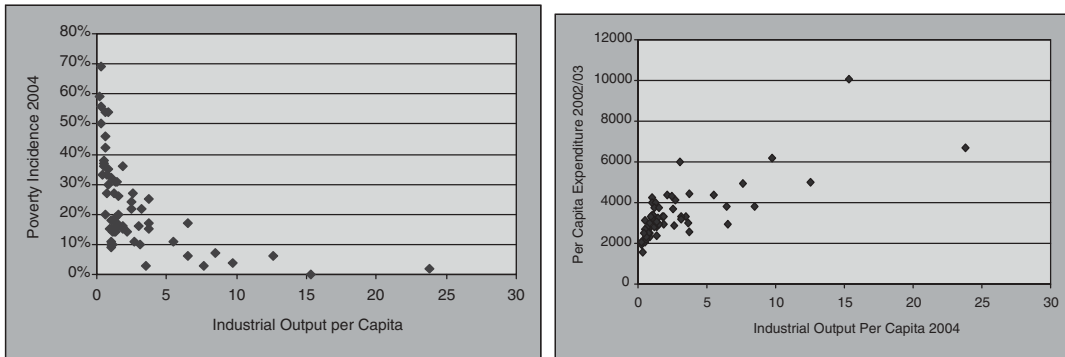
4.2.2 Industrial Pollution, Poverty and Health

Industrial pollution and poverty

Industrial development in Vietnam has been a driving force in the impressive reduction in poverty and the growth in living standards in the last decade. The higher the industrial output per capita, the lower the poverty incidence and the higher the per capita expenditure (Figure 4.10). On the one hand, industry, and especially industrial growth, contributes to poverty reduction and an increased standard of living. On the other hand, local communities, which may or may not directly benefit from the industrial growth in their area, are affected by pollution. Industrial pollution presents a serious health threat to workers and the public, particularly for low-income groups, which can least afford ill-health.

In line with their high industrial concentration, the highest pollution loads are found in two

FIGURE 4.10 Living Standards and Industrial Output by Province



Poverty incidence is from VLSS 2004, per capita expenditure from VNHS 2002/03.

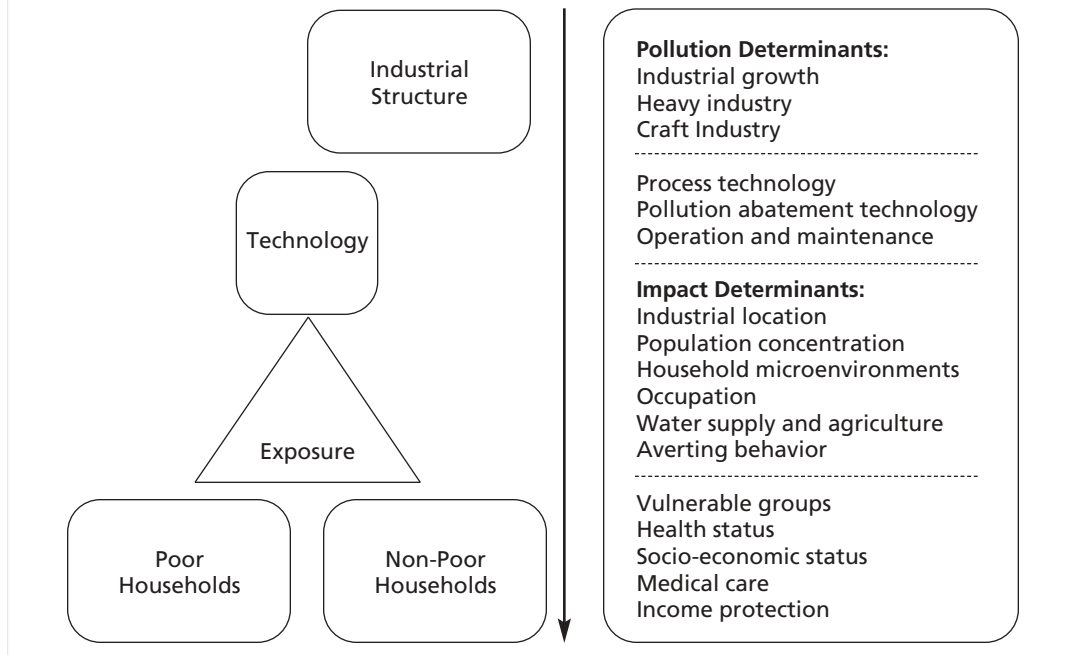
BOX 4.6 Methodology of the Industrial Pollution and Poverty Case Study

The PEN study involved a “macro” and “micro” approach and incorporated existing national, provincial, district, commune, village and household data on industry, poverty, water supply, and health.

At “macro” level, the Vietnam National Health Survey (VNHS 2002) was used to analyze health conditions, employment and demographic characteristics, and household water supply. The national research team collected district level data from offices in 14 provinces, assembled a national data set of seriously polluting establishments (SPEs) at the commune level, and categorized “craft” industry villages at the commune level in the Red River Delta from a study by MoST/INEST.

At “micro” level, the national team, with initial support from the Korean Institute for Industrial Economics and Trade (KIET), conducted field observations and interviews in several cities and “craft” villages.

Linkages taken into account reflect the complexity of determinants of impacts of poverty on the poor. The following relations between industry, pollution, human exposure, natural resource damage, and impacts on the poor were all taken into account in the analysis:



regions, the Red River Delta and the Southeast region around Ho Chi Minh City. Inter-regional differences in industrial output are not pronounced when presented as output per capita. The Southeast and Red River Delta have a slightly higher per capita output. However, when looking at total industrial output, a more likely indicator of potential pollution and health issues, about 70 percent of national industrial output is concentrated in the Red River Delta and the Southeast. Nearly 50 percent of this output comes from the Southeast. Little of the industrial output is produced in the Northwest and the Central Highlands (Figure 4.11).

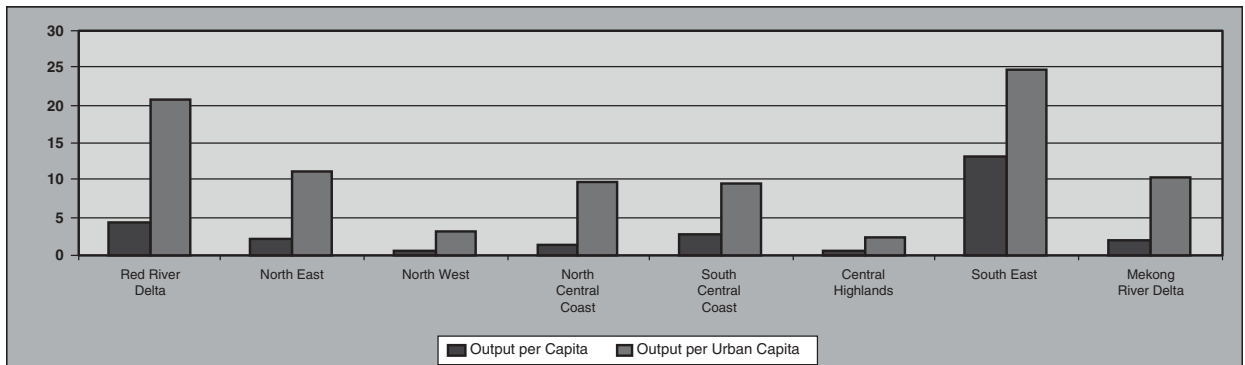
The poor are more likely to be industrial workers with higher occupational health risk. In the Red River Delta and the Southeast, 30 to 35 percent of urban low-income workers are employed in industry, compared to 15 to 25 percent from high-income households. The difference is even more pronounced in the six provinces with the highest industrial output in Vietnam (Figure 4.12). In Hai Phong, 55 percent of low-income workers are employed in industry, compared to only 13 percent of the high-income group.

Within the two most industrialized regions of Vietnam, the Red River Delta stands out for having rapid industrial growth, which is likely to

generate both more rapid poverty reduction and more environmental problems. Vietnam’s industrial production has increased about 15 percent per year between 1995 and 2004 (Maps 4.7). Regional industrial output growth during that period was 17 percent in the Red River Delta. Eight of the ten provinces with the fastest industrial growth are in the RRD, Northeast, and Northwest regions. The lowest growth was in the Central Highlands and the Mekong River Delta.

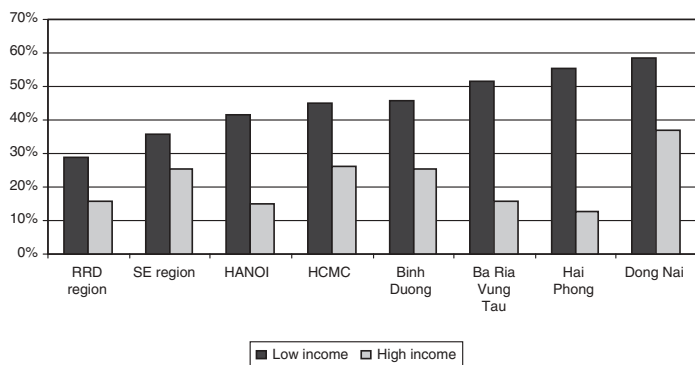
Linkages between poverty and geographical distribution of industrial development and pollution strongly relate to the type of industrial sector—State versus non-State. Non-state industrial output is strongly associated with higher living standards and lower poverty. Provincial poverty incidence is 0.2 percent lower for every 1 percent higher industrial output per capita from the state sector, and 0.4 percent lower for every 1 percent from non-state industry. Similarly, the provincial per capita expenditure level is 0.1 percent higher for every 1 percent higher industrial output from the State sector, and 0.15 percent higher for every 1 percent from the non-State sector. Compared to the state sector, the larger influence of the non-State industrial sector on provincial living standards might be due to the

FIGURE 4.11 Regional Share of National Industrial Output in 2004



Figures are Million Dong (1994 constant prices).

FIGURE 4.12 Industrial Employment in Urban Vietnam



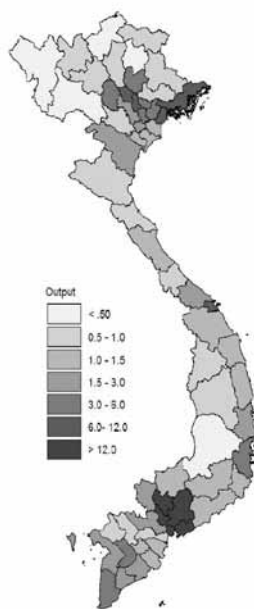
Source: Derived from VNHS 2002.

non-State sector’s generally smaller scale and higher labor intensity.³

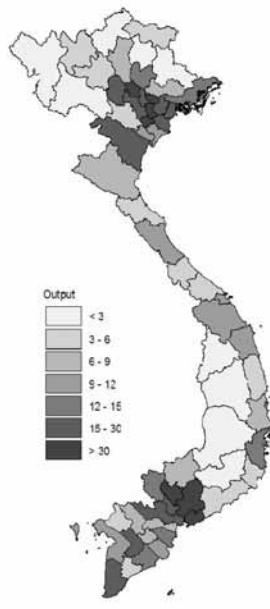
The non-State sector is at the same time the sector with the highest correlation to poverty reduction, and the sector in which more polluting—or more pollution-intensive manufacturing sectors—are mostly found.⁴ High-pollution-intensive sectors represent almost 30 percent of total manufacturing output. While non-State manufacturing output was 27 percent of total manufacturing output in 2004, 37 percent of output from high-pollution-intensive sectors came from non-State manufacturing. State- and foreign-invested manufacturing growth is relatively “pollution neutral” since State manufacturing is particularly high in the chemical and basic metals sectors and foreign-invested manufacturing is highest in the chemical and tanning and leather

MAPS 4.7 Provincial Industrial Output

Industrial Output Per Capita 2004



Industrial Output Per Urban Capita 2004



Provincial Output Growth 1995-2004

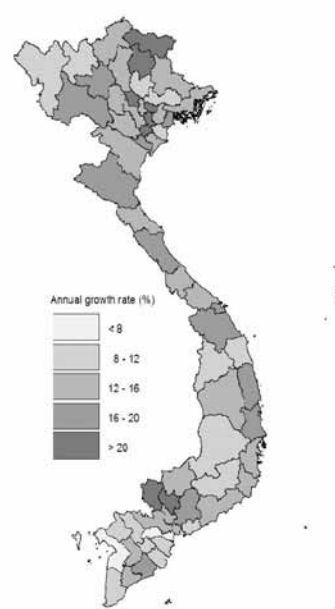
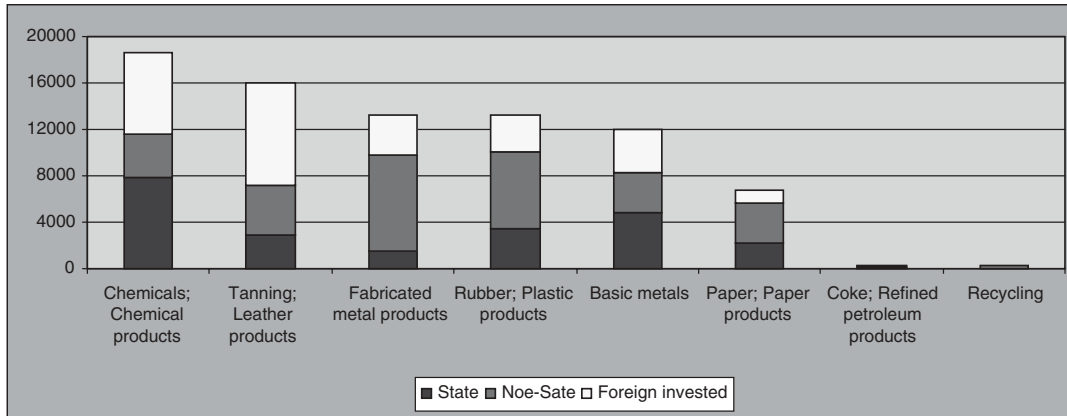


FIGURE 4.13 High-Pollution-Intensive Manufacturing Output, 2004

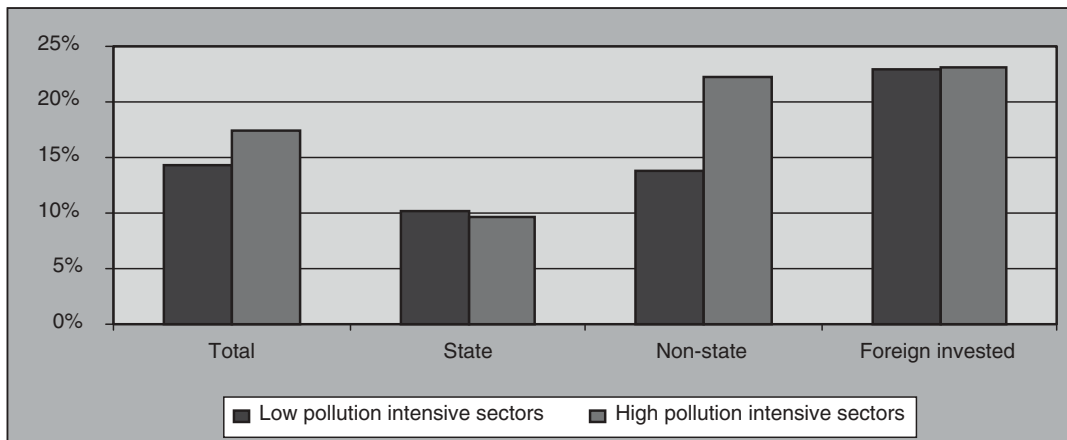


Billion Dong in 1994 constant prices

product sectors. Non-State manufacturing dominates in the fabricated metal products and rubber and plastic sectors (Figure 4.13). These high-pollution-intensive non-State sectors grew in the range of 25 to 30 percent per year, nearly twice as fast as low-pollution-intensive non-state sectors (Figure 4.14).

Among the non-state sector industries, the craft industry has witnessed phenomenal growth, especially in the Red River Delta region, where 60 percent of the craft industry is located. According to MoST/INEST (2005), there are more than 840 craft villages in the RRD region. The concentration of the craft industry is particularly high

FIGURE 4.14 Manufacturing Output Growth, 1995–2004



in Ha Tay and Thai Binh provinces. A quarter of the rural communes in the RRD have at least one craft village, with some communes having more than five.

Rural industries were in the past limited to mines. Mines are located in a mix of poorer and less-poor provinces. They are likely to draw poorer workers, and their concentration creates high potential environmental impact on those living nearby. There are 16,000 hectares formally allocated to mining in Vietnam. The area is concentrated in 11 provinces. In these provinces, 0.1 percent of total land area, often concentrated in a few districts, is allocated to mining. Many of these provinces are in the Cau River basin.

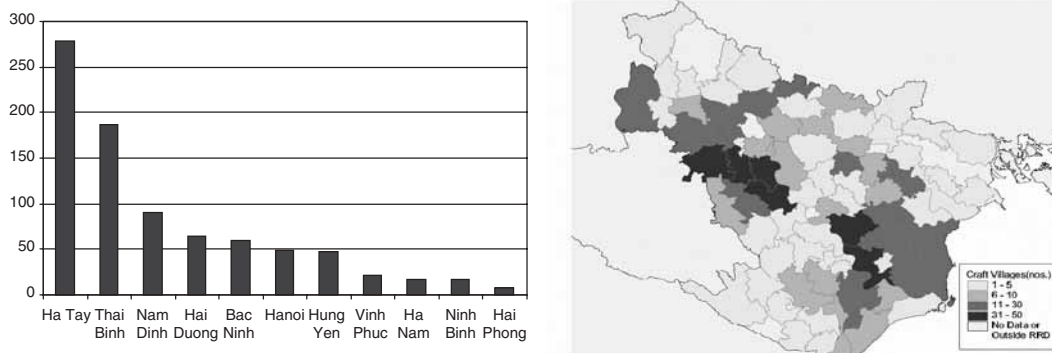
Industrial pollution in Vietnam is shifting from an urban-only issue to a mixed urban-rural issue. The government has made significant progress in relocating industrial enterprises away from many of the major city areas to industrial zones. This has alleviated some of the pollution in and near residential areas. Some enterprises in the cities have also installed pollution control technology. These improvements are not complete; numerous small- and medium-scale enterprises and remaining large enterprises continue to pollute the urban

environment in Vietnam. However, pollution from industrial zones is now increasingly impacting the nearby environment, including water resources, paddy fields, and aquaculture farms.

A major focus of Vietnam’s expanding industrial development and its possible pollution impacts (also on different socio-economic groups) has been the expansion of craft village (CV) industries, now tentatively accounting for almost 20 percent of Vietnam’s Industrial Output Value (KEI 2005). More than 55 percent of Vietnam’s CVs are located in the Red River Delta in North Vietnam, with a particular high concentration in Ha Tay and other provinces like Thai Binh and Nam Dinh (figures 4.15a and 4.15b). Initial mapping shows that the same pattern appears for the most polluted CV industrial enterprises with highest concentrations in areas located North West and South & South East of Hanoi (figures 4.15b). A critical pattern is that CV industries are creating pollution patterns in rural communities that were spared earlier from industrial pollution.

There was no difference in poverty incidence in rural communes with and without craft villages in the RRD in 1999. Average incidence was remarkably close to the national average. More

FIGURE 4.15 Craft Villages in the Red River Delta



Source: From data provided by INEST, Hanoi Polytechnic University, Vietnam.

recently, poverty incidence may have declined faster in communes with craft villages, but no systematic data is available to confirm this supposition. The craft industry typically consists of household enterprises. On average, about 60 percent of households in the craft villages are engaged in the industry in the RRD, and in a quarter of the villages more than 80 percent of the households are engaged. Households engaged in the craft industry usually have a substantially higher income than the agricultural households in their villages and in the RRD in general. As the household enterprises grow, they hire workers who are generally poor people. This is most pronounced in Ha Tay and Thai Binh provinces, the provinces with the highest number of craft industries. Thirty percent of low-income workers are engaged in industry in these provinces, while only 13 to 17 percent in the high-income group are engaged in these activities (Figure 4.16).

Communes with lower poverty incidence in 1999 tend to have craft industry with higher pollution intensity (Figure 4.17). Craft villages engage in a variety of production activities that range from non-polluting to highly polluting, some with long and important cultural traditions and some with a recent commercial and industrial nature. Activities include highly skilled embroidery, weaving, pottery work, and ceramics to food processing, construction materials, and waste recycling, such as plastic and metals. While the causes of this relationship are not clear, it could suggest a trade-off between income generation and environmental quality in relation to the development of craft industry.

Analysis of the Vietnam Health Survey reveals substantial inequality in health conditions in urban areas. While it is not possible to establish a relationship between health effects and air pollution in urban areas from this survey, this finding does suggest that controlling air pollution from industry and other sources could provide substantial health benefits for low-income households.

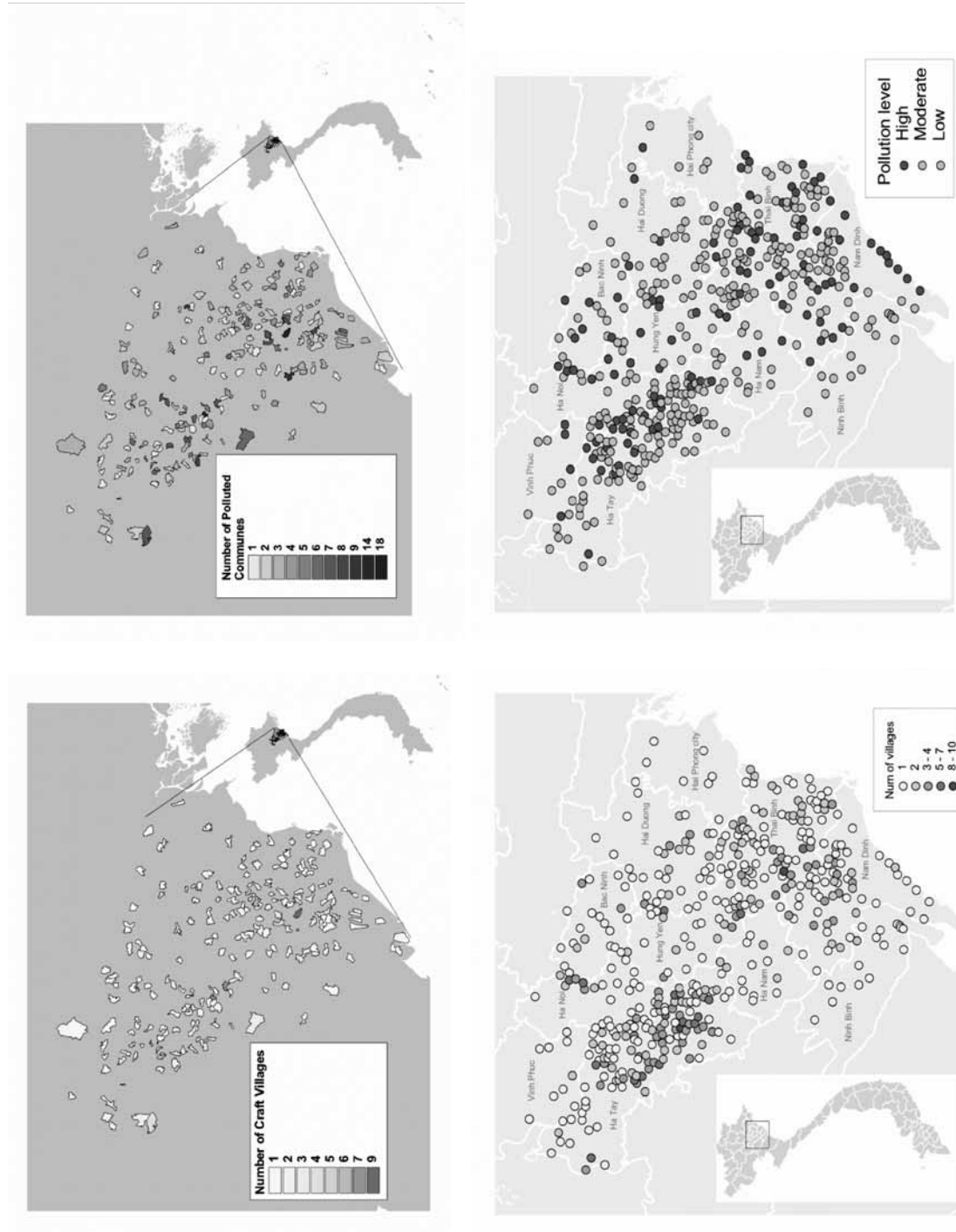
The burden of ill health in urban areas, which mostly affects children to the elderly, is clearly

linked to poverty. Air pollution causes cardiovascular mortality in adults, acute respiratory mortality in children, and respiratory illness in children and adults, resulting in hospitalizations, lost work days, and lost school attendance). It is the elderly and young children that are most at risk of health effects from air pollution.⁵ In urban children under 5 years old, nearly 35 percent of all cases of acute respiratory illness (ARI) occur in the 20 percent lowest income households. In contrast, only 12 percent of the cases are in the highest income households (Figure 4.18). In the population over five years of age, the prevalence of ARI is two times higher in low-income than in high-income households.⁶ People from low-income urban households also die younger. The average age at death was 60 years in the three lowest income groups, compared to 66 years in the two highest income groups (Figure 4.18). Numbers of children are disproportionately high in lower-income households. About 30 percent of children in urban areas in Vietnam live in the 20 percent lowest income households.

Visual observation of areas of residence of the poor revealed the degree of higher exposure of the poor to air pollution. The poor in urban areas tend to live in cheaper but more polluted and environmentally unsafe areas. The urban poor also are disproportionately affected by occupational health risks. They are over-represented in industries with high occupational health risk and exposure to pollution, particularly in small-scale industries with no pollution control technology and worker protection. In a lead recycling craft village, for example, workers operate open furnaces to melt batteries. In a tanning enterprise, workers are in direct contact with wastewater. In addition to these pollution and health issues in urban areas, evidence is mounting of serious health effects from craft industry pollution in rural and peri-urban areas (Box 4.8).

Craft industries generate both air and water pollution. Craft industry wastewater pollution constitutes a health risk to poor households in particular. Untreated wastewater from craft indus-

MAPS 4.8 Craft Village Concentrations and Pollution Hotspots in the Red River Delta



Source: Maps generated by combining INEST CV database and MONRE's classification of polluted enterprises.

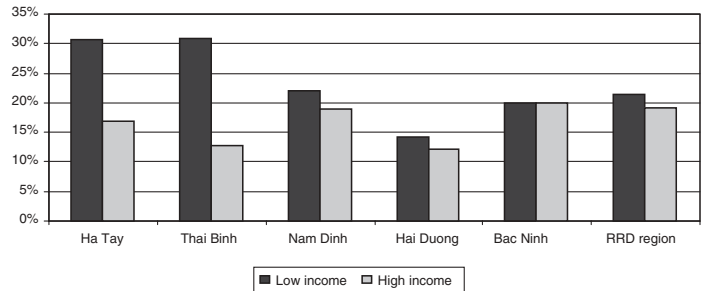
tries increases the risk of contamination of dug wells. The poor are less likely to own craft enterprises. They are often migrants including migrants from minority ethnic groups. The owners are often also exposed to pollution but not to direct occupational health risks, and they have more access to alternative drinking water sources and to health services.

Policy implications

Environmental regulatory improvements can achieve a “win-win” poverty and environment impact if efforts are directed toward reducing the impacts of industrial pollution on the health of low-income groups. Environmental health in relation to industrial pollution relates more to policies for low-income groups than to poverty reduction. There is a broad need for reform in the regulatory framework and for parallel enforcement of this framework in the workplace and in residential areas.

At present, the challenges that Vietnam is facing in the context of craft industry development are similar to the challenges that China and

FIGURE 4.16 Industrial Employment in Rural Vietnam

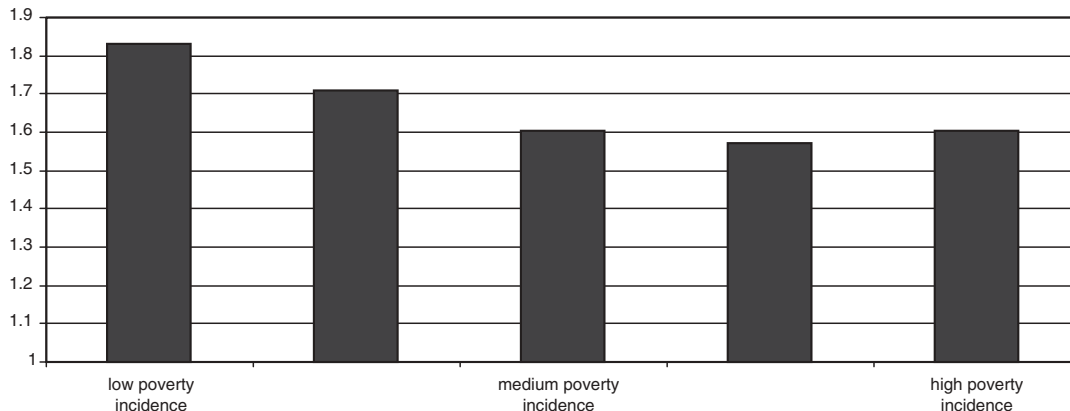


Source: Derived from VNHS 2002.

Korea have faced in the development of SMEs (Box 4.9).

Impact of craft industries in and around the Red River Delta on the health of the poor requires urgent attention. Uncontrolled development of small and medium industrial enterprises would result in a drastic increase in pollution. Preventing this uncontrolled development will require a mix of measures. First, a national regulatory framework for craft industries needs to be in place and

FIGURE 4.17 Craft Village Pollution Intensity and Poverty Incidence



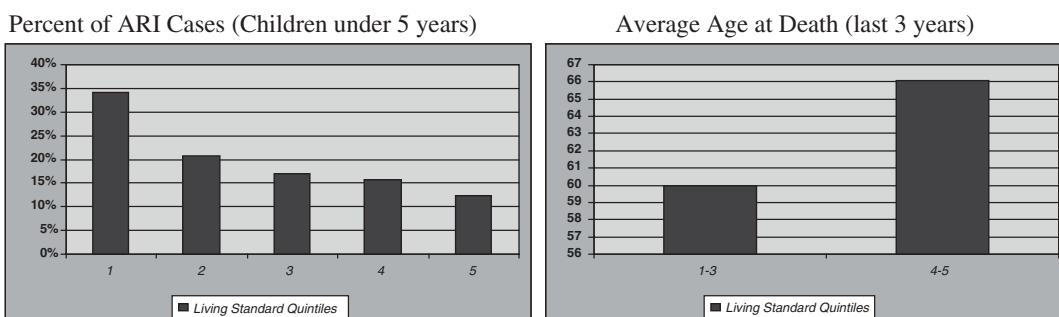
Source: Derived from data prepared by Tai, Thang et al (2006). Villages are classified low=1, medium=2, and high=3 pollution intensity based on type of craft production.

Industrial Pollution and Health

BOX 4.7 Craft Village Studies in Vietnam

Three comprehensive studies of the craft industry have been carried out in recent years. MARD/JICA (2005) identified over 2,000 craft industry villages, defined as having at least 20 percent of households produce the same craft or at least 20 percent of village income from craft products. MoST/HPU (INEST) (2005) identified 1,450 craft villages, including 840 in the Red River Delta, defined as villages with craft production constituting at least 50 percent of village income or having 30 percent of households engaged in craft production. MONRE/VEPA (2003) focused on 366 craft villages in six provinces in Nhue-Day River basin. The studies by MoST and MONRE concentrated on the environmental aspects and workers' occupational health risks in craft villages. KEI, Korea (2005) also reviewed environmental conditions in craft villages and explored potential environmental management solutions to the problems.

FIGURE 4.18 Burden of Ill Health in Urban Areas



Source: Calculated from VNHS 2002.

BOX 4.8 Main Findings by the Vietnam Background Study

- **Industrial pollution in many cases impacts all people, poor and non-poor alike but the poor have fewer mechanisms to cope with the impacts from pollution.**
 In Chi Dao commune, in a lead battery recycling craft village, both the poor, non-craft households, and wealthier craft households were impacted significantly by the different types of pollution. The craft households (there were only 25 in the 500-household village) live and work nearby heavily polluted water. The wastewater, which has been measured to hold 15 times the maximum lead-content standard, ends up in ponds or in the ground near the craft households. The poor are usually hired by the craft households to do the melting and collecting of the recycled lead at the furnaces, and thus are directly exposed to the toxic fumes. The lead content in the air in Chi Dao village is estimated to be about 4,600 times higher than the standard.
- **In Du Dai, a food processing craft village in Thai Binh Province, water pollution caused by livestock production and noodle steaming facilities affect the poor and non-poor indiscriminately. The poor however cannot afford health care treatment or deeper wells. Many of the workers are ethnic minority people.**
- **In the major cities, the poor live in locations with higher exposure to industrial pollution and higher risk to health damage and disaster**
 In District 6 in Ho Chi Minh City, an inner-city district with the highest poverty incidence (9.19 percent) of the districts studied, an open drainage canal that flows through the district is the cause of serious environmental pollution throughout the district. The poorest people, who live in slum areas along the canal, are most severely affected from the exposure to this pollution source.

Source: Tai, Nguyen Van and others (2006).

BOX 4.9 Relevant Experiences of Environmental Pollution of SMEs in China and Korea

Since the late 1980s, the main engine of China's industrial development has been industrial small- and medium-enterprises (SMEs), often referred to as Township and Village Industrial Enterprises (TVIEs). In China, TVIE's share of gross industrial output value increased from about 25 percent in 1990 to 58 percent in 1998, while industrial output value itself increased 20-fold between 1985 and 2004. From 1989 to 1995, TVIEs accounted for almost the entire increase in industrial-based water pollution loads. TVIE-generated particulate emissions (industrial dust) tripled and TVIE-generated solid waste volumes more than doubled. While industrial state-owned enterprises (SOEs) were subject to a set of government pollution control policies from the 1980s, the TVIEs were not subject to such regulations. When the pollution loads and their environmental impacts were realized through the nationwide survey of more than 1 million TVIEs in 1995 and 1996, the government decided in 1997 to close down about 70,000 small enterprises. As a result, pollution loads were driven down in 1998 and 1999. However, China is still struggling with the aftermath of the earlier "laissez-faire" TVIE policies. Some of the critical lessons are:

- It was particularly in the period when the TVIE contribution expanded that major pollution increases took place.
- The regulation to control pollution from TVIEs should have been in place at the outset of this expansion, not at its end.
- Technical, economic, and organizational means to control pollution from TVIEs should have been developed during the first phases of its expansion, not after.

Korea followed a similar path in industrial development and environmental pollution of SMEs. SMEs grew rapidly in the late 1970s and the early 1980s as government support was redirected away from the large conglomerates. The majority of SMEs were concentrated on high polluting industries such as textiles, dyeing, leather, foundries, metal plating, paper manufacturing, and cement manufacturing. SME-generated pollution loads were estimated to account for more than 80 percent of the entire increase in industrial pollution loads from the mid-1970s to the early 1980s. The 1963 Pollution Prevention Law failed to contain industrial pollution due to a social atmosphere that placed higher priority on economic growth over environmental protection. Following increasing pollution due to the proliferation of SMEs, the 1977 Environment Preservation Act introduced comprehensive environmental standards and total pollution load management, mainly targeting SMEs. Government's financial support to SME investments in pollution prevention facilities proved to be the most efficient policy. From 1983, the Korean Government began to provide long-term low interest loans and tax incentives for environmental investments and the downward spiral of industrial pollution was gradually reversed.

needs to be enforced. Second, mechanisms to modernize production facilities and use improved technology are required. Attention to the impact on low-income groups should be incorporated at all stages. While wastewater pollution control from craft industry is a priority, immediate attention is also needed in neighboring communes and areas with high reliance on shallow dug wells. Water quality monitoring of wells should be expanded, and programs implemented to provide local people, especially the poor, with safe water supply.

Pesticide Use and Poverty

Pesticides are the third and last specific research area in linkages between poverty and environ-

mental health. Pesticides relate to the agricultural sector and may cause diffuse pollution but their linkage to poverty is the potential environmental health risks that they generate.

Pesticide use in Vietnam started as early as the 1950s. Pesticide consumption grew significantly during the 1990s, increasing from 20,000 tons in 1991 to more than 40,000 tons in ____ (FAO 2004). These increases followed crop intensification and increased cultivation of crops that required higher pesticide applications, such as dry-season paddy or fruits and vegetables. In addition to the intensification of pesticide use, there is evidence of improper pesticide use and its impact on health. Hospital admission records in Vietnam, for example, trace nearly 11 percent of all poi-

sonings to pesticide misuse, with approximately 840 pesticide poisonings in 53 provinces in 1999 (Poison Control Center 2000). Available studies, however, do not provide any analysis of the burden of misuse shared by the poor.

At the national level, the National Health Survey reveals a clear pattern of higher pesticide use among the rural poor than among the non-poor (Table 4.6). There is also a pronounced pattern in the application techniques. Of those farmers who use pesticides, the poor use protective equipment during pesticide spraying much less frequently than the non-poor.

The lowlands do not show higher pesticide use than the uplands. First, the use of pesticides is prevalent in the whole country (Map 4.2). Second, the upland regions of the Northeast and the Central Highlands, which specialize in high-value perennial crops, have several poor provinces with the highest prevalence of pesticide use in the country.

The government has started an extension program of good agricultural practices that include optimizing the use of pesticides. Just as in other countries in the region, this shift is necessary to adjust to international market quality standards, and is also welcome in terms of improved environmental management. If this shift is to be successful, however, policies have to ensure that the poor and non-poor farmers, who are important

pesticide users, have access to appropriate agricultural inputs and techniques.

Eighty-six percent of the surveyed households report spraying pesticides every year. Pesticide use is highest—92 percent—among the poorer 20 percent of households, and lowest—75 percent—among the better-off 20 percent of households. The Vietnam Health Survey data for the Mekong River Delta is overall lower, with 58 percent of rural households using pesticides, but the linkage between income group and pesticide use is similar.⁷

Poor farmers in the survey use on average less than half of the total reported annual pesticide use among the non-poor households. This is not due to a more limited range of products used. There is no difference in the use of insecticides, fungicides, and herbicides among the poor and the non-poor. Crop intensity is similar. Eighty-nine percent of poor farmers in the sample and 60 percent of the non-poor cultivate less than 1.5 ha of land. Rice is cropped three times a year. Application times over one year are 4.5 times for the poor, which is slightly less than the 5-time average for the non-poor. Average quantities per application, therefore, make the difference.

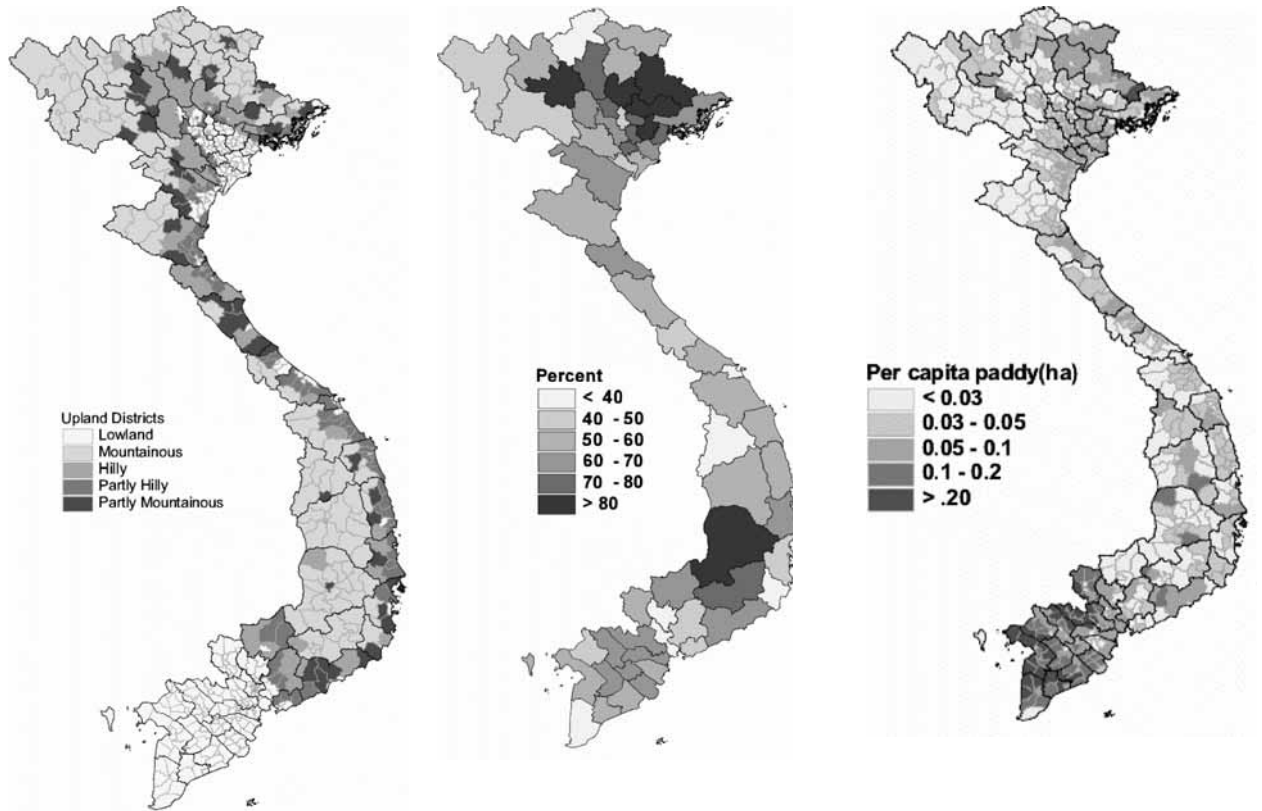
There is a striking difference in toxicity between pesticides used by poor households in the survey and pesticides used by the non-poor. When quantities were weighted based on their toxicity, it appears that the poor use a higher amount of “risk-weighted” pesticides (Figure 4.19). Slightly more than half the total quantity of pesticides used is, however, only moderately toxic based on the WHO classification (category II). None of the pesticides that the poor or the non-poor report using are extremely hazardous (category Ia) and only 0.5 percent of the total quantity is from the second-highest category of toxicity (category Ib).

The poor in the survey use masks and other protective measures less often; this is statistically significant at the 10 percent level. Around 42 percent of the poor do not use a mask and are, therefore, likely to use no protection other than a shirt and trousers, whereas only 36 percent of the non-

TABLE 4.6 Share of Rural Households Using Pesticides

Quintile	HH using pesticides	HH using protective equipment		
		Always	Sometimes	Never
1	64%	57%	18%	25%
2	73%	64%	17%	18%
3	68%	67%	16%	17%
4	52%	70%	14%	16%
5	35%	72%	11%	17%
Total	61%	65%	16%	19%

MAPS 4.9 Paddy Area Distribution in Vietnam



BOX 4.10 The Pesticide Use Survey in the Mekong River Delta

Why is pesticide use more prevalent among poor farmers? Is the use of hazardous pesticides also more prevalent among them? Do these facts relate to different awareness levels and behavior patterns about risks related to pesticide use? And do the poor differ from the non-poor in access to information on risks related to pesticide use and to protective measures? These are the questions that a survey in the Mekong River Delta undertook to answer. The study was also seeking to analyze whether health impairments attributable to pesticide use were disproportionately higher among poor farmers.

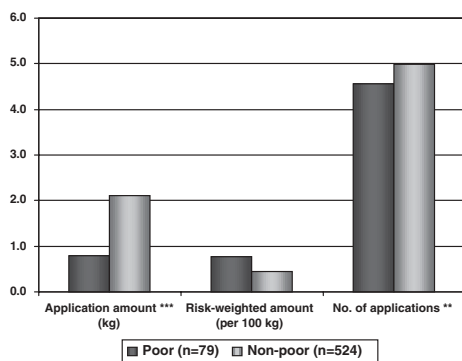
The study surveyed 603 rice producers in 10 districts about their cropping systems, pesticide use and practices, application precautions, averting behavior, and health effects.

The Mekong River Delta, the largest region of intensive rice production in Vietnam, was selected because it offered the advantage of a simple and intensive production system. This avoided discussing differences in pesticide use among a large range of crops.

Households with per capita income below 1.2 Million VND/year (13 percent of the sample) are defined as poor and compared with other households defined as non-poor.

The full report of the national team is available on CD-Rom (Dasgupta et al 2005, Nguyen 2005)

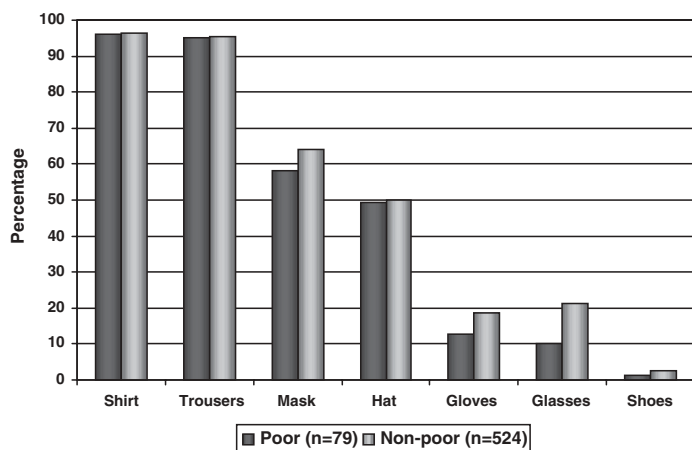
FIGURE 4.19 Application Amount, Risk-Weighted Amount (kg), and Number of Applications



***Statistically significant at 1 percent level of significance
 **Statistically significant at 5 percent level of significance

poor do not use a mask. The difference is more pronounced for protective equipment with less frequent use, such as gloves and glasses. When asked why, close to one-third of poor farmers said that masks were not available, compared to only one-fourth of the non-poor. Only 34 percent of the poor stated that they believed masks

FIGURE 4.20 Use of Protective Equipments



were uncomfortable, compared to 41 percent of the non-poor.

Poor farmers also use alternative plant protection methods less frequently. Only 9 percent of the poor state that they used integrated pest management (IPM) technologies, a number significantly lower than the 16 percent of non-poor farmers who cited the method. Similarly, 79 percent of the poor farmers—versus 68 percent of the non-poor—stated that they did not use any pest control method other than pesticides.

By contrast, the poor appear to be at least as aware of risks from pesticide use and to have good access to information. Both the poor and the non-poor in the survey make clear statements about their perceived risk from pesticide use. Only 3 percent of the poor and 1 percent of the non-poor did not answer the question. 30 percent of the poor stated that using pesticides generated a high risk, a proportion almost 50 percent higher than for the non-poor (Table 4.7).

Poor farmers have a fair level of access to information. Only 5 percent of the poor, or 2 percent-

TABLE 4.7 Perceived Risk of Pesticides (above) and Access to Information (below)

Source	Poor	Non-poor
Public media	38.8	40.9
Pesticide companies	17.8	18.5
Other	14.4	12.8
Agricultural extensionnists	17.7	11.6
Pesticide retailer	5.5	9.1
No information available	5.5	7.1
NGO	0.2	0.1
Total	100.0	100.0

Perceived Risk	Poor	Non-poor
High risk	30	21
Medium risk	25	26
Small risk	28	31
No risk	14	20
Don't know	3	1
Total	100	100

Sample size (n=)	Poor	Non-poor
	79	524

age points less than the non-poor, state that no information is available on pesticides. All farmers identify the public media as their primary source of information on pesticides. Pesticide companies and the staff of the local agricultural extension offices rank second as information sources. The level of education probably plays an important role in accessing information. Only 1 percent of the poor in the survey have no primary education, and more than 45 percent have studied beyond primary school. Availability of information from agricultural extension agents is also important. These are a main source of information for 18 percent of the non-poor, a proportion 50 percent higher than for the poor. More than 60 percent of farmers in the survey are aware of pollution from pesticides through water, and 27 percent state that wildlife could be impacted.

The usefulness of accessible information, therefore, appears to be a critical factor that triggers more cautious behavior in relation to pesticide use. The poor appear to have less access to training and to information that allows real choices. Only 29 percent of the poor compared to 34 percent of the non-poor in the survey say that they have participated in formal training in safe handling of pesticides. While this difference is not significant, the difference in access to IPM training is. IPM is an appropriate method for all farmers, regardless of their living standards, but while 60 percent of farmers in the two upper quintiles have received IPM training, only 37 percent of those in the lowest quintiles have participated in such training.

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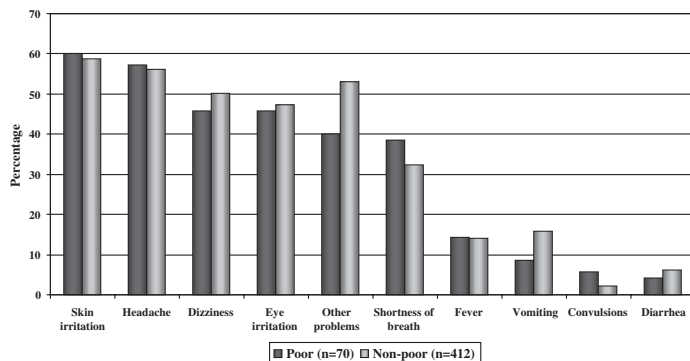
Suppliers also play an important role in pesticide use. Seventy-six percent of farmers in the first quintile purchase pesticides on credit, compared to 54 percent in the highest quintile. The poor thus depend on credit providers for product selection. The non-poor use pesticide retailers as information sources, but may be in a better position to compare. Only 21 percent of farmers in the lowest quintile regularly change the products they buy; 32 to 42 percent of those in the upper two quintiles do. Poor farmers state more often that the important factor in their choice of pesticides is price, not technical effectiveness or safety.

The poor may also be unable to avoid pesticide toxicity when they are hired for pesticide spraying. This situation is not uncommon, as indicated by the substantial proportion of rice growers in the highest quintile of the survey who do not report spraying pesticides (25 percent). Many of them probably hire other farmers to spray pesticides on their fields; these are likely to be poorer individuals or even landless people. Rural poverty is often related to landlessness in the Mekong River Delta.⁸

Potential differences in health impacts are difficult to identify. The tests carried out in this study may only have an indicative value, but they indicate substantial exposure to pesticides. Around 60 percent of farmers experienced skin irritations, headaches, dizziness, eye irritations, shortness of breath, and other acute short-term health effects after spraying pesticides (Figure 4.21).

There is no clear distinction in how the poor and the non-poor are affected, but there is high awareness of the issue among both the poor and the non-poor. When asked whether they believed that these symptoms were related to pesticide use, 81 percent of poor and 82 percent of non-poor farmers responded affirmatively. Different levels between the poor and non-poor are visible in some

FIGURE 4.21 Self-Reported Health Impairments After Using Pesticides (% of farmers)



cases, but may not be significant. Blood tests indicated significant exposure to organophosphates or carbamates among 42 percent of the poor versus 32 percent of the non-poor.⁹ Thirty-eight percent of the poor versus 31 percent of the non-poor reacted positively to patch-skin tests for contact dermatitis, indicating existing exposure to pesticides. In subsequent specific tests of reaction to three commonly used pesticides, only 15 to 25 percent of the farmers tested positive, and there was no clear distinction between poor and non-poor.

Policy implications

There are three main reasons why the differences observed among income groups in relation to pesticide use, although small in absolute terms, deserve attention in terms of policy making. First, the large range of variables that show a correlation with income groups provides a solid body of evidence of a poverty and environment linkage in pesticide use. Second, many of the differences observed are probably on an increasing trend. As the non-poor become increasingly able to avoid the use of more toxic pesticides, they may continue to be directly exposed to these pesticides. Third, the poor and the non-poor alike are subject

to potential health impacts in an environment where paddy fields are predominant. Waterborne diffuse pollution can become a substantial problem for all those who live in this environment.

The national policy to reduce the use of toxic pesticides is a sound policy with an overall positive impact both in terms of poverty and environment. This policy can, however, gain from careful incorporation of problems that are specific to the poor. Poor farmers tend to participate less in agricultural extension unless a specific effort is made to reach out to them. The relatively higher levels of education and access to information create an opportunity for information programs on pesticide use. These messages can help them change attitudes and practices when faced with a pesticide issue.

4.2.3. Poverty and Environment in Regional Programs: The Cau River Basin

Key findings

In contrast with classical environmental awareness messages, poverty and environment linkage areas cover not only forestry but also lack access to safe water and sanitation and impact from the mining sector in the upstream. Landscape degradation is an issue in addition to industrial pollution in the downstream. Localized environmental impacts are at least as important as impacts from one section of the river basin on lower section one.

Social differentiation within communities is increasing rapidly and is accompanying industrial pollution. This creates a need for public intervention to go beyond pollution remediation. Social differentiation with the upstream and downstream section is extremely high and is generating a need for balance within the river basin in the allocation of investment resources.

The village level is a key level for targeting specific investments, while the province is a key level for environmental awareness and stakeholder coordination.

The beautiful landscapes and clean waters of the Cau River in northeast Vietnam are described in a well-known traditional song in Vietnam. The river basin is today one of the three highest national priorities in terms of environmental management. The Cau River originates in Bac Kan Province. It then flows through Thai Nguyen City, a seriously polluted industrial zone in the country (Vietnam Environmental Monitor 2003). Bac Ninh Province in the Red River Delta is one of the downstream provinces and is home to a high proportion of the 200 craft industry villages in the river basin. The Cau River basin is among the most important areas in Vietnam in terms of population concerned with water resource management issues. An interim steering committee was set up initially to coordinate water resource management in the river basin. A 13-year master plan to protect the Cau River's environment was released in 1998. Water resources and pollution have been analyzed, and a substantial number of engineering solutions have been incorporated in

the provincial development plans. Implementation of the master plan, however, faces severe budget limitations. The Cau River basin was proposed in 2004 as a candidate to pilot an integrated sustainable development program under Vietnam's national Agenda 21.

Poverty and environment in the upstream cau river basin

Forestry in Bac Kan is an important part of land use and is clearly household-based, but the sector provides limited income. Close to two thirds of total land area within the river basin in the province and in the districts surveyed has been zoned as production forest land. Most forest is natural forest zoned for production due to a sparse forest cover. Satellite images show that active deforestation took place in the 1990s within the river basin, and that the limited reforestation operations have mostly taken place in more accessible areas (Castella and Dang 2002). Most of the

BOX 4.11 Comprehensive Analysis of Poverty and Environment Linkages in the Cau River Basin

How do various poverty and environment issues interact within the limited geographical domain of the river basin? Can these interactions serve as a basis to prioritize investments in the existing master plan and in the proposed sustainable development program? And what can be learned from these interactions to design environmental awareness activities within the framework of the national Agenda 21 program? A comparative analysis was carried out in two provinces in the Cau river basin to answer these questions.

A 700-household survey in six communes was combined with a methodology of rural appraisal with focus group discussions, direct observation, and interviews in Bac Kan Province, the upstream province, and Bac Ninh Province, one of the downstream provinces with a high concentration of craft industries. Actual household incomes have been recorded, which allows for analysis by quintile.

The survey was initially designed to analyze natural resource use in the upstream river basin survey, but the magnitude of mining and drinking water issues led to include these as well.

The establishment of a multisectoral commune-level database was envisioned but turned out to raise substantial difficulties¹⁰. Instead, we use district-level data from the PEN II land use database and the national health survey.

The master plan is designed to benefit the 54 districts of the 6 provinces that are members of the river basin committee¹¹. The analysis takes into account this level as well as (1) the 30 river basin districts defined as affected by the Cau River in the master plan;¹² (2) the impacted districts, or those districts plus the 12 districts of Hai Duong Province; and (4) the 16 riverside districts that directly create or receive pollution impacts along the main riverbed (Map 1). Area and population covered each vary from 1 to 3.7 between definitions (4) and (1).

The full report of the national team is available on CD Rom (Socio-economic development center 2005)

area is in a stage of natural regeneration. Ninety-five percent of households have been allocated forest land. Land that remains under a state forest enterprise provides fuelwood and benefits from protection contracts to the households.

The four districts located within the physical river basin are substantially less poor than the three more remote northern districts located outside of the river basin. The Dao people, an ethnic group generally living in disadvantaged conditions compared to the main ethnic group in the province, the Tay, account for a high proportion of the population in all districts but a higher one in the northern districts. Environmental stakes differ as well. Forest in the northern districts is mostly zoned for environmental protection and includes the Bac Be National Park. Slopes are markedly steeper than within the river basin. The impact of rotational agriculture, a practice that the Dao have retained in all districts to complement their small areas of paddy fields, is likely to be higher than within the river basin. Erosion within the river basin is generated by causes broader than rotational agriculture and mining is an important cause.

The mining sector is present in three of Bac Kan's four river basin districts. Its environmental impact on soil and water resources appears to be substantial. Cho Don district plays a crucial role in the water balance of the whole river basin, because of its location at the source of the Cau River. Cho Don is also the district with the largest proportion of land allocated to mining uses—2 percent of total land area¹³.

A combined issue of water quantity and water quality is stated by households as one of their main problems and affects the poor more than the non-poor who can afford alternative sources. Close to 85 percent of households mention water shortages during the dry season. Twenty percent of households in the water source commune have shifted from dug wells to gravity water pipes, because of declining water quality in the dug wells. This desire to shift to a more modern type of water supply can be related to the higher incomes

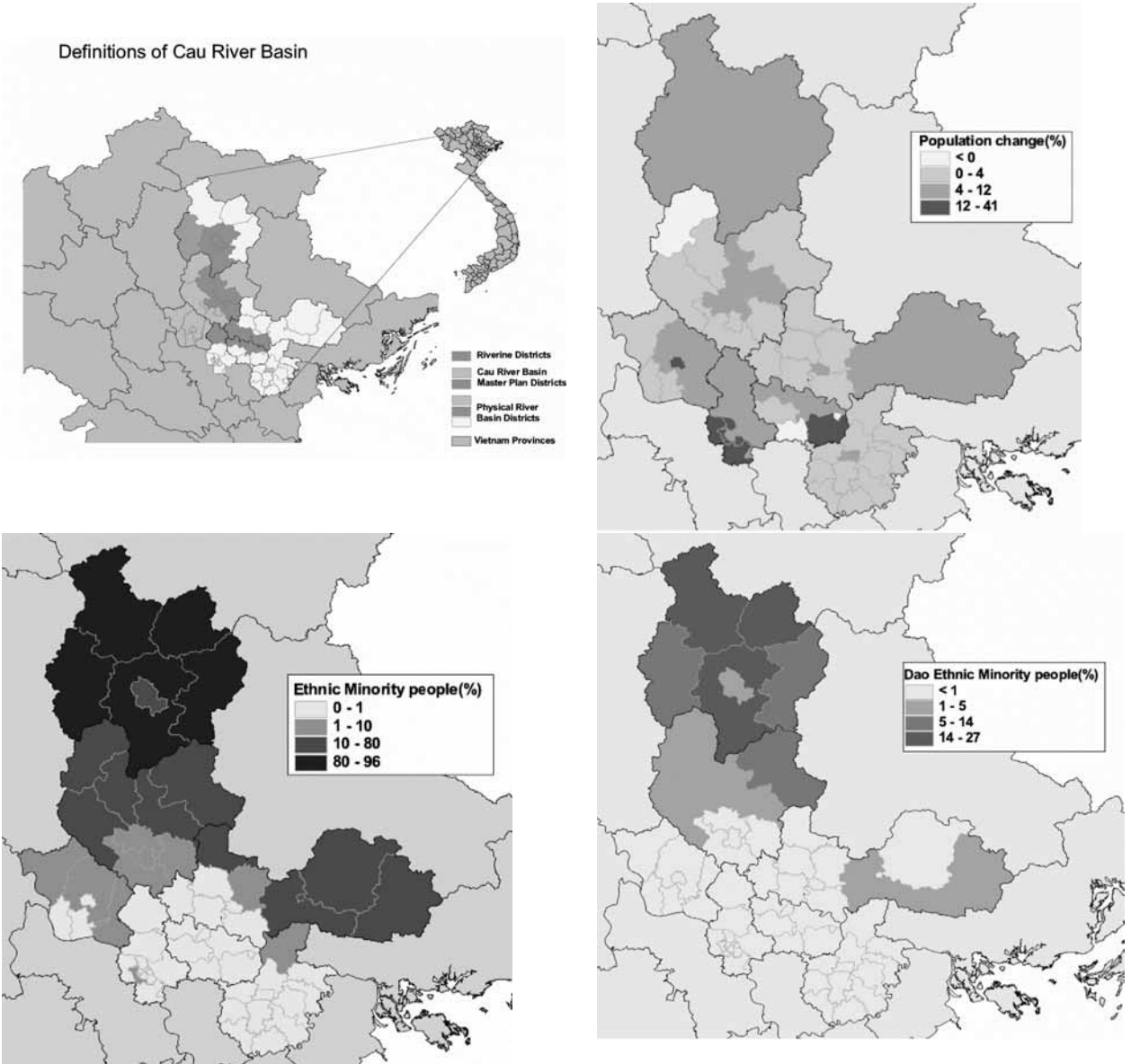
available from local employment in mines. Average incomes recorded in that commune are 45 percent above the other two communes. However, social disparity also increases with mining and other non-agricultural activities. The income of the richest 20 percent of the surveyed households is more than 9.5 times the income of the poorest 20 percent in the river source commune with the large mine. It is only 2.9 times greater in the fully agricultural and forestry communes. Poor households are often not in a position to avoid water pollution in dug wells.

Both large and small mines generate pollution issues. In one village within one of the three communes surveyed, a boom in illegal gold mining in the early 1990s attracted several thousand informal workers. The activity has been banned since, but households express high concern over water quality. They claim that they have lost domestic animals, an important household asset for households in poor communities, due to water toxicity.

Social differentiation is equally visible in access to forest resources. Poorer households have been allocated 3.6 ha of forest land on average, significantly lower than the average of 5 ha for the entire sample of households. About 10 percent of households have been allocated more than 10 ha and up to 67 ha of forest land. Poorer households are also allocated forest that is more distant.¹⁴ Allocation of distant forest land means fewer opportunities for households to use this land to grow timber or cash trees. The number of large domestic animals, another indicator of access to forest resources since large animals in the area mostly feed in the forests, is also clearly linked to income groups.

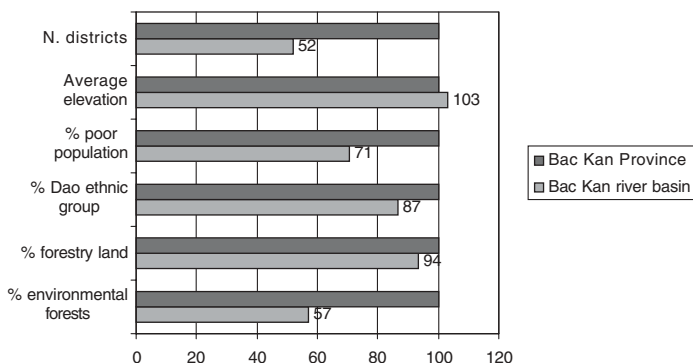
Differences in poverty levels between villages are visible. The average income in higher-income villages is 1.2 to 1.5 times the income of the poorer villages within each of three communes surveyed. These differences have a clear ethnic dimension. Two of the villages surveyed are from the Dao ethnic group in a mixed Tay, Dao, and Kinh commune, while the other villages belong to fully Tay communes with only a few Kinh

MAPS 4.10 Cau River Basin



Upper left: boundaries of river basin. Upper right: population change. Lower left: ethnic minority people in total population. Lower right: poverty incidence to replace Dao ethnic group.

FIGURE 4.22 Forestry and Poverty Indicators in the Upstream Province



households. The two Dao villages rank second and third poorest among the 11 villages surveyed. Paddy accounts for 100 percent of agricultural land in all Tay villages (except the two higher-income villages, where the land may have more profitable uses). It accounts for only 15–20 percent of agricultural land in the two Dao villages. The development of tea and other perennial crops on deforested forest land is low –1.3 ha one average - in all villages due to limited forestry budgets available for the provision of seedlings. The Dao villages have planted the smallest areas.

Ethnicity sometimes relates to poverty and natural resource use in opposite directions. Households in the two Dao villages have been allocated 6 and 11 ha of forest land on average, significantly more than in the seven higher-income villages, where forest land allocated to households is only 4 ha on average. This is due to larger forested areas in the remote locations where the Dao villages are established. All Tay villages are increasing their area of paddy field by opening new plots. One Dao village is engaged in the same trend, while the other is not. Paddy intensification through a shift from one to two crops a year is practiced in the two Dao villages and in the higher-income Tay villages, but not in the other Tay villages.

Poverty and environment linkages in the upstream Cau River basin appear to have a “his-

torical” stratum related to differences in status between villages in each commune and a more recent stratum related to social differentiation within communities. In the first stratum, poorer villages have smaller paddy field areas and continue to farm sloped land, although they are gradually reducing this practice through intensification of the paddy fields. They may access larger areas of forest land but are less likely to derive income from it. Poorer villages have less access to collective water networks and are at risk of significant impact from point pollution. In the second stratum, the poor are more exposed to dug well pollution and less opportunities to derive income from their forest land.

These strata are not visible in statistics alone. The income of the surveyed Dao households is 74 percent of the survey average, less than the income gap between households. The richest commune is also the commune where the income of the poorer 20 percent of households is the lowest. Finally, differences between the poor and the non-poor in land use are not visible when comparing average variables for income groups across the district.

Poverty and environment in the downstream cau river basin

Bac Ninh Province, although downstream of Thai Nguyen’s heavy industries, has important pollution sources in the province itself. The development rate of household-based craft industries in Bac Ninh Province is staggering. The number of households running craft industries in Yen Phong, the main district surveyed in Bac Ninh Province, grew to more than 5,600 in 2004. In this district, 20 percent of households run a craft industry. High pollution impact is generated by craft industries, agricultural ventures and large enterprises and is concentrated in a small number of villages within the communes. Paper recycling is one of the heavily polluting craft industries. Phong Khe village, a well-known craft village part of the survey, turned to paper recycling in the 1990s after

firecracker production, its former production, was banned. The second surveyed commune has a pig-raising and alcohol-brewing village. A local coal power plant is the main pollution source for the third survey commune, which has retained agriculture as its main activity. State-owned industrial industries in Yen Phong district increased from 5 to 24 over the same 10-year period, and private enterprises grew from 23 to 154.

Social differentiation is growing rapidly and is substantially higher than in Bac Kan. The incomes of the richest 20 percent of households in the paper recycling village are 54 times the incomes of the poorest 20 percent in the third commune (the commune that has not diversified out of agriculture). The poor population in craft villages is mostly comprised of workers coming from outside the village to work in local household-based industries. There are no less than 4,000 workers in Phong Khe village alone. Occupational health and lack of healthcare system was mentioned as an issue by the respondents.

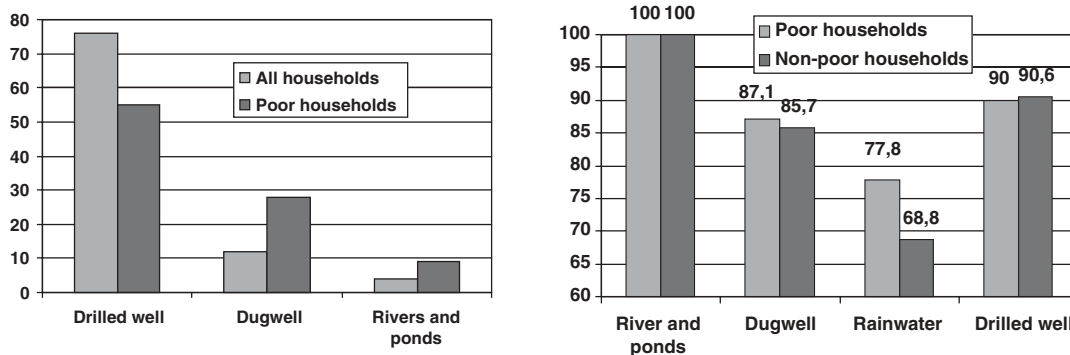
Unclean drinking water, a contaminated general water environment, coal gas, and dust are the environmental issues mentioned as affecting daily lives. Commune health workers witness higher incidence of several diseases in the craft villages. The poor reported 9.8 sick days in the

last 12 months versus 6.4 days for the non-poor. Both of these figures are higher than the national average of 5.8 days. The entrepreneurs see pollution as an unavoidable cost of poverty reduction. This view is supported by rapid reduction of poverty incidence decreases as pollution increases. The proportion of households with incomes below \$1 per day is 57 percent in the agricultural commune, 33 percent in the alcohol brewing commune, and 13 percent in the paper recycling commune.

The poor are at least as aware as the non-poor about environmental risks. They use water sources that are less safe but state concerns about unsafe water more often (Figure 4.23). They assess dug wells as an unsafe water source but are twice more likely to rely on them than non-poor households. The poor even raise concerns for water quality from drilled wells.

District and commune leaders underline the technical and financial limitations of the two pollution remediation policies are in place, (1) hotspot treatment for some of the large industrial establishments; and (2) the development of industrial zones to move craft industries out of residential areas. The coal power plant has been covered under the pollution remediation program for large industrial sites but local residents believe that the

FIGURE 4.23 Water Sources in Three Downstream Communes. Left: Percentage of Households Using Water Sources. Right: Percentage of Households Assessing Water Source as Unsafe



impact from the exhaust has remained significant. An industrial zone was created in the paper recycling village, but only 60 industrial establishments, or around one-third of the total number, have had the means to assemble the required investment to settle in that zone. The leaders stated feeling as though they were left alone to address local pollution issues with limited resources. They underline that the river basin master plan assembled evidence of pollution charges many times above national standards as early as 1998, and that yet limited changes have taken place since then.

Linkages between the upstream and downstream river basin

Bac Kan and Bac Ninh are two provinces only a short distance away from one another that reflect the extreme upland/lowland dimension of the poverty-environment nexus in Vietnam. Bac Kan Province was created when the former Thai Nguyen Province was divided into two by zoning out into the section of the province that specialized in forestry. Bac Kan has the third lowest population density in the country (57 people/km².) Bac Kan, with 62 percent of its land area under forest cover, is the third most forested province in the country. The province ranked seventh in terms of poverty incidence in 2004, just as it did in 1999. It only ranked 55th in terms of

absolute numbers of poor people in 1999, despite the fact that 60 percent of its residents live below the poverty line. This figure remained high in 2004, estimated at about 50 percent.

Bac Ninh had 445 poor people per km² in 1999, the highest density in the country in relation with very high rural population densities, 1,064 people/km² in 2000 or more than 20 times the population density in Bac Kan. With the exception of Hanoi municipality, Bac Ninh is the province with the smallest territory and the highest population density in Vietnam. It is also the third least forested province in Vietnam, with only 1 percent of land zoned as forest land. GDP per capita in Bac Ninh is 85 percent higher than GDP in Bac Kan, though the economy is now growing at the same rate of 2.3 to 2.4 percent per year in the two provinces. Poverty incidence in Bac Ninh decreased from 38 percent in 1999 to 3 percent in 2004.

All household and community-level indicators of poverty are markedly higher in the upstream districts reflecting both lower incomes and lower access to services (Table 4.8). There are however two exceptions. Paddy field per capita is however not lower in Bac Kan than in Bac Ninh. Area per capita is very small in Bac Ninh in relation to high population density, and progress in opening new paddy fields to increase the sustainability of farming has been made in Bac Kan. Children in

TABLE 4.8 Poverty and Environment Indicators in the Upstream and Downstream Districts

District/Province	Cho Moi/ Bac Kan	Yen Phong/ Bac Ninh	% Bac Ninh/ Bac Kan
Monthly income 1000 VND (VLSS)	191	326	171
% Kinh population	21	100	476
Agricultural land per capita	1347	545	40
% crop production in income	42	8	18
% agriculture and forestry in income	62	22	35
% households with temporary housing	26	1	5
% households without safe water	85	20	23
% households without sanitation	79	54	68
% communes with doctor	44	100	229

Bac Kan, although overwhelmingly from ethnic minority groups, have equal access to education. In the future, job opportunities outside subsistence farming and information in general might become equally accessible across the river basin.

One of the most common environmental awareness messages in Vietnam says that increasing forest cover rates in upstream watersheds will preserve or improve water balance in the downstream watersheds and prevent soil erosion. Upland farmers in some of the poorest, heavily forested districts are receiving this message repeatedly (Tessier 2002). This message is very far from reality in the Cau River basin. Forest resource degradation impacts the local economy in the upstream section before generating potential impact in the downstream section. Most of the forest land is now under natural regeneration, but this process will take a long time.

Assessing the relative responsibilities of subsistence farming and of commercial forest exploitation in forest degradation in the past is much less of a priority than building alternatives for the current period. Alternatives are in place for farmers who are starting to develop tea and other perennial crops but are more difficult to identify for the local government itself. The development of the mining sector, an alternative with a disproportionate environmental impact, is not an appropriate solution. Forestry and related rehabilitation needs do not only relate to the upper river basin. Just as in the traditional song about the Cau River, trees were an important element of landscapes all along the Cau River.

The downstream river basin suffers from an uneven water balance, but there is no evidence of the impact of subsistence activities in the upstream river basin. Much of the pollution increase in the downstream section is reported as being generated locally by a combination of heavy industries, unregulated craft village industries, agrochemicals, and organic pollution. Heavy industries in Thai Nguyen not only generate pollutant emissions, but also have high water uptakes that reduce water availability for the downstream section of the river

basin. Flood episodes followed by low water flows do put downstream provinces at risk and worsen pollution impact but water shortages are also an important issue in upstream communes. Local stakeholders mention a possible combination of factors that include disruption from mining operations at the river basin head and past degradation of forest resources, perhaps in combination with climatic trends. This is consistent with the fact that soil erosion in Bac Kan may be a more serious issue in sections of the province that belong to river basins other than the Cau River basin.

Policy implications

The masterplan mostly proposes investments for forestry development in the upstream section are mostly for forestry development, and concern for environmental issues is limited to the downstream section of the river basin. By doing so, the masterplan omits the issue of access to safe water and control of spot pollution in the upstream section. It does recognize the need for planting trees and improving landscapes in the downstream section. The continuing focus on forestry in the uplands is more dictated by the absence of budgets available from national programs.

The environmental improvements identified in the initial master plan significantly exceed the financial resources available. The master plan budget is \$1 per person per year, if the six provinces are fully included. The master plan underlined the importance of more cost-efficient “soft investment” to overcome these important budget constraints. Improving coordination between agencies and exchange of information was identified as an important type of “soft investment” early on. The focus of the Agenda 21 program on environmental awareness is a second type of “soft investment.” Messages based on a comparison of representative communes—one in the upstream section, one in the downstream section—were initially planned. The awareness messages would have described initial difficulties and progress made through a pilot program in these two communes.

The Cau River basin offers an ideal setting for innovative environmental awareness messages. Messages that would tell the story of a need to increase forest cover rates to restore water balance in the downstream section can be replaced with up-to-date, realistic messages. The strong contrast between less-favored forested uplands populated by minority ethnic groups and heavily polluted lowlands that also have an important poverty issue is an opportunity to develop messages based on two shared issues, the need to restore water quality and landscape degradation. Messages based on shared issues have higher potential to generate attitude change.

In a constrained budget environment hard investments are likely to remain focused on selected locations within the physical river basin itself. The provincial level is however an appropriate level for cross-sectoral coordination and environmental awareness and is recognized in the master plan. Some of the solutions to environmental degradation within the physical river basin are located in province sections that are out of this river basin. Tourism development is an option worth exploring as an alternative to mining in Bac Kan even though the Bac Be national park is outside of the physical river basin. Well-functioning protected areas may be a powerful awareness-raising factor. They convey the message that industrial pollution is not a necessary evil in economic development.

Interventions prioritized as “win-win” poverty and environment solutions are also cost-effective solutions that can help alleviate budget constraints. Safe water access ranks first among these cost-efficient solutions. Affordable options to give access to safe water to the poor in the downstream section are likely to be less investment-intensive options than full coverage of the population with tap water systems. Access of specific villages to safe in the uplands can be more cost-efficient than larger-scale tree plantations. When safe water access is secured. Households will continue to shift from cropping sloped land to animal production and perennial crops as tea.

Community capacity building is another cost-efficient intervention with the potential to be a “win-win” solution in the long term for poverty and the environment in the Cau River basin. Capacity building needs are high among local cadres. With improved capacity access of poorer communities to development opportunities or to environmental improvements can improve. Building community capacity through various means, from training local cadres to formal enhancement in the regulatory framework, is an indirect environmental intervention, but a direct poverty reduction intervention that can significantly improve the environment.

4.3. POLICY OPTIONS: INTEGRATING POVERTY AND ENVIRONMENT IN NATIONAL POLICIES AND PROGRAMS

1. Geographical Targeting of Policies and Programs

Prioritizing the upland sector or the lowland urban and industrial sector is not relevant. There is a dual need for interventions in the marginal rural areas and in the urban or peri-urban areas that are in a rapid industrialization process. There is, however, a striking contrast between existing poverty reduction programs in upland rural areas that are mostly conducive to environmental improvements, despite room for improvement, and environmental programs in urban and industrial areas that have so far largely missed a pro-poor dimension. The former deserve continuation in the long term, while the latter require innovative and pro-active approaches. The danger would be to reduce “well-known” interventions in upland rural areas to concentrate on innovative interventions in the lowlands. Some lowland rural areas also have important poverty and environment issues that are unrelated to industrialization. These include the Southernmost areas of the Mekong for access to safe water and coastal areas with poor population subject to typhoons.

Upland rural areas with persistently high poverty rates and pressing natural resource management issues will however deserve specific intervention programs in the long term. The government already has a long-standing policy of specific support to these upland, ethnic minority areas and a specific agency, CEMMA. The initial goal of this policy was centered on security concerns in border areas, and economic development was mostly promoted through in-migration. This goal shifted to poverty reduction in the early 1990s (Communist Party of Vietnam 1989) and several targeted programs are implemented, today with support from several international donors. The 135 Program under the Ministry of Planning and Investment, initiated in 1999, is probably the best-known program for upland areas along with other programs under MOLISA. This program targets poor and remote communes primarily for small infrastructure development. The number of beneficiary communes totaled 1,875 in 1999, and increased to 2,335 in 2003.

The Northern mountains region stands out for its very high poverty incidence and poverty depth. Poverty and environment linkages are equally important in the central regions. Regional differences can best be taken into account through programs with a regional dimension. And the specific need for an actively pro-poor continuation of forestry reform in the central regions needs to be fully recognized by Government and donors alike.

The Red River Delta and adjoining provinces has an outstanding issue of rapidly growing pollution and degraded river basins such as the Cau river. These deserve geographically targeted interventions. Interventions covering both uplands and lowlands and oriented towards soft investments such as environmental awareness can have high efficiency compared to pollution remediation alone.

Targeting poor villages within communes is both a need and a challenge. Poverty and environment issues are combined in some of the villages in some cases, separate in others. Most impor-

tantly capacity to prioritize village needs and interventions needs to be enhanced among government and at commune level and specific tools are needed.

Finally, some poverty and environment issues would be best addressed at a nationwide level. Environmental health risks in relation to pesticides, for example, are prevalent throughout the country.

2. Priorities and Importance of Multi-Sectoral Approaches

The policy implications of each detailed PEN research area together create a framework of priorities (Table 4.47). Other priorities that have been covered under the PEN research include pro-poor disaster preparedness programs, environmental health issues such as malaria and indoor air pollution, and issues specific to protected areas.

Potential “win-win” impact on poverty reduction and the environment lies more in incorporating better attention to the environment in existing poverty reduction programs and taking a “pro-poor” approach in existing sector policies and environmental programs than in innovative interventions.

Most priorities identified are multi-sectoral within broader rural or urban and industrial development areas. Interventions needed for balanced and equitable industrial development for example are multi-sectoral by nature. A poverty and environment approach needs to take into account not only pollution control and prevention through relocation of industries to industrial zones for example, but also how each solution may affect the poor differently from the non-poor. Urban development, including transportation, determines the locations where the poor can afford to work and live. Health services in urban areas can be pro-poor by focusing on children and the elderly and on occupational health in high-risk occupations. Social protection measures accessible to the poor are also a necessity. Although the

TABLE 4.9 Summary of Program Priorities in Relation to Poverty and Environment Linkages

Poverty & environment linkage area	Program/policy priority
Environmental health in rural areas	<u>Clean water & sanitation</u> : improved services for rural households: a—with no improved water supply or sanitation b—using polluted dug wells. Information/education programs. Community leader information and training. <u>Pesticides</u> Strategic information campaign for users and retailers
Environmental health in urban and industrial areas	<u>Industry regulatory framework and institutional capacity building</u> Example: pro-poor national regulatory framework for craft industries <u>Urban & peri-urban development</u> Priority to access to safe water and sanitation Affordable improvements in working & living conditions Capacity building for land law implementation
Natural resource use in upland areas	<u>Continued poor commune program</u> with improvements in: Community capacity building Information <u>Land administration</u> Development of modern land use plans, with simplified specifications in marginal areas Community leader information and training on legal framework Linkage to pro-poor forestry reform in the transition from State to enterprise sector
Natural resource use and environmental health	<u>Area-based integrated program</u> Environmental awareness program combined with selected priority investments

government is already implementing some multi-sectoral interventions, the agencies that have taken part in the PEN research or contributed data—MoNRE, MPI, MARD, MOH, CEMMA—can improve the poverty and environment impact of these interventions through better coordination among themselves as well as among other stakeholders that include enterprises, local governments or the media.

3. Opportunities for Poverty and Environment Initiatives

There is an opportunity to give high visibility to broad poverty and environment issues by making them stand-alone initiatives. Four such initiatives have been identified (Box 4.12).

The specific difficulties of marginal upland areas that are home to ethnic minority people deserve to be addressed by a separate poverty and environment initiative for the Cordillera. Such an initiative could facilitate recognition that, despite existing policies, inequitable access to resources or lack of capacity to compete with other economic operators creates powerful limitations in poverty reduction, sound environmental management, or both. Building community capacity in areas such as land administration would also have potential in such an initiative. An initiative in the region could also focus on bringing pro-poor information that, unlike general mass media information, would be tailored to the practical needs of the local population.

BOX 4.12 Potential Poverty and Environment Initiatives and Cross-cutting Limiting Factors

There is potential for four poverty and environment initiatives:

- A nationwide clean water and sanitation initiative
- A poverty and environment initiative for ethnic minorities in the Cordillera (in relation to the existing partnership for poorest communes)
- An area-based comprehensive initiative in degraded territories (already planned for the Cau River basin) to support innovations in pro-poor environmental health and pollution remediation.

Access to clean water and sanitation is such a clear and broad poverty and environment priority that it deserves a specific nationwide initiative. The contrasted issues of the marginal upland areas in the Cordillera and of the rural and peri-urban areas that are increasingly affected by diffuse pollution would justify a double initiative. A specific clean water access program—instead of the existing general infrastructure-building 135 program—would serve to target those currently without access and would help balance investments between clean water and roads or other much-needed but expensive infrastructure. In the lowlands, affordable, broad-based solutions to address diffuse pollution need to be introduced. Again, access to appropriate information for the poor would be an important element of such initiatives.

An initiative in the urban and industrial sector would facilitate innovation, a critical element for success in these interventions. Innovative approaches are needed for issues that are partly rural, partly peri-urban, and partly urban. Innovative technical management systems need to be set to address issues such as diffuse pollution, as well as in terms of institutions to deal with, for example, pollution issues concentrated in villages within communes. Disclosure of information on pollution levels, wherever possible based on improved pollution monitoring, can be a useful measure to help the poor and the non-poor get relevant information. Public awareness campaigns can also help promote risk-averting behaviors among low-income groups. The proposed Agenda 21 program in a degraded river basin is one of

these innovative interventions. A regulatory framework for craft industries and other major gaps in the legal or regulatory framework require urgent action. Improved capacity for multisectoral urban development policies is a critical skill. Improved institutional capacity can bring in improved implementation and enforcement of the regulatory framework, enhanced coordination between stakeholders, and increased attention to innovation.

The Ministry of Planning and Investment (MPI) has expressed interest in Bank assistance to urgently address industrial pollution issues in “hot spots” particularly in the Cau River Basin as a follow-up to this study (note that this proposal is being shaped at present in line with findings presented in map 4.8). The planned pilot project would provide technical assistance to support (i) the *government* in strengthening monitoring and enforcement of compliance with environmental regulations, implementing environmental information disclosure programs, and introducing regulations for craft industries; (ii) *industry* through the preparation of environmental management audits, the introduction of self-monitoring and environmental management systems such as ISO 14,000, adoption of clean technology, and training programs for workers’ safety in high health risk industries; (iii) the *banking sector* through the preparation and adoption of environmental manuals. On the investment side, the project would pilot pollution management investments including (i) the establishment of centralized craft industry zones and centralized waste water treatment systems for highly polluting craft industries in areas with high pollution risk of

potable water supplies and where the density and size of craft industries make this economically justified; and (ii) investments, in a cost sharing basis, in cleaner technologies and pollution control in medium and large scale enterprises in high growth-high pollution intensive sectors in enterprises, which make commitments to introduce environmental management systems and to comply with environmental regulations. MPI is considering the inclusion of an environmental health component into the proposal, reflecting health impacts polluting industries may have on certain populations, for example through the use of unsafe drinking water sources (see figure 4.23).

Endnotes

1. The latest World Bank poverty update for Vietnam shows that in 2004, 39 percent of the poor were ethnic minorities, a figure that has risen from 20 percent in 1993.
2. Since it was too early to examine land titles, the analysis was done on allocation of land use rights on forest land.
3. Foreign-invested industrial output has no significant association with provincial poverty or living standards. This might be influenced by the concentration of foreign-invested industry in a few provinces, and is not necessarily inconsistent with the foreign-invested industry having important macroeconomic benefits, and thus indirectly contributing to higher living standards.
4. Pollution intensity defined as pollution load per unit of production output.
5. World Health Report 2002. World Health Organization.
6. Estimated from the VNHS 2002.
7. The health survey covers all rural households, while this survey is focused on rice growers.
8. The study was focused on rice growers and therefore did not cover exposure of landless people to pesticide use.
9. The blood test used a cholinesterase enzyme technique measuring active cholinesterase enzymes in erythrocyte and plasma using the Test-Mate-Kit (EQMR-USA).
10. IRR's SAM project has established a detailed database for Bac Kan Province.
11. Hanoi municipality only has two river basin districts and is not a full-fledged member; Vin Phuc is a full member with six river basin districts, although the Cau River does not flow through the province; Hai Duong is a member because it receives downstream impacts.
12. The actual number of districts is changing. Three districts have recently been merged or divided into two. In all districts, AQ4 at least part of the physical river basin are included. Six of Bac Giang's 10 districts, which are the watershed of a lower tributary, are excluded.
13. Mostly under a joint venture between a state-owned enterprise from Thai Nguyen province and two Asian enterprises.
14. Poorer households in other case studies were found to be allocated more distant forest land with poorer quality land (Sunderlin and Huynh 2005). The survey only recorded distance to land with protection contracts, but a similar situation is expected for production forest.

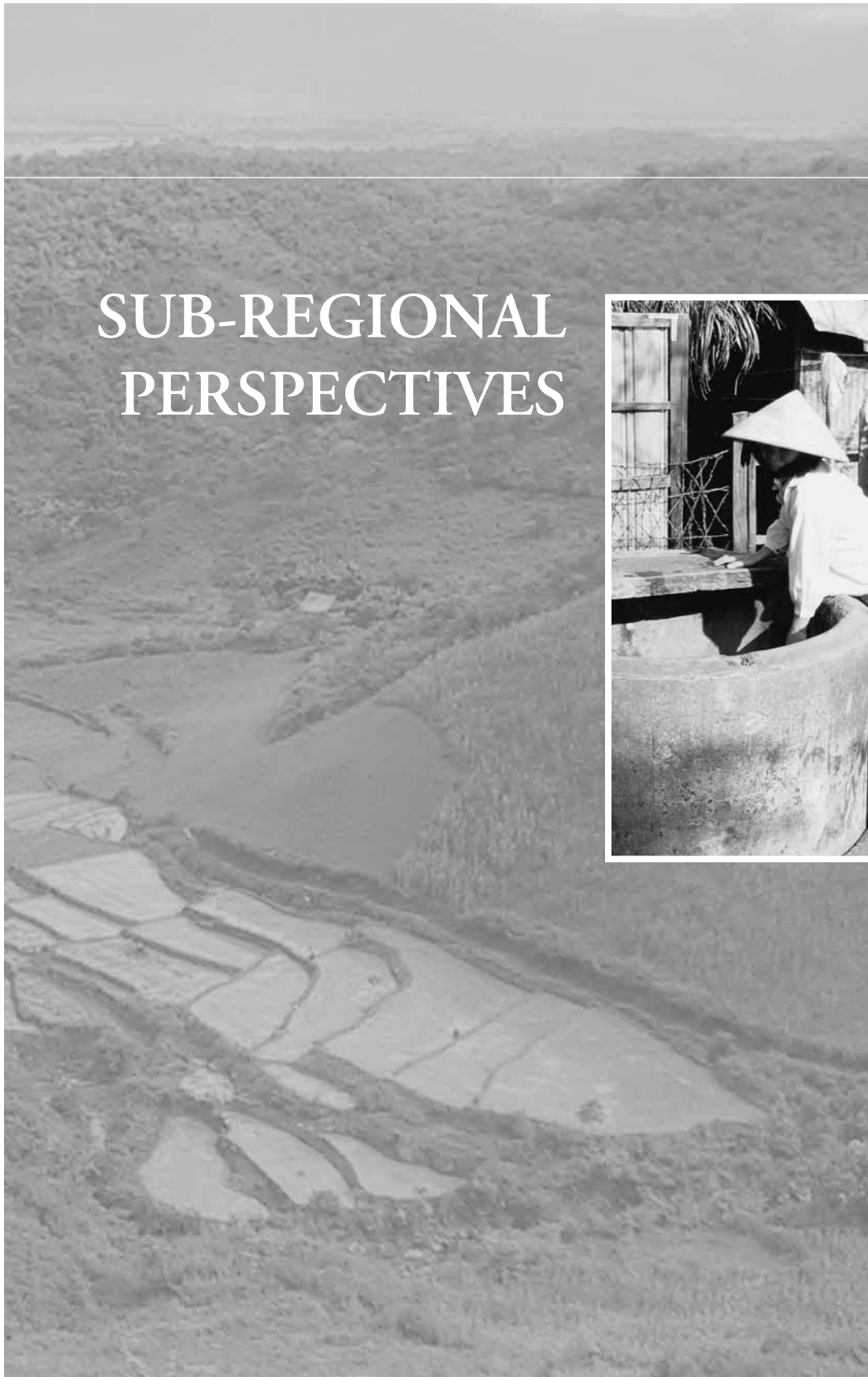
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SUB-REGIONAL PERSPECTIVES



Subregional Findings

INTRODUCTION

The Lower Mekong River flows through Laos, Cambodia, and Vietnam in its lower stretches. Do the three countries form a “subregion” in terms of poverty and environment issues?

The Lower Mekong River itself is not a common thread when environment is analyzed from the point of view of its linkages to poverty. In Cambodia, seasonal floods heavily affect large numbers of poor. At the same time, seasonal flooding is important for many rural farmers. In Laos, the Mekong floods affect the non-poor groups that form the vast majority of Mekong plains inhabitants. In Vietnam, floods along the northern central coast are related to local topography and typhoons and not to the Mekong River, and only the southernmost section of Vietnam, the Mekong River Delta, belongs to this river basin.

This chapter highlights which areas of poverty linkage have high magnitude in only one of the three countries or are shared among two or three countries. The practical solutions to these issues are often country-specific, but broader policy options are largely similar. This creates opportunities to jointly address poverty and environment above the national level.

Subregional environmental initiatives are already in place, but there is a largely untapped

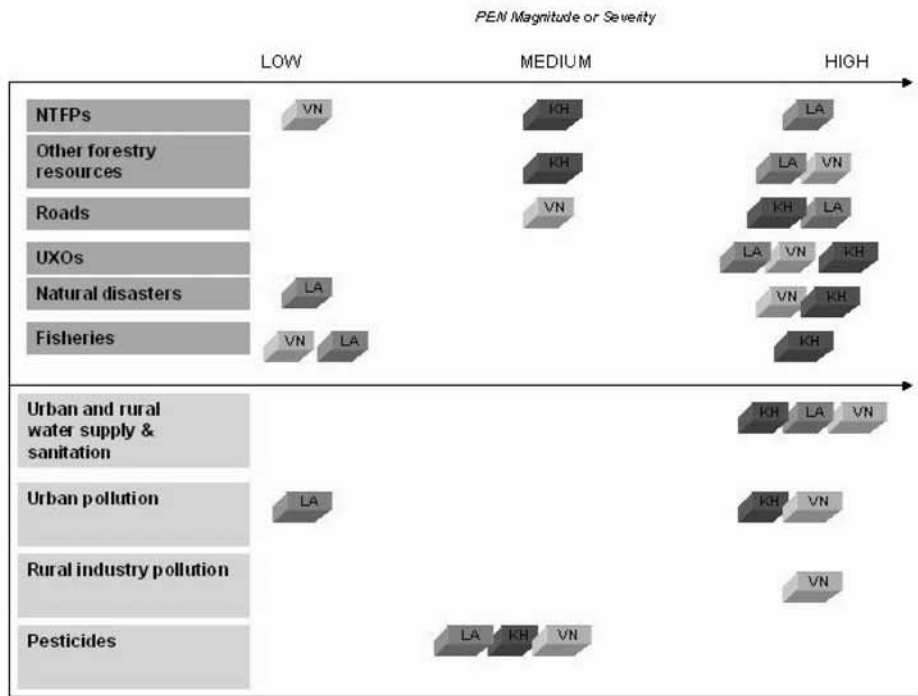
potential to address poverty jointly with environment in initiatives at that level. The three countries are already part of cooperation bodies, most notably ASEAN and the Mekong River Commission.¹ ASEAN is a driving force behind the current opening of borders and regional roads.² According to MRC, the international body established to promote and ensure the sustainable management of water and related resources, the condition of the common resources “ha[s] implications for how successful people are in raising their standard of living and bringing about related social improvements” (MRC 2003).

Potential joint initiatives will be a focus topic for discussion among national stakeholders at the subregional PEN conference. This draft chapter will be revised after the conference to fully incorporate the results of this upcoming event.

Shared Features in Poverty and Environment Linkages

The PEN research has analyzed the magnitude of several poverty and environment linkages in Vietnam, Laos, and Cambodia. When taking a horizontal view of poverty and environment, linkages can be ranked as having high, medium, or low magnitude or severity based on information on spatial distribution of the issue and of poverty (Figure 5.1).

FIGURE 5.1 Magnitude of Poverty and Environment Linkages in the Three Countries
 VN = Vietnam, LA = Laos, KH = Cambodia



Poverty and environment linkages of high relevance in more than one country include:³

- Environmental health issues with water supply and sanitation and urban pollution,
- Natural resource use issues related to forestry issues (including NTFPs, other resources and the impact of roads), UXO contamination, and natural disasters.

Environmental Health and Poverty

The analysis of environmental health and poverty linkages in each of the three countries has revealed three important shared features (Figure 5.1):

- The joint existence of a poverty and environment nexus for clean water and sanitation and of important difficulties in taking it fully into account (in all three countries),
- A combined issue of lack of access of the poor to services and of widespread diffuse water pollution (in all three countries),

- Low levels of community capacity and information on environmental health (an issue of special relevance in Vietnam and Laos), and
- Special challenges in urban areas (Vietnam and Cambodia at the present stage).

Access to safe water is spelled out in the national policy frameworks and is one of the Millennium Development Goals. Yet the gap between the poor and the non-poor in accessing clean water and sanitation, and their lagging behind in the progress being made, remains a major environ-

mental health issue. Differences between countries are dwarfed by the shared importance of the issue itself (Figure 5.1).

For the subregion as a whole, there is a risk of diffuse water pollution of diverse origins. This has already materialized in Vietnam. Water pollution in upland areas originates not only from local organic sources, but also from pesticides. Water pollution in lowland areas can be a combination of organic, agricultural, and industrial pollution. The wide distribution of paddy fields and water bodies in all regions, not only in the lowlands, probably plays a significant role in this problem. The poor and non-poor share the issue of avoiding pollution when they live in areas with polluted waters. The poor, even in marginal rural areas, can also be confronted with spot pollution. With high and increasing inequity levels, the poor visibly find it difficult to access the improved services being created.

The PEN research provides evidence that ethnic minority people have less access to clean water and sanitation and demonstrates that complex demand problems are probably at play. The poor are at least as aware as the non-poor of pollution risks but, as pointed out in the case studies, communities need to have the capacity and local institutions in place to access services and maintain them. Appropriate information for individuals is also often missing. The lack of appropriate technology is also a problem, especially in Cambodia's drought-affected plateaus and in the case of Vietnam's polluted dug wells.

Inequitable access to safe working and living environments is high in the growing urban areas in the subregion, as well as in Vietnam's industrial areas. Communities do not have formal institutional capacity to manage local issues. Information on workers' rights and residents' rights is weak. Improved management systems, such as urban land use planning, are just starting to be put in place in Vietnam through the land law.

Natural Resource Use and Poverty

Regarding linkages between natural resource use and poverty, the analysis derived two important shared features in the three countries:

- Access of the poor to their resource base appears to often be a prominent issue compared to appropriate management of resources by individual households, and
- Communities' capacity in marginal areas is weak; this stands out as a limiting factor for the implementation of potential poverty and environment policies.

Access of the poor to their local natural resource base is restricted in some cases and totally open in others. Issues of restricted access, generally to forestry resources, are insufficiently recognized in the subregion—in sharp contrast with other countries in Southeast Asia such as Indonesia (Homes 2002). Stakeholders that compete for resource access include local and migrant households in migration regions, both of which are possibly equally poor. They also include larger operators, from small local entrepreneurs to large international corporations. The weight of the forestry sector in the three countries is a key element in this context. Commercial timber is a major national commodity in Laos and Cambodian, and remains an important one in the southern two-thirds of Vietnam. This competition is openly discussed in the media in Cambodia, but not in Laos and Vietnam. Difficulties with open paddy fields in UXO-affected areas in Laos are another type of access restriction. Examples of open access include most NTFPs. In Cambodia, most natural resources are under open access, unless a concession has been set up. When the poor do not have sufficient access to an environmental resource that is critical to their livelihood, they generally turn to another, less-restricted resource that can generate negative environmental impact while providing limited livelihood improvements.

In situations of open access, the local traditional community management modes may have

allowed sustainable resource management in the past, but they are often disrupted. Population growth, migration, and the arrival of market demand are elements that combine to create disruption. In situations of restricted access, weaker communities may not be in a position to access the information they need to improve the situation. Ethnic minority communities may have retained strong management systems in some instances, but they are also more likely to have encountered disruption. Communities' capacity is also a critical element in the important and widely discussed issue of balance between the need to build a rural road network and forest conservation. The case studies in Laos have documented communities' desire and confidence in their ability to manage their own resources in a sustainable manner after a road is opened, but difficulties are likely to occur unless communities' legal capacity in resource management is established and taken into account.

Disruption of community capacity is partly a legacy of war. War legacy is one of the reasons behind active rural-to-rural migration in Cambodia, and is still visible after 30 years in the marginal areas of Laos and Cambodia. Land use systems that may appear traditional have often already been through several steps of adaptation. UXO-contaminated areas are among the poorest rural areas in Laos and in Cambodia, while Agent Orange residues, which are believed to continue to generate serious health impacts, are clearly

located in the poor areas that link southern Laos to southern Vietnam (Lao UXO program 2003).

The management modes of natural resources, from the commercial logging sector to subsistence agriculture, are in a transition stage in the three countries. This rapid change further weakens poor communities. In Vietnam, state interventions in commercial logging are gradually replaced by corporate operators, where national and international corporations are taking over from state forest enterprises. In Cambodia, the concession system is being replaced with logging contracts. Farmers' subsistence land use systems are changing. The most noticeable change relates to traditional rotational agriculture (or shifting cultivation, Box 5.1). Rotational agriculture is gradually becoming more intensive, a change that mostly generates benign or even positive environmental impacts. Paths of change are identical, but stages of progress are contrasted, Vietnam being the most advanced.

Shared Geographical Features that Shape Poverty and Environment Linkages

Linkages between environmental health or natural resource use and poverty in the three countries occur in a geographical context that displays three further and important shared features:

- A dichotomy between lowlands, where urban centers and industrial growth are located,

BOX 5.1 Rotational Agriculture, Poverty, and Environment

Poverty and environment linkages have been repeatedly described as a downward spiral between environmental degradation and rural poverty. The transition of rotational agriculture in Laos and Vietnam is illustrative. As population pressure increases and the desire of more educated households for less strenuous farming tasks rises, fallow periods become shorter until they eventually disappear.

The transition is technically difficult, especially in weed control. Declining yields may occur in the process. Interaction with government policies or with other stakeholders competing for the same land resources often makes things worse. When farmers are asked to rapidly reduce their rotational agriculture area, either fallow cycles are reduced too quickly to allow for adjustment, or subsistence farmers turn to opening other plots of land "behind the hill."

Soil erosion in upland areas remains an issue, but rotational cultivation is probably not the main culprit. River basin topography—especially for river basins flowing into Vietnam from the Himalayan plateau—as well as commercial agriculture and non-agricultural activities such as mining all play a role in soil erosion.

and the marginal rural areas that are lagging behind;

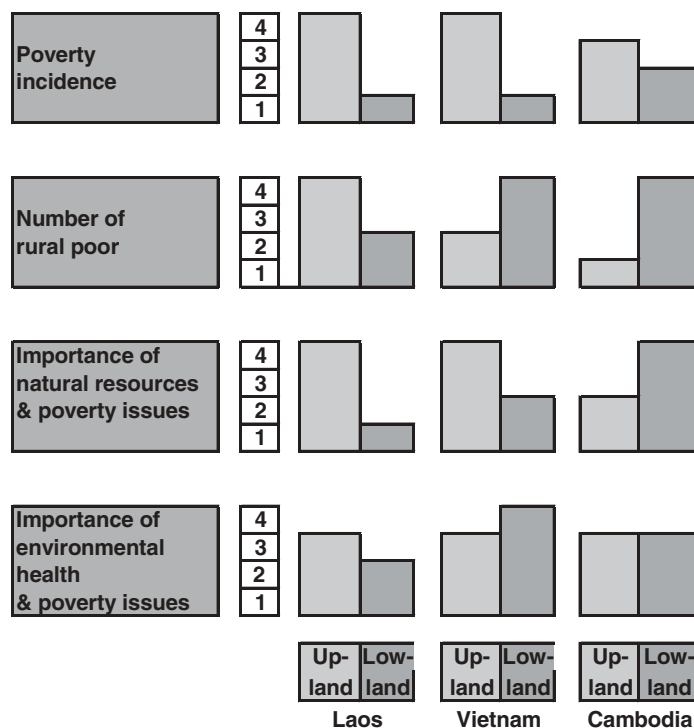
- Legal communities that are composed of several smaller village communities; and
- The importance of rural-to-rural migration.

The upland / lowland structure is present in each of the three countries. Vietnam and Laos both display a strong contrast between their lowlands and their uplands, which by and large form the Annamite Cordillera (Figure 5.2). The poor on both sides of the mountain range account for the largest share of the rural population and live in a region where national forest resources are located. Most ethnic minority groups in the Cordillera are distributed across the two countries. Yet an important difference between Vietnam and Laos is the national distribution of poverty. In Laos, which has low population density throughout the country, the upland poor account for a substantial share of poverty in the country. The highest absolute numbers of poor in Vietnam reside in the densely populated lowlands. Cambodia also has higher poverty in the plateau and mountain regions, where there is a high concentration of ethnic minorities—but the overall land area and population within upland areas is much smaller, so that the overwhelming majority of the poor reside in the lowlands, many of them in villages within communes on marginal plateau soils. Numbers of rural poor are also high in the floodable areas. Since 60 percent of Cambodia is under forest, no correlation is visible between rural poverty-trap areas and the location of forest resources.

Communes in Cambodia and Vietnam are composed of villages that tend to have unequal endowments and therefore contrasting poverty levels. (The commune is the legal institution, while the village is the human community.) Small village communities in Laos are in the process of being merged into larger villages to obtain legal status.

Migration is modifying these geographical patterns in an important manner. The increasing environmental health issues specific to growing

FIGURE 5.2 Upland and Lowland in Poverty & Environment Issues in the Three Countries
Qualitative assessment of magnitude from 1 = low to 4 = very high



urban centers are not specific to the subregion but are nevertheless an important feature. Migration into rural areas, which are often as poor as the regions of origin, is creating pressure and disturbance on natural resources. In spite of their different political systems, rural-to-rural migration is a combination of government-sponsored programs and spontaneous migration in each of the three countries. Population migrates from resource-poor areas to what are perceived to be resource-rich areas.⁴ Spontaneous migration is especially high in Cambodia, a combination of the post-war phase, where many still have not found a stable community to settle in, and of traditionally seasonal migration patterns. The government is in the process of creating “social concessions.” Some of

the land will be provided to local residents, and some may be provided to migrants. In Laos, the village consolidation and focal zone policies, which are at the center of many debates among the donor community and have been discussed in the country chapter, actively promote rural-to-rural migration. Migration from the lowlands to the uplands in Vietnam, a sensitive issue that is often not discussed openly, is also a mix of spontaneous trends and government programs.

Many of the correlations observed between natural resource use and poverty in environmentally fragile areas retain an unclear link to causality because of these two geographical factors. Does poverty play an important role in resource decline or degradation? Or are the poor affected by resource degradation? Are they at risk of natural disasters that can be largely unrelated to natural resource use? All these remain equally valid questions.

Shared Policy Options

When poverty issues and environment issues are observed to take place together and to have possible causal links in Laos, Cambodia, or Vietnam, a combination of a small number of limiting factors is generally observed. These factors—access to resources, information and education, management systems and community capacity—create together a strong obstacle to sustainable development. While they may be observed in many countries, what makes them so important in Laos, Vietnam, and Cambodia is the contrast between their visibility and their low-key status in national environmental policies and donor-supported programs. Each of the ten PEN studies has yielded strong evidence that two, three, or even four of these factors were at play in poverty and environment linkages, while at least one was not fully taken into account in the policy framework:

Despite broad availability of information through the media and improvements in education levels, the poor continue to face more difficulties in coping with and finding solutions to

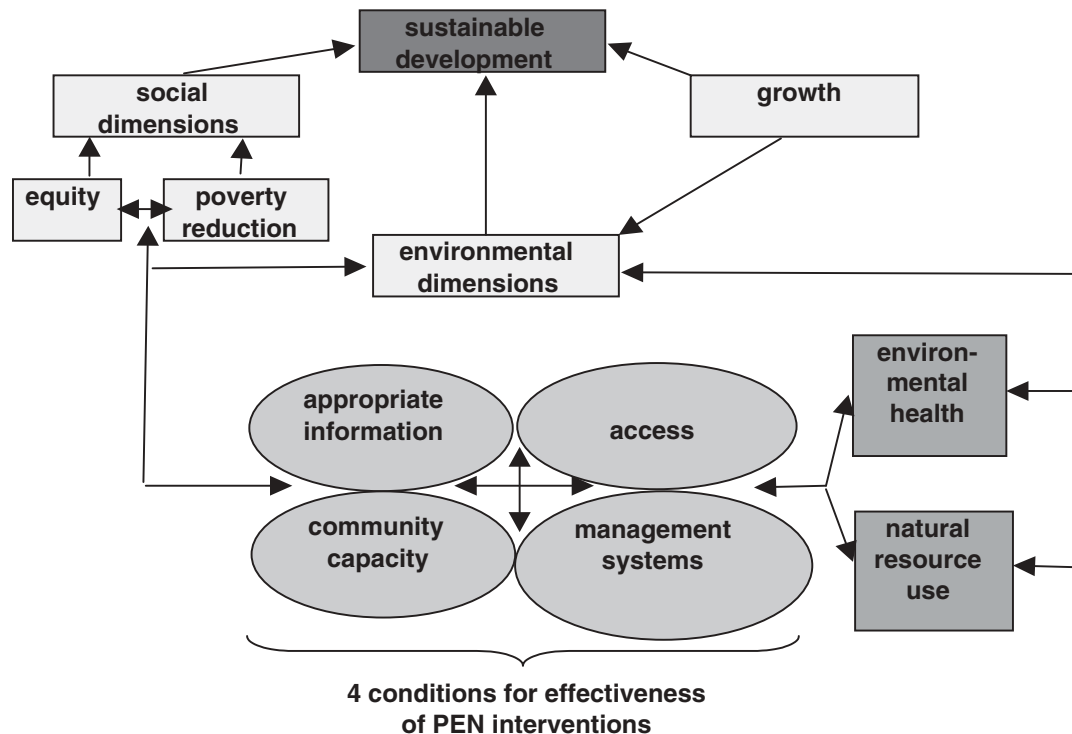
the environmental problems they face. Although the need for increased community capacity has achieved high visibility in decentralization and poverty reduction policies and programs, its importance for the environment is often less recognized. There is also a need for better recognition that the lack of appropriate and sustainable management systems, be it in terms of technology or in terms of institutional arrangements, may continue to limit poverty reduction and environmental improvements.

Four important policy implications derive from the combination of these limiting factors and are shared by the three countries:

- “Indirect” policies and programs focusing on improvements in the four main PEN conditions are as needed as direct interventions on environmental issues;
- Poverty and environment interventions in the subregion need to fully take account of challenges in relation to local institutions, especially at community level;
- Appropriate pacing of change is a key element in policy making; and
- International donors have a role to play to ensure that these are fully incorporated in national policies and programs.

Several donor agencies are in the process of supporting poverty reduction programs that fully incorporate environment. While design procedures in international programs have generally led to screen environmentally friendly approaches to poverty reduction and to avoid negative social impacts in environmental programs, they now want to go one step further. However, direct investments in environmental improvements are unlikely to succeed unless improvements in access, information, and education, as well as capacity and management systems are facilitated at the same time. Indirect interventions on these limiting factors should also be considered. Perhaps one important value of donor intervention is to facilitate cross-sector interventions. Just as

FIGURE 5.3 The Four Main Conditions for Effectiveness of PEN Interventions in Cambodia, Lao PDR and Vietnam



limiting factors for poverty and environment are not within a specific sector, cross-sector solutions are generally needed to generate win-win poverty and environment solutions. Government interventions are often sector interventions. Geographically targeted policies in the uplands of Vietnam and Laos are designed to be cross-sector interventions, but they would gain from fully incorporating issues of environmental health and sustainable natural resource use.

Community capacity is a legal and institutional issue compounded with social and cultural features. The two-tiered system of formal and informal communities makes community capacity building an even more complex issue. So does migration. Migrating communities have to rebuild capacity and need time to do so. Targeting poorer villages is an option worth considering in Cambo-

dia and Vietnam, and justifies targeting at that level. However, prioritizing poorer, often environmentally fragile villages is no easy task. The communes need to build capacity to identify priorities and ensure they are taken into account. Migration can be so high that it may make geographical targeting less relevant. Disruption from migration can be so substantial that migration will eventually fail to achieve poverty reduction outcomes, or to preserve the environment, or both.

Rapid change is taking place in the subregion in terms of economic growth, access to roads, communication technologies and markets. Timing might be the key to successful policies and interventions. Progress in environmental health, especially in clean water and sanitation, is slow, while much more proactive interventions could take place. Conversely, national policy frameworks are

often designed to hasten change in natural resource use, while gradual, careful solutions are needed to ensure success in terms of poverty reduction.

Policy options in environmental health and poverty

- Environmental health policies would be best structured in the three countries as a dual set of programs, one for marginal areas and one for urban areas. Marginal rural areas deserve an intensified initiative to provide clean water and sanitation access to the poor. Social disparity in urban areas deserves attention in the three larger urban areas in Vietnam and Cambodia. Other urban areas will gain from addressing these problems early on.
- Pro-poor improvements in environmental health in urban and industrial areas require legal framework improvements, together with information and awareness programs, real initiation of land use regulations, and institutional reforms giving more capacity to the affected communities. These programs are best structured when they focus both on target residents and their living neighborhoods and workers and their work environment. A number of pro-poor urban development programs are in place and deserve expansion.
- Programs should gain from being joint initiatives among the agencies building infrastructure, the agencies in charge of sanitation development, of hygiene information and, more generally, of information (including the media), and—in Laos and Vietnam—the agency in charge of ethnic issues. Such joint efforts are required to trigger real change in the poverty trap areas.
- Information and education would greatly benefit from careful tailoring to the specificities of ethnic groups. Innovative information messages have potential to trigger local interest in accessing improved services, to facilitate attitude change toward clean water and sanitation, and to raise interest in community

management of water systems. Indoor air pollution deserves inclusion in the messages. And community capacity-building obviously needs to include training of local cadres.

Policy options in natural resource use and poverty

Ensuring more equitable access of the poor to the local resource base or helping them break out of traditional low-return unsustainable activities are two policy options that have the potential to be successful poverty and environment strategies but will require long-term efforts in the three countries. Increasing access needs to go hand-in-hand with the design of new community management systems. Sustaining these systems when stakeholder relationships and the market environment are changing quickly will require enhanced capacity at the community level. Promoting non-traditional activities requires access to markets and services in the marginal areas and is unlikely to be pro-poor, unless special attention is paid to giving the poor access to these activities. And non-traditional activities may be more harmful than subsistence agriculture to the environment unless new management modes including appropriate technology are in place.

Geographically targeted programs that incorporate attention to these issues are already in place in Vietnam and Laos, but there is a need for better recognition that these marginal areas deserve long-term support policies. It is this long-term dimension, provided it is recognized, that allows policies and programs to focus on indirect interventions to manage the environment better and not on direct environmental interventions.

In this context of a need for sustained support to the marginal areas in the longer term, three shorter-term policy options derive from the PEN research:

- Improvements in access and community capacity can best be achieved if policies do not create additional disruption by promoting rapid change in local land use systems. National policy frameworks, in sharp contrast with the

recent past, are starting to take this need for slow adjustment into account and they deserve support in this process. In Lao PDR, the shifting cultivation policy is formulated today as stabilization. In Vietnam, allocation of forest land for rotational agriculture has been legalized and allocation of forest use rights to communities has started. Conversely, migration policies are still viewed as a priority option in the subregion and have the potential to generate poverty, environmental damage, or both.

- Addressing growing and emerging issues compared phasing-out issues will increase the effectiveness of interventions. Rotational agriculture is a primary example of a phasing-out issue in the subregion. Improved management of marketed NTFPs under strong market demand is a growing issue. So is the need for increased transparency about stakeholders use of natural resources.
- Innovative awareness programs targeting poor communities in environmentally fragile areas are, just as for environmental health, an important “forgotten” option. Existing programs have long been sending simple messages relating to forest conservation and to reduction of unsustainable slope cultivation. These messages are obsolete, and national governments can benefit from introducing modern environmental education, taking into account a broader array of issues.

5.2. Potential Subregional Initiatives

Laos, Vietnam, and Cambodia: comparison and exchange of experience on poverty and environment

Many of the poverty and environment issues are shared between two countries, while the third faces a contrasting situation. Seven fields stand out as opportunities for subregional exchanges (Table 5.1). Subregional exchanges focusing on linkages between poverty and environment largely remain an innovative approach, especially for rural areas and border areas. Country-to-country

exchange programs tend to relate either to economic development in general or to the environment alone.

Poverty and environment issues may remain difficult to address through joint subregional projects or policies

There are two reasons for taking a cautious look at subregional initiatives. First, there are remaining security concerns in the marginal areas that are also often border areas. These concerns cannot be taken lightly. For example, the southern ethnic groups in Laos are neighbors to the Central Highland groups in Vietnam. The Central Highlands are regarded in Vietnam as a region that has been recently facing unrest.

Second, joint projects may not be feasible when the legal and regulatory frameworks between two countries differ markedly. Transboundary protected areas, for example, are an effective and necessary approach in terms of environment, but taking poverty reduction into account in these initiatives is far from obvious. Integrated protection and development projects have proven to be an appropriate approach on the Vietnamese side of the Laos-Vietnam border (for example World Bank 1997, WWF 2005). In Laos, such projects might still provide some encouragement for those who would hope to benefit from a development intervention to migrate into the protected area. Similarly, in urban areas, Vietnam, Laos, or Cambodia are likely to have very different answers in terms of urban land use planning, and lessons learned are more likely to be a valid field for exchange of experience than for joint action.

Subregional exchanges should primarily involve local governments and experts and should focus on the production of information and capacity building tools and on monitoring. Ethnicity should be taken into account when designing these tools.

Country-to-country exchanges are also already taking place between local governments across borders, but they tend to address immediate

TABLE 5.1 Opportunities for Subregional Exchanges

	Subregional poverty and environment linkage	Source of relevant experience	Scope of relevance
Environmental Health and Poverty	Linkage 1. Water Access for Ethnic Minority Communities	Infrastructure and formal community capacity building in Vietnam Informal community management system in Lao PDR	Primary: Vietnam and Lao PDR Secondary: Cambodia
	Linkage 2. Diffuse Pollution in Wells	Diffuse Pollution in Vietnam Technical solutions in 3 countries	3 countries
	Linkage 3. Low-income groups in urban areas	Existing programs (Asia Urbs and Citynet 2001) and projects	3 countries
Natural Resource Use and Poverty	Linkage 4. Natural disaster preparedness	Pro-poor flood response in Cambodia Pro-poor typhoon response in Vietnam	Primary: Vietnam and Cambodia Secondary: Lao PDR
	Linkage 5. Livelihood improvement in UXO affected communities	Pilot projects in 3 countries	3 countries
Cross-sector	Linkage 6. Targeted investment programs in upland areas	135 program in Vietnam and related donor-assisted projects	Primary: Laos Secondary: Cambodia
	Linkage 7. Environmental awareness programs in poor areas	Agenda 21 in Vietnam Miscellaneous project experience in 3 countries	Primary: Vietnam and Laos Secondary: Cambodia

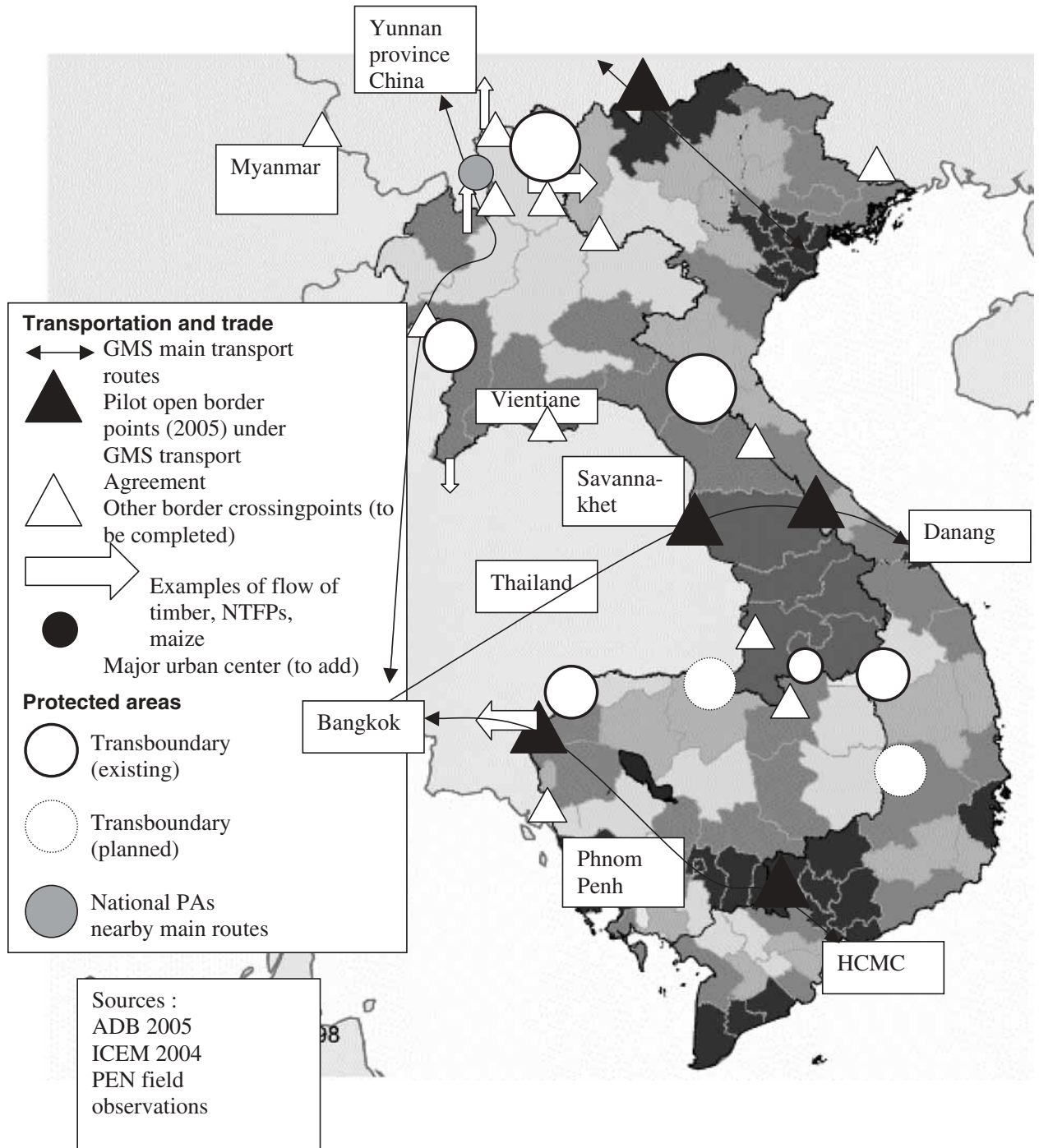
issues of illegal activities or to simply promote economic relations. There is potential to expand the scope of these exchanges to cover priority issues among the seven subregional poverty and environment issues (Box 5.1). Researchers and technical assistants often specialize in one of the three countries. Subregional exchanges would allow them to learn from comparative analysis and to facilitate exchanges about lessons learned between the countries.

Researchers and technical assistants engaging in subregional exchanges would be in a position to develop tools in the form of public information packages and media products to support national programs in priority poverty and environment

problem areas. There will be much added value in terms of environmental information and education if these tools take ethnicity into account. In the past, communication between ethnic groups living in different states has been—and often remains today—a sensitive issue. Today, with the development of IT, appropriate information on environmental health and natural resource use can be best packaged for ethnic minorities at the subregion level, while information delivery could remain at the national level and below.

The PEN research has documented how analysis is limited by the lack of consistent data. Several key poverty and environment indicators, such as access to clean water and for forest

MAP 5.1 Poverty



BOX 5.2 Border Features of Poverty and Environment Linkages

Border areas have a special role to play in subregional initiatives for poverty and environment. The vast majority of border areas between Vietnam, Laos, and Cambodia are marginal, fragile areas with high poverty incidence. Forty-six priority poor districts in Laos—and many of Vietnam’s districts with a high share of communes listed as remote and poor—are upland border districts (Map 5.1).

Border regions had long specialized—perhaps as many marginal areas in the world—in trade that ranged from informal to illegal, but this is changing as the opening of the border between the two countries is making rapid progress⁵—a remarkable change compared to recent decades. A shift from informal to more formal trade is taking place. This shift originates not only from the opening of borders but also from the use of information technology. Increasingly comprehensive regulatory frameworks in Thailand and China are also encouraging informal traders to turn to formal transactions.

Opening borders in poor areas is a coin with two sides for the environment and for poverty. Legal trade can help reduce environmentally adverse illegal activities as local economic operators may find larger formal transactions more profitable than smaller informal ones, provided international trade does not bypass the local operators of border trade. There is, however, a risk of larger-scale environmental threats from international trade with limited poverty reduction gains. From a biodiversity perspective, trade in plant and animal products has long been an area of concern for environmental groups. This focus rightly deserves to be continued, but legal trade requires as much attention as the persistent illegal activities.

Examples of poverty and environment related to legal or informal trade:

- Logging for export to China and Vietnam increase as stronger environmental regulations come into operation in these countries.
- Active NTFP exports to China and Vietnam are depleting resources for some species, even when trade is legal. Quantities and prices often remain in the grey area of informal trade, and illegal exports of species with biodiversity value complement legal ones (PEN study on NTFPs in Laos).
- The hill closure policy in China and the development of demand for animal feed in the subregion trigger rapid development of hybrid maize cultivation on sloped land in Laos. This often generates forest losses with limited income gains (Prodesa 2002).
- Pesticides are often purchased by farmers directly on border markets in Northern Laos in a total absence of agricultural extension services (Ducourtieux 2004).
- In Laos, roads built by enterprises outside of road network development plans can lead to forest depletion with limited improvements in accessibility for local people (PEN study on roads).

Local governments in marginal border areas are confronted with the issue of making improved decisions in terms of environment and poverty as trade is increasing. The transition stage between informal and formal exchanges creates specific challenges. Increased transactions are taking place while local government capacity, be it in controlling environmental impact or in ensuring poverty reduction gains, is limited. Two types of subregional initiatives can support this process:

- Local-government-to-local-government exchanges with a focus on the subregional poverty and environment issues;
- Design of information and training materials targeting local governments.

cover, happen to be MDGs. With a joint effort to use a shared methodology when assembling these indicators, the governments and the donor agencies that support their poverty reduction efforts would have a solid basis for making investment and policy decisions that fully incorporate both poverty and environ-

ment. The subregion appears to be an ideal space for the collection and use of a consistent set of poverty and environment indicators. The district level (except in Cambodia), the commune level, and the village level (for village samples) have been identified as important targeting levels for PEN analysis. A monitoring

program collecting MDGs at these levels on a regular basis would be a cost-effective option.

These priorities for exchanges and monitoring fully justify a third phase of the PEN study. Phase I consisted of an extensive review of available geographically referenced data and an analysis of correlations between poverty and environment. Phase II turned to researching linkages and poverty and environment in terms of policy implications. A third phase could usefully focus on supporting exchanges as well as monitoring poverty and environment issues and progress.

Endnotes

1. Vietnam, Laos, and Cambodia, which together formed French Indochina until 1954, also take part in the international cultural cooperation forum related to the French language.
2. Vietnam joined ASEAN in 1995, Lao PDR joined in 1997, and Cambodia in 1999.
3. Several poverty and environment linkages that have not been analyzed in depth in one of the three countries are not included in the figure but are however viewed as highly relevant. These include indoor air pollution and malaria.
4. The subregion has a centuries-old history of migration of ethnic groups from the North to the South.
5. Under the Greater Mekong Subregion Cross-border Transport Agreement that was initiated in 1999, major roads will soon link major urban areas in the three countries and in Thailand and China (Map 5.1). Full implementation of the agreement is expected for 2007–08. Five pilot border points are fully open since 2005 (ADB 2005).

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