

**Poverty and Environment:
Understanding Linkages at the Household Level**

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1. Understanding Poverty-Environment Linkages at the Household Level

The World Bank's fundamental goal is poverty reduction. While the Bank participates in lending and development through many different types of activities, it is important to examine these practices through a poverty lens. In 2002, some 50 percent of the global population subsisted on less than \$2 a day. Approximately 44 percent of all households in Africa and 31 percent of people in South Asia lived below the dollar-a-day poverty line (WDI 2006). As these figures suggest, the Bank's poverty mandate remains vast, important, and urgent.

The Bank is also one of the largest international donors in the area of environmental management. Last year alone, the Bank provided \$1.4 billion (in either loans or grants) in aid to poor countries to improve the environment. The Bank's activities in this arena include lending for forestry operations; improvements in air quality; changes in environmental institutions and governance; and investments in water and sanitation infrastructure. In partnership with the Global Environment Facility (GEF), the Bank plays a major role in global efforts to stem climate change, biodiversity degradation, and toxic and chemical waste impacts.

The question is whether these large investments in poverty reduction and environmental management are mutually reinforcing. History ultimately will provide an answer; in the meantime, there are smaller issues that can be addressed now. An important component of this question, for example, is whether—and to what extent—environmental management can contribute to poverty reduction. Are current environmental management strategies successful in addressing the problems of the poor, and what challenges do they face? And, most importantly, what is the role of the poor and their behavioral strategies as management programs are put forth?

Poverty reduction is a three-part problem. It involves (1) stemming the fall of households into further poverty, (2) enabling movements out of poverty, and (3) ensuring that the non-poor do not become poor. Reducing vulnerability is as important as reducing poverty. While there is a role for environmental management in each of these areas, the importance and type of management will differ. It is important to take a microscopic view of the poverty-environment problem and to understand how households rely on the environment, what factors condition household dependence on the environment, and the extent to which improvements in environmental management change the choices faced by the poor. These questions are at the core of this report. We focus on two classes of poverty-related welfare outcomes: (1) the more usually identified income and expenditure measures, and (2) health outcomes. Our attention to household-level analyses and actions distinguishes this report from other more broad-based analyses.

Poverty and environmental change at the macro scale

In order to understand the scale of the poverty-environment problem we first consider some macro indicators of poverty and environmental change across nations. Table 1.1 compares averages of some key indicators for low income and high income countries.

Table 1-1 Selected macro indicators linking poverty, natural resources, and under-5 mortality

	Low-income countries	High-income countries
Share of natural resources in total wealth (%)	29	2
Population per sq. km. of forest	324	104
Deforestation rate (% per year)	0.5	-0.1
Access to improved water source (% of population)	75	99
Access to improved sanitation (% of population)	36	..
Under-5 mortality per 1,000 live births	122	7

Source: *World Development Indicators, Where is the Wealth of Nations?*

Note: Wealth-share data are for 2000; all other data 2004

This table shows that poor countries are much more dependent on natural resources as assets than rich countries. The ratio of people to forested land is over three times higher in low-income countries compared with high income. This gives a crude indication of pressure on forests, and the outcome is visible in the table. While forested lands are growing at 0.1 percent per year in high-income countries, they are shrinking at 0.5 percent per year in low-income countries. Access to “environmental infrastructure” in the form of improved water and sanitation shows a similar divide. The outcome is that mortality rates for children under the age of five are nearly 18 times higher in low-income compared with high-income countries.

Table 1.2 looks at the distribution of health outcomes and access to environmental infrastructure across wealth quintiles within selected developing countries. The same general picture can be seen: wealthier households within these countries have greater access to environmental infrastructure and better health outcomes (lower stunting and under-5 mortality).

Among the ten leading risk factors to health in developing countries, the top four include malnutrition, unsafe sex, unsafe water and lack of sanitation and hygiene, and indoor smoke from solid fuels (WHO 2002). The prevalence of malnutrition is not only associated with food insecurity; it is now widely recognized that an unhygienic environment is a key determinant of malnutrition among young children. Clearly,

achieving the Millennium Development Goal health targets requires public policies that focus on reducing environmental risk factors through better access to basic environmental services, as well as better access to health and education services.

Figure 1.1 presents data from a poverty-environment study undertaken in Laos, Cambodia, and Vietnam by the Bank's East Asia Region. It shows rank correlations between poverty indicators and environmental indicators. Looking at this sub-region is further evidence of a significant correlation between poverty and certain environmental and health indicators. However, here the macro evidence is not uniform and begs for a more careful examination of micro studies.

These macro indicators suggest that a link between natural resources, the environment, and poverty is at least plausible. Moving the analysis to the household level helps us examine the correlation and identify the cases where the correlation is indeed strong. This is the main focus of this report.

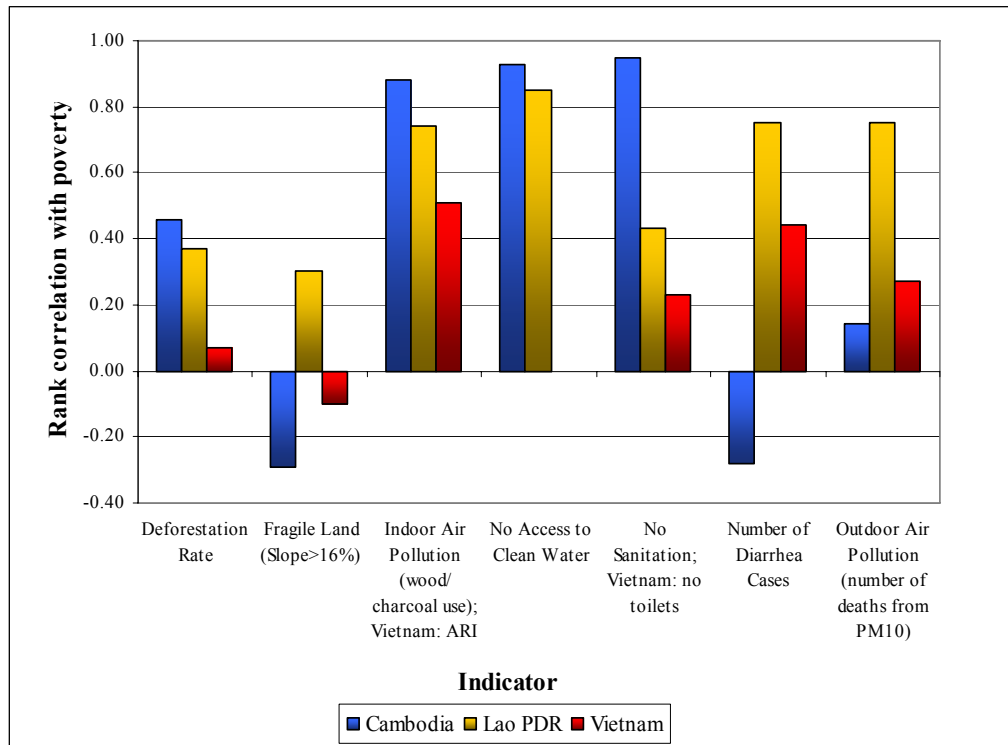
Table 1-2 Distribution of health outcomes and access to environmental infrastructure, selected countries.

	Lowest	Wealth quintiles			Highest
		2	3	4	
Under-five mortality per 1,000 live births					
Egypt	147	119	85	62	39
India	155	153	120	87	54
Kenya	136	130	92	85	61
Peru	110	76	48	44	22
Uzbekistan	70	44	55	52	50
Stunting (%)					
Egypt	38	34	29	25	20
India	60	59	54	48	34
Kenya	44	38	30	31	17
Peru	46	31	19	10	5
Uzbekistan	40	30	30	25	31
Improved water (%)					
Egypt	47	73	87	97	99
India	6	15	27	44	74
Kenya	1	9	16	43	76
Peru	14	60	87	97	100
Uzbekistan	47	59	78	96	99
Improved sanitation (%)					
Egypt	46	78	94	97	100
India	0	0	4	22	80
Kenya	0	1	3	12	64
Peru	0	7	44	87	100
Uzbekistan	0	1	2	5	70

Source: Rutstein and Johnson (2004).

Note: Data for Egypt are for 1995, 1992–93 for India, 1998 for Kenya, and 1996 for Peru and Uzbekistan.

Figure 1-1 Correlations between poverty and different environmental indicators found from previous PEN work in Cambodia, Lao PDR, and Vietnam



Environmental management and pathways to household welfare

Environmental change, particularly of local natural resources, can affect poverty through many pathways (Sunderlin et al. 2005; Dasgupta 2004, 2003; Wunder 2001; Duraiappah 1998; Reardon and Vosti 1995). To see this relationship more clearly, we build on a simple model by Barrett (2004) that links household income and assets.

Consider a poor household whose welfare is dependent on assets that the household has access to or owns. These assets may include biophysical, human, environmental, and constructed capital. At any point in time, household well-being depends on the returns to these assets and any exogenous shocks. Exogenous shocks simply reflect unexpected changes as a result of natural disasters, death, gifts, or macro market changes. Further, returns to assets generally have two components: (1) known returns, and (2) an uncertain component that depends on weather, sickness, and so on. Changes in welfare can thus result from four types of changes: (1) changes in asset holdings, (2) changes in returns to these holdings, (3) changes in the uncertain component of returns, as well as (4) changes in exogenous income, which can be positive or negative (Barrett 2004).

The interesting issue is how environmental management can affect household well-being. While we use household income and welfare interchangeably, we recognize that income

is only one measure of well-being. Household health would be another measure; aspects of the discussion below would apply equally to health outcomes.

Changes in environmental management can have two effects in the short to medium term. First, it can change the return to assets. For example, agro-forestry techniques might improve the productivity of household land holdings, or smokeless stove programs might contribute to improved indoor air quality, health, and productivity. Thus, one reason to improve environmental quality would be to add greater value to the flows from household land or labor. Any health improvements that come from environmental management will also have direct welfare impacts that are independent of productivity improvements.

Changes in resource management can also increase household assets. For example, this could occur if there are land reforms or if households secure access to forests through community forestry. Another aspect of this is improved environmental quality, which may contribute to reduced morbidity or mortality and greater labor power. It is important to recognize that labor is often the only asset that poor households have, and that sickness and death can have intergenerational effects. Any improvements in environmental health can have long-term impacts on households' ability to move out of poverty.

Over the longer run, environmental changes can contribute to unexpected shocks. Climate change can increase the variability of returns, for example, with greater variation in rainfall patterns, the variability of crop yields may increase. New disease vectors emerging from climate change might make households more vulnerable. Exogenous shocks, such as floods or hurricanes, can also wipe out household assets and contribute to loss of life. Environmental management matters to the extent that natural barriers such as mangroves and coral reefs diminish the effect of these shocks.

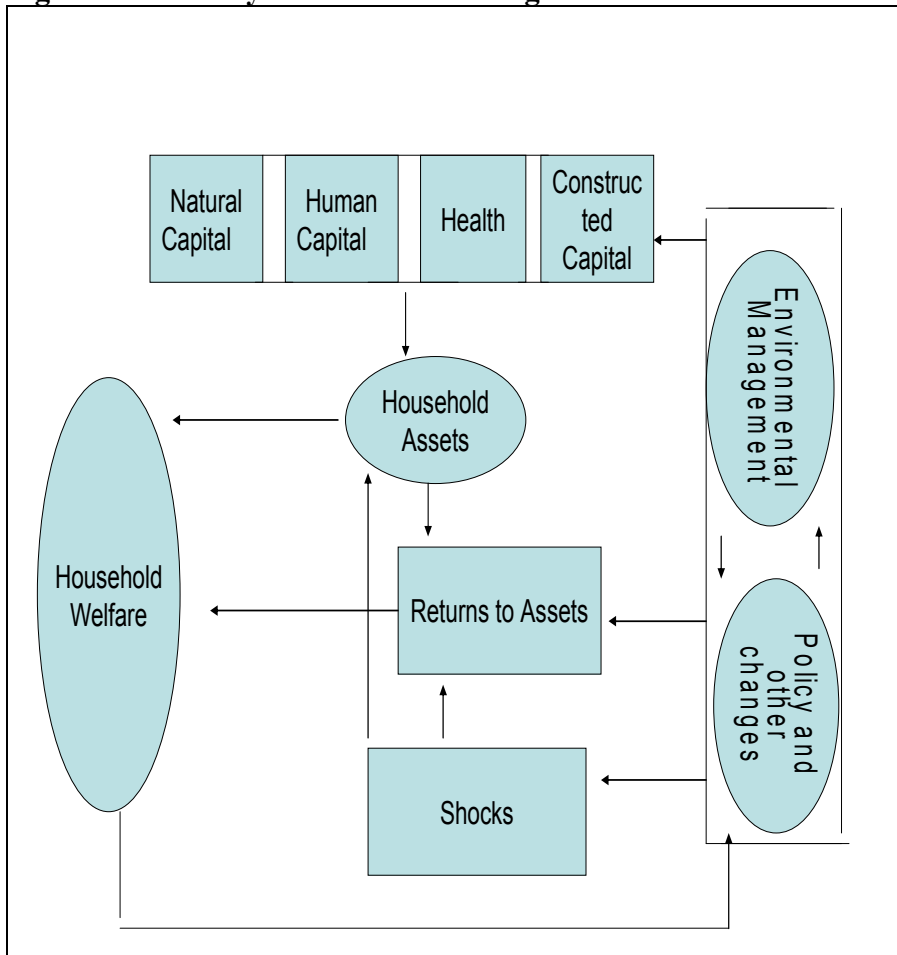
Further, there is potentially an interactive relationship between poverty and the environment. However, these simultaneous and ongoing changes are difficult to empirically isolate.

This simple model reminds us that households care about expected welfare outcomes as well as variations in these outcomes. For poor households that are unable to bear shocks, maintaining a steady but low level of economic activity may well be the optimal strategy (Barrett 2004). Such households are simply unwilling or unable to make the changes required to build up their assets or improve their productivity to get themselves out of poverty. For example, in areas with ecotourism or if there is an increase in demand for local forest products, very poor households may not gain from growth in the industry (Lybbert et al. 2002). Even if the returns are high, for example, they may not participate in new jobs because of perceived risks of switching to new types of labor or because of initial costs associated with switching.

Similarly, while access to clean water would improve child health, obtaining a new connection to the main distribution line may be too expensive for the poor (World Bank 2006). In addition, many households in low-income countries may be uninformed about the mechanisms available to mitigate the effects of poor water quality or the health risks of staying indoors during peak emission periods of cooking with biomass fuels. Better

environmental conditions at the community level can generate external health benefits. But public decisions often overlook the health benefits of information and community-level externalities. Unfortunately, many of these issues can converge to keep poor households in low-equilibrium poverty traps.

Figure 1-2 Poverty-environment linkages at the household level



The existence of poverty traps is particularly relevant for households that are closely dependent on local natural assets or livestock for subsistence. In such instances, the returns to assets are often endogenous. Among migrant herdsman in rural Ethiopia, for example, the profits from livestock farming depend on the number of animals in the herd. Lybert et al. (2004) found that if an external shock pushes the herd size below a certain threshold, then these migratory farmers become sedentary and are no longer able to grow their main asset (livestock). There are many examples of fish stock depleted beyond a certain threshold simply not being able to recover. If this happens, the only way out of poverty may be migration and new forms of employment. Even with a small boost, poor households may not be able to pull themselves out of poverty, even in the context of a growing economy.

It is useful here to understand the dynamics of poverty and the use of natural “commons.” The poor are known to decrease short-term consumption in order to maintain the long-

term health of their private assets. However, they may also reduce the quality and quantity of the natural capital they have access to in order to increase their current consumption to the detriment of future consumption. As Dasgupta (2004) argues, there can be dynamic feedback loops among poverty, local natural resources, and population growth. Households that depend on the commons may have more children to help them collect from the commons, which can lead to further degradation. In turn, this can trigger a demand for more children. Such action is more likely to happen under conditions of open-access or ambiguous tenure over resources. Many of the recent community-based natural resource management programs are an attempt to clarify rights and responsibilities over natural resources in order to minimize such actions. Given high discount rates, however, poverty can lead to depletion of natural capital even when rights are clear. When natural capital is not substituted by other forms of investment, this can lead to a dynamic spiral with income and resources declining over time.

Scope of the report

This report seeks to present micro evidence on how environmental changes affect poor households. We focus primarily on environmental resources that are outside the private sphere, particularly commonly held and managed resources such as forests, fisheries, and wildlife.

Our objectives for this volume are three-fold. We are first interested in using an empirical data-driven approach to examine the dependence of the poor on natural resources. There is considerable case study information available about the poor and their reliance on resources and different theories about the pathways through which changes in the stocks of resources affect the poor. However, if we scrutinize household data across large populations and examine multiple case studies, what evidence do we find of poverty-resource linkages? We believe there is an information gap regarding the nature of the dependence of the poor on natural resources and the mechanisms that influence this dependence.

Poverty is a multidimensional phenomenon and, as previously noted, income is only one aspect. Our second objective is to examine the role of the environment in determining health outcomes. International aid organizations interested in health often focus on building the hardware of institutions and medical supplies or on policy reforms that are focused entirely on the health sector. However, there is a need to broaden the scope of health sector activities to include environmental management as a mechanism for preventing sickness. We pursue this line of inquiry by building on studies that use large data sets and by examining new literature.

A third area of interest concerns the role of policy instruments and reforms. It is almost a cliché to state that policy reforms in one sector have unexpected outcomes on other sectors. However, it is still useful to try to understand such consequences, particularly if they matter for poverty reduction. A policy issue that is quite topical is decentralization of natural resource management and the creation of communitarian institutions by the state, partly in response to state-level failures to manage natural resources efficiently. But, how effective are these institutions in improving the lot of the poor? And are these

institutions egalitarian in their outcomes? We look at evidence from multiple countries to address these questions.

Another instrument available for environmental management is payments for environmental services. We have a growing number of examples of this instrument in Latin American countries. However, what do we understand about its poverty impacts? Are the poor willing to participate in such schemes? This is another area that is explored in this report.

This report uses general economics literature as well as data collected by the World Bank and its partners to analyze poverty-environment linkages at the household level. The data are mainly from household surveys such as the Living Standards Measurement Surveys and include information on a broad range of poverty indicators. The data were not necessarily collected to answer questions regarding environmental changes and their links to poverty. However, they have considerable information that we have been able to exploit for this purpose.

Poverty-environment linkages are inherently dynamic and involve behavioral responses that make the identification of cause and effect difficult. Thus, questions related to these linkages are ideally answered with the use of panel datasets or with data from randomized experiments. However, detailed panel or experimental data are rarely available, and there is merit to identifying empirical regularities through rigorous examination of cross-sectional data. We discuss some of the methodological challenges faced in analyzing poverty-environment problems throughout this volume, and explain some of these issues in more detail in Chapter 4 (Box 4.1). We also fill important gaps with information drawn from peer-reviewed literature.

