Investing in Environmental Wealth for Poverty Reduction

Prepared on behalf of the Poverty-Environment Partnership by

UNDP

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International Institute for Environment and Development

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The World Conservation Union

WORLD RESOURCES INSTITUTE

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This publication is a joint product of staff from UNDP, UNEP, IIED, and WRI, prepared on behalf of the Poverty-Environment Partnership. The views expressed herein do not necessarily reflect those of their respective governing bodies, or when applicable, the countries there represented.

Other Poverty-Environment Partnership publications

1. Linking Poverty Reduction and Environmental Management: Policy Challenges and Opportunities (2002)
2. Poverty and Climate Change: Reducing the Vulnerability of the Poor through Adaptation (2003)
3. Environmental Fiscal Reform for Poverty Reduction (2005)

Available at www.povertyenvironment.net/pep

Investing in Environmental ealth or Poverty e uction

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Foreward

An historic opportunity—the eradication of poverty—is within reach of the 2005 World Summit. However, a critical barrier persists: progress on eliminating poverty will only be possible with expanded, more effectively targeted investments in environmental management as a means of achieving the Millennium Development Goals (MDGs).

Speeding progress towards the MDGs will require stepping up attention to and investment in the environment. Investing in sound and equitable environmental management makes good economic sense, and a major scaling-up of worldwide investment in the environment is essential for creating the opportunities that people need to lift themselves out of poverty. Increased investment alone is not enough, however. To be effective, investment must be accompanied by the empowerment of communities, local governments and the private sector to lead local development efforts. Of particular importance is the need for governance and policy reforms that extend to poor people secure property and user rights over the environmental assets that provide their livelihoods, and that ensure a greater voice in decisions affecting how these assets are managed.

To inform deliberations at the Summit, the Poverty-Environment Partnership (PEP)—a network of more than 30 international development and environment agencies—launched the 'Environment for the MDGs' initiative to galvanize support for the significant scaling up of worldwide investment in environmental management to help win the fight against poverty and achieve the MDGs. The PEP commissioned two background reports—one on the economic case for investing in the environment to reduce poverty and the other on tools and methodologies for assessing environment's contribution to poverty reduction and pro-poor growth. The Partnership has also prepared a brief synthesis paper summarizing the key messages of the two longer, more technical reports.

The following report on Investing in Environmental Wealth for Poverty Reduction makes an important contribution to the debate about poverty-environment relationships by documenting and evaluating the economic evidence surrounding investment in environmental assets as a strategy for fighting poverty. Prepared by leading environmental economist David Pearce, Professor Emeritus at University College London, the report surveys the current state of knowledge on several key environmental dimensions of poverty, including the direct and indirect dependence of the poor on natural resources, the vulnerability of the poor to environmental risk, the total cost of environmental interventions and investments needed to reach the MDGs, the economic benefits and rates of return to environmental investments, and major reforms needed to create a policy and governance context that will be conducive to cost-effective investments. Noting that current knowledge is sufficient to warrant immediate policy action, Professor Pearce nonetheless identifies a few key areas where significant information gaps remain and further research is needed.

The 2005 World Summit provides a critical opportunity to mobilize a much wider 'coalition' of interested governments, inter-governmental organizations, research institutes, businesses and civil society organizations to take this agenda forward, as an essential component of global action to end poverty and secure the benefits of healthy ecosystems for all the Earth's inhabitants, now and in generations to come.

About the Poverty-Environment Partnership

The Poverty-Environment Partnership (PEP) is a network of bilateral aid agencies, multilateral development banks, UN agencies and international NGOs that aims to address key poverty-environment issues within the framework of international efforts to achieve the Millennium Development Goals. Analytical work and knowledge-sharing activities undertaken by the PEP since 2001 points to three broad, fundamental lessons that underpin efforts to link poverty reduction and environmental management:

The environmental quality of growth matters to people living in poverty;

Environmental management cannot be treated separately from other development concerns;

People living in poverty must be seen as part of the solution rather than part of the problem.

PEP Member Organizations: Bilateral Agencies: Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Japan, Netherlands, Norway, Sweden, Switzerland, United Kingdom, United States. Multilateral/UN Agencies: African Development Bank, Asian Development Bank, European Commission, UN Food and Agriculture Organization, Inter-American Development Bank, International Fund for Agricultural Development, International Monetary Fund, Organization for Economic Cooperation and Development, UN Department for Economic and Social Affairs, UN Development Programme, UN Environment Programme, The World Bank, World Health Organization. International NGOs: International Institute for Environment and Development, IUCN-The World Conservation Union, World Resources Institute, WWF International.

More information on the PEP can be found at www.povertyenvironment.net/pep.

Preface

The common perception of many is that the environment is still the "Cinderella" of development policy. Although environmental issues receive increasing public and media attention, it seems that many development decision-makers are still not persuaded that investing in the environment can make as much of a contribution to poverty reduction as more conventional measures, such as infrastructure and education. One MDG – MDG7 - explicitly addresses the environment, but members of the PEP take the view that preventing further environmental degradation, and improving environmental quality, is central to nearly all the MDGs.

There are many ways of understanding what has come to be known as the "poverty-environment nexus." This report adopts the perspective of environmental and development economics. It will not necessarily appeal to all members of the development community nor is it intended to do so. It is aimed at those decision-makers and opinion-formers who look for a compelling economic case for investing in the environment to secure poverty reduction consistent with the MDGs. Some will already be persuaded of that case. Others might accept it in general terms but seek hard evidence that it makes sense. Yet others may be unpersuaded but have an open mind when confronted with the evidence.

Making the economic case does not diminish other arguments – for many there is a simple moral compulsion about poverty reduction (or environmental conservation) which does not need economic justification. But economics can help, as we try to show in this report. Copious use is made of footnotes to the literature. This is deliberate. The goal is to offer judgments and conclusions based on evidence, and those who wish to pursue the supporting literature will be able to follow up on the extensive references upon which this report relies.

Finally, tackling poverty in practical ways that have a reasonable chance of success is immensely complex. This report focuses on one dimension of this complex issue – addressing the management of environmental assets to improve the lot of the poor. Drawing boundaries around this dimension has proved difficult, simply because there are so many interdependencies in poverty policy. Singling out environmental policy and investments as a major means of helping the poor will not work unless many other conditions are satisfied – notably governance and institutional change within developing economies, and changes in the way the rich world currently treats the poor world. One report cannot do everything, and if it tried it would quickly descend to the bland and the general. The focus on the economics of the environment and investment in environmental assets, therefore, needs to be borne in mind while reading this report.

David W. Pearce

Acknowledgements

The Steering Committee for the PEP 'Environment for the MDGs' initiative includes UNDP (Peter Hazlewood and Charles McNeill), UNEP (Esther Reilink and David Smith), DFID (Helen O'Connor), IIED (Steve Bass and Tom Bigg), IUCN (Joshua Bishop and Andrew Deutz), SEI (Johan Rockström), WRI (Dan Tunstall) and WWF (Dawn Montanye and David Reed). The supporting paper on the economic case for investing in the environment to reduce poverty and support pro-poor growth was led by IUCN. David Pearce, Professor Emeritus at University College London, is the principal author of the paper.

The Steering Committee is grateful to many PEP members and others for contributing valuable insights and information. Special thanks go to Karen Holmes, who edited the Executive Summary, and to Kimberly Soffar, who guided publication design and production.

Note from the author

This report has not been easy to write. It tries to tell a coherent story, rooted in economic theory and evidence. If it succeeds, then it is due to the substantial efforts of individuals within the Poverty and Environment Partnership who have commented extensively on earlier drafts and supplied many relevant studies and documents. If it fails, then it will be due to my own limitations in handling the enormous amount of information and comment I have received. Among the many who have helped, I am especially grateful to Joshua Bishop, Jeffrey McNeely, Hans Friedrich, William Jackson and Simon Rietbergen of IUCN in Gland, Switzerland; Steve Bass, Maryanne Grieg-Gran and Gordon McGranahan of IIED, London; Paul Steele (Sri Lanka); Lucy Emerton of IUCN, Sri Lanka; Edmund Barrow of IUCN (Nairobi); Helen O'Connor and John Burton of DfID, London; Rati Mehrotra of IUCN; Marit Kragt of the Environment and Water Directorate, Netherlands Ministry of Foreign Affairs; Jon Strand of the International Monetary Fund; Jan Bojö of the World Bank; Monique Barbut of UNEP, Paris; Dawn Montanye of WWF US; and Mustapha Chouikha, Melita Rogelj, Pedro Novaes and Hammad Naqi Khan, all Fellows of the LEAD Programme, based at Imperial College London.

If I have left anyone out, my apologies in advance.

Executive Summary

The following report, Investing in Environmental Wealth for Poverty Reduction, examines investments in and policies for improving environmental quality and natural resources management, and documents the critical role played by these investments and policies in creating opportunities for people to lift themselves out of poverty. Its intended audience is decision-makers who require hard economic evidence to evaluate the proposition that investment in sound, equitable environmental management is an effective—indeed, an essential—strategy for reducing poverty.

The economic case for investing in the environment to reduce poverty is grounded in analysis of what has come to be known as the poverty-environment nexus. Such analyses can be, and are, made without reference to economics; however, the rapid expansion of the subject of environmental economics in recent years provides an opportunity to examine poverty-environment issues in a context that is likely to yield the kind of insights and arguments that many consider to be particularly persuasive.

Environmental sustainability and the MDGs

Achieving the MDGs will require expanding per capita endowments of capital assets, especially the environmental assets used by the poor to earn their livelihoods and increase their well-being.

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Available evidence indicates that the EKC hypothesis fails to describe experience with many forms of environmental change. Clear instances include biodiversity loss and global climate change, which entail irreversible losses that no amount of income growth can restore. Even where the EKC broadly fits experience, it is highly sensitive to policy measures that enable a 'tunneling through' by which societies can bypass an early period of accelerating environmental decline and move directly onto a development trajectory that traces a path of environmental improvement. In short, environmental degradation is neither the inevitable price of, nor a desirable path for, economic development (Box 2.3).

Poverty, wealth and the environment

Poverty reduction strategies must achieve a two-fold goal: expanding the asset base of the poor and increasing the efficiency with which those assets are converted into well-being for the poor.

Successful, sustainable poverty reduction requires expanding the asset base of the poor and raising the productivity of those assets for generating income and well-being for the poor. The focus on an asset-based rather than an income-based approach to fighting poverty is important because the nature of assets held by the poor determines the strategies they can use to improve their well-being. Moreover, economic evidence suggests that inequalities in asset holdings worsen the prospects for economic growth and hence for poverty reduction based on stimulating overall growth of the economy.

Using an asset-based approach to poverty reduction leads to policy implications that may differ from those associated with a conventional income-based approach. For instance, shifting policy focus from income to assets makes it clear that investing in improvements to soil productivity on marginal lands is a potentially effective strategy for poverty reduction, because such investments could, in effect, help ameliorate inequalities in the value of land owned by the rich versus the poor.

Poor households rely heavily on environmental assets as a source of wealth from which to generate income and improve their livelihoods.

The health and well-being of all humans depends on clean water, clean air, fertile soils and other services provided by natural systems. However, environmental assets and the services they provide are especially important for people living in poverty. A majority of poor people in rural areas draw much of their livelihoods from forests, pastures, fisheries or farming. Nearly 1.1 billion people worldwide depend on forests for their livelihoods, and forest-related income provides a significant share of total household income in many global regions. Other ecosystems provide similarly important benefits; for example, coral reefs are a source of substantial income for poor households from fishing.

Environmental capital is a critical component of the asset base of most developing economies.

Environmental assets also make up a far larger share of national wealth in developing countries than in high-income countries. Using innovative 'wealth accounting' techniques for measuring the asset base of nations, a World Bank study estimates that environmental wealth accounts for 26 percent of the total wealth of low-income countries, versus 13 percent of wealth in middle-income countries and only 2 percent of wealth in OECD countries (Table 3.2). Wealth accounting also provides insights into the nature of income growth experienced by countries, and whether this growth is based on sustainable increases in per capita wealth. In many instances,

Addressing the low quality and vulnerability of the environmental assets of the poor is an important objective for anti-poverty policies.

Even more so than other kinds of assets, the environmental assets that make up a disproportionately large share of the wealth of the poor are prone to rapid depreciation, unless cared for and regenerated. With few assets, low-quality assets and lack of access to technology to make their assets more productive, poor households and communities may have incomes that are too low to generate re-investable surpluses for maintaining, much less expanding, their asset base. Insecure property and resource rights and other disincentives to wise management and use of resources also contribute to degradation of environmental assets.

Strategies to reduce poverty must address another important dimension of the poverty-environment nexus: the greater vulnerability of the poor to environmental hazards, including natural hazards, such as storms, floods and droughts, as well as man-made threats, such as air and water pollution. This vulnerability has been revealed by recent evidence from poverty mapping studies, which confirms that the poor tend to reside in areas with stressed and/or low-quality environmental resources, such as land of naturally low soil fertility, polluted air, contaminated water and water shortages. For instance, the poor often live on marginal lands, such as steeply sloped areas, where they are at higher risk of landslides and resulting loss of life during storms and floods.

Poor people also suffer greater loss of life and health from pollution and other environment-related causes. Developed by the World Health Organization, an indicator that adjusts life expectancies for the burden of disease shows that, on average, 20 percent of the total loss of life expectancy in developing countries is attributable to environmental causes, versus only 4 percent in rich countries (Table 3.6). Losses of human capital due to environmental causes have been estimated for various cities in the developing world; extending these estimates across all developing economies suggests that total damages could be on the order of US$200 billion per year. Treating these costs as a stream of damages over a 30-year time horizon indicates a net present value of some US$550 per person in the developing world.

One key area for policy action is addressing the 'short-termism' and high discount rates of the poor. Because the poor are more concerned with day-to-day survival than with longer-run well-being, they are likely to give a low weight to the future when making decisions, including decisions about managing their environmental assets. While people in rich countries typically have discount rates of less than 10 percent, evidence from the developing world suggests discount rates of 30-150 percent, and higher (Table 4.1).

Improving access to credit, capital and insurance markets would do much to lower effective discount rates, creating important benefits for the poor through impacts on investment in environmental assets. For example, one likely benefit of increasing the access of the poor to insurance is, perhaps surprisingly, decreased pressure on fragile soils and marginal grazing lands. This effect comes about because, in the absence of access to insurance, the poor hold larger herds of livestock than they would if they could secure alternative forms of insurance.

Recent research suggests the appropriate scope for policy interventions to help ensure that local institutions of communal resource management are able to adjust to conditions of resource scarcity quickly enough to avoid ecosystem collapse.

Resource scarcity and/or degradation requires that local institutions (that is, social and legal norms of behavior) shaping natural resource use in poor rural societies adapt to cope with these changes. Often this adaptation will take the form of changes in resource rights and local environmental governance. The capacity for adjustment is not automatic and institutional change may not occur quickly enough to avoid collapse of the resource or ecosystem in question. Some societies have proved able to successfully negotiate a dynamic process of change in traditional institutions and resource regimes, while others have not.

One key implication of research on this phenomenon concerns the appropriate scope of policy interventions. Direct government involvement in actual reforms to local institutions for managing communally held resources is likely to be counterproductive; however, there is often a role for policy action to defend working systems of

Note that investment in new protected areas needs to be environmentally effective, and not just in ‘paper parks’ that lack adequate resources and capacity and are plagued by corruption. Most important, existing and new protected areas must properly compensate those whose access to resources and livelihoods has been or will be disrupted, with such compensation to be based on foregone wealth rather than foregone income.

benefit-cost ratio for reaching the MDG7 target (that is, halving the population without access to safe water and sanitation) was 7.5:1 (Table 5.1).

Rates of return to investments in a a can be very high, with substantial variation according to geographic context and the specific conservation technology used.

An economic survey of soil conservation in Central America and the Caribbean found mixed results (Table 6.3), with high rates of return (60 to 85 percent) for various conservation measures (such as terraces, rock walls and diversion ditches) on diverse crops (corn, sorghum, coco yam) in diverse settings (Costa Rica, Haiti, Honduras, etc.). Evidence from other global regions is not as well-documented, but partial surveys suggest a similar picture. Moreover, such studies often understate the benefits of soil conservation because they take into account only the impacts on crop productivity and do not incorporate other significant benefits of slowing land degradation, including improved food security, increased school attendance (due to decreased demand for child labor), enhanced creditworthiness and access to finance for farmers (based on better land quality), protection of vulnerable habitats for maintaining biodiversity, and reduced contribution to global warming.

Increasing a a , is likely to yield high returns on investment.

Although the MDGs contain no explicit target for energy supply or energy 'quality' for the poor, it is difficult to imagine major progress in eradicating poverty without significantly expanding the quantity and quality of energy services consumed by the poor. The International Energy Agency estimates that investments of about $17 billion per year over 12 years will be needed to provide an additional 500 million people with access to electricity by 2015, consistent with MDG 1 of halving extreme poverty by 2015. Further investment on the order of $11 billion per year is needed to replace the traditional biomass fuels (wood, dung, charcoal) used by the poor for cooking and heating with cleaner, modern fuels, such as kerosene. Surprisingly, economic studies have not estimated in money terms the benefits of these investments. However, benefits of $40-56 per person per year would be sufficient to just offset costs. Since this figure represents less than 10 percent of average rural expenditure for energy and only 2-3 percent of average urban expenditures, investments in access to sustainable energy are likely to have significantly positive benefit-cost ratios.

Moreover, replacing the traditional biomass fuels used by the poor would yield multiple benefits in terms of time savings (for women and children who currently spend hours per day collecting fuel), improved human health (due to better indoor air quality), reduced environmental damage from fuelwood cutting, and improved soil quality (from returning animal dung to farmers' fields rather than burning it).

Investments in , a , a a can produce substantial net benefits, especially for the poor.

Investments in conservation can help protect intact ecosystems from conversion to less diverse uses, such as agriculture. When carefully designed and managed, conservation pays and the poor gain, too.

The economic values of forests have been extensively studied, including the benefits of sustainable timber management. Of critical importance are payments for carbon storage and sequestration, since the evidence suggests that these dominate other forest ecosystem values. However, agroforestry, a conservation option that incorporates trees and enhanced wildlife habitat into cropland, produces high returns on investment, with benefit-cost ratios ranging from 1.7 to 6.1 (Table 6.8).

Economic studies of wetlands and mangroves consistently show that conservation is economically attractive, with benefit-cost ratios in the range of 1.2 to 7.4 (Table 6.11). Notably, the conversion of mangroves to shrimp aquaculture appears to be economically very unattractive.

Investments in better management of over-exploited fisheries can produce significant economic and ecological benefits due to reduced catch effort, although the costs in terms of unemployment can be high. An example of successful investment in improved fisheries management comes from Madagascar, where a system of long-term tradeable licences was introduced in 2000. Preliminary evaluation of the scheme suggests a very acceptable benefit-cost ratio of 1.5.

Investments in wildlife conservation can also help the poor when the benefits of conservation, largely in the form of tourism revenues, are shared equitably with local communities. Experience in southern Africa has shown that wildlife conservation can be more profitable than alternative land uses, such as cattle ranching (Table 6.12).

The policy context for successful investment in environmental assets for poverty reduction

Without the right conditions, investments frequently fail. By and large, the institutions and policies that need to be in place in order to make pro-poor investment in environmental assets 'work' are well known.

Social capital is essential for successful management of communally held resources, but the role of policy in efforts to create social capital is subject to debate.

Cohesive and cooperative communities clearly are pre-requisites for communal resource management regimes capable of protecting local environments and raising living standards. However, social capital tends to break down under conditions of environmental degradation, as resource scarcity can strain community cohesiveness as well as the rules governing access and use of communal resources.

Such impacts raise questions concerning the potential role of policy in creating the social capital needed for effective management of communally-held environmental assets. The evidence suggests that the most appropriate role for policy is likely to be in removing factors that inhibit social capital formation, such as weak resource and property rights. Direct policy interventions designed to increase social capital are likely to be counterproductive.

The quality of governance influences the effectiveness of pro-poor investments and pro-poor policy.

Investments in environmental assets are unlikely to be successful in reducing poverty without clearer definition and enforcement of resource rights of the poor. Studies indicate that better governance is strongly associated with higher income growth, and a better policy environment enables opportunities for asset formation. Strong resource rights, such as secure land titling, can help provide collateral for investments in soil and water conservation.

Access to credit is crucial for investments in environmental assets to reduce poverty.

Without access to credit at affordable interest rates, the poor cannot smooth their consumption across good and bad times, making poverty worse. Lack of credit also prevents the poor from being able to make the short-term sacrifices needed to realize long-term benefits.

A key concern for policy is ensuring that not only is credit accessible and affordable, but also that incentives are in place to make sure that credit is directed to pro-poor asset formation rather than current consumption. Strengthening the market for informal credit is usually more effective than trying to expand formal credit

The poor need improved access to insurance to cope with vulnerabilities to environmental hazards, such as droughts.

Because the poor rarely have access to formal insurance markets, their predominant strategies are self-insurance (through liquidation of assets, such as cattle) and mutual insurance (in which households agree collectively to make up shortfalls in any one household's income). With few tangible assets, the poor have limited ability to self-insure, and mutual insurance schemes are easily overwhelmed by events, such as natural disasters, that strike entire communities. Growing evidence indicates that the environmental assets of the poor act as a source of 'natural insurance'. For example, a study of farming households in the Brazilian Amazon demonstrates that households resort to gathering more non-timber forest products (such as nuts and fruits) as agricultural incomes fall.

The removal of environmentally damaging subsidies is a top policy priority for stimulating pro-poor investments in environmental assets.

Regardless of the initial motivation for subsidies, in the end the poor usually are not the main beneficiaries of developing-country subsidies, which tend to be 'captured' by richer groups. However, a higher priority is reform of subsidies in the rich countries. OECD government spending on subsidies in the agriculture, energy and water sectors damage developing economies and outstrips the development assistance provided by these governments by a factor of 10.

Market-based environmental policies for pro-poor asset formation may be a longer-term goal for many developing countries, due to institutional capacity constraints.

A limited number of such instruments are already in use in developing countries, including local fishery quota schemes (Madagascar), trading in water rights (Chile, Mexico), and air pollution quotas (Chile). The distributional impacts of market-based environmental policies such as environmental taxes and charges may prove to be somewhat of an obstacle, since taxes are likely to impose a larger burden on the poor, proportionate to income, than on relatively rich groups. In some cases, the solution may lie in looking at dispensations for poorer groups, as has been done with water and energy tariffs in many countries.

Payments for environmental services (PES) may have significant potential for pro-poor benefits.

Although the primary purpose for PES is environmental improvement, there appears to be considerable scope to design and implement PES so as to integrate poverty reduction benefits with the environmental goals of such schemes. The key requirement is for all parties, buyers and sellers alike, to be better off with the PES than without it.

Evidence of the pro-poor nature of PES schemes to date is limited. However, the poor may face special obstacles to participation, including lower bargaining power than other, non-poor contracting parties. Also, unless the poor have clearly established legal rights to their resources, they may not be able to participate in PES or only able to participate with the government acting as intermediary.

Some surveys have found that PES can constitute a significant fraction of income in poor households. For instance, a study in Nicaragua found that small farmers participating in cooperatives supplying organic and 'fair

Information gaps and research needs

A Note on Reading This Document

The links between poverty and the environment are broad and complex. There are many valid ways to assess these links; this report offers one perspective. In short, it is important to appreciate the limitations of this report:

It does not attempt to explain all the causes of poverty nor does it provide a comprehensive menu of actions to address poverty.

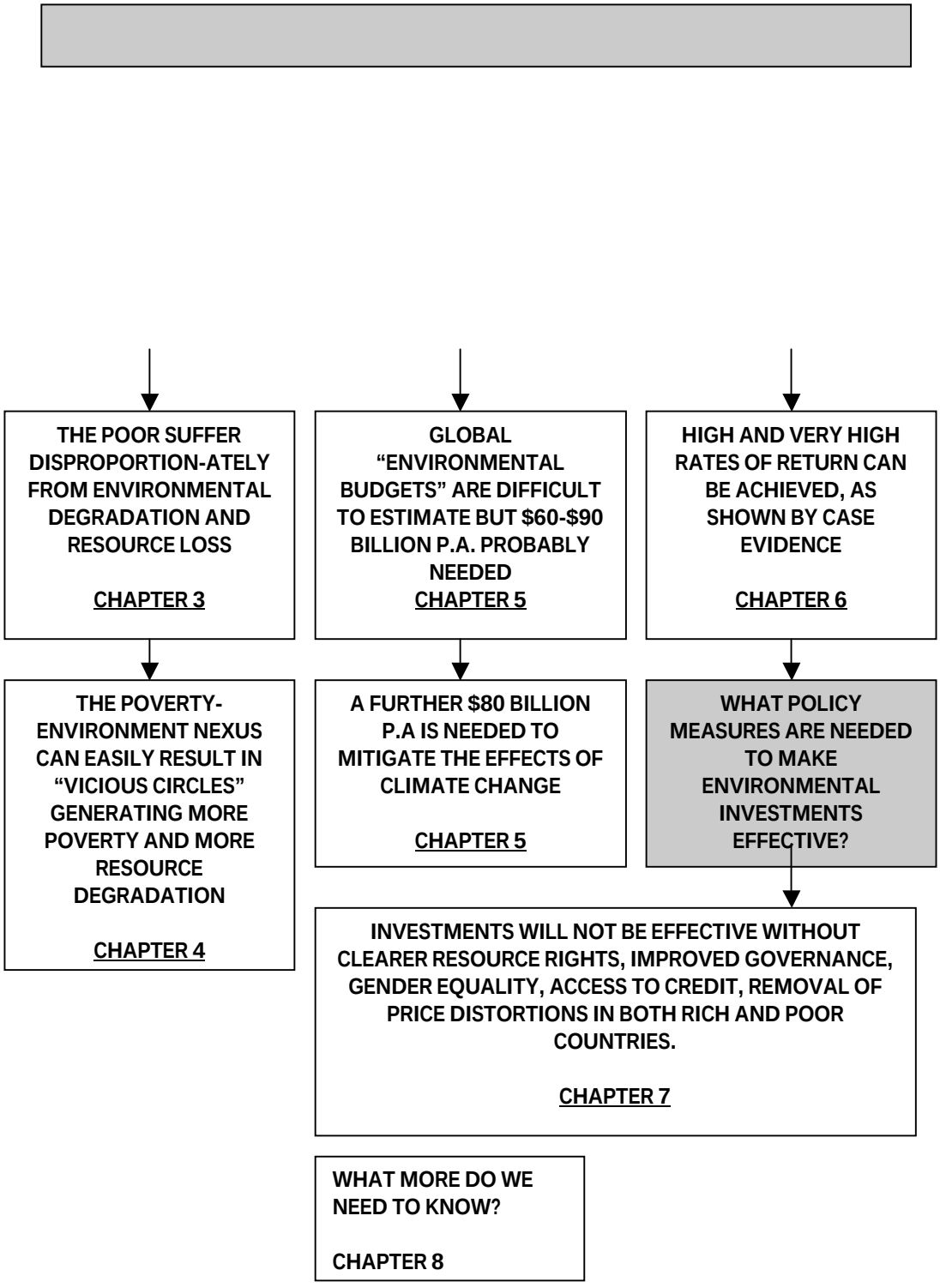
It is concerned with just one aspect of poverty, but one that the members of the PEP believe to be vital – the state of the environment in poor countries, the way this interacts with poverty, and the economic case for investing in environmental quality and natural resources as a means to reduce poverty.

It touches only briefly on the wider issue of North-South relations, which may sustain and cause poverty – the structure of world trade, globalization, exploitation by the powerful, etc. These are important issues. For some they may be the most important issues. But they are beyond the scope of this report.

The arguments presented are economic in nature, partly because that is how many influential people see the issues, and partly because economic logic and evidence can help to clarify what needs to be done to reduce poverty.

Above all, many still see the environment as a "luxury good," something the poor can address when they are richer, but not now. This report is dedicated to correcting that view: Investing in the environments on which the poor depend often makes immediate economic sense.

A Guide to the Report



1 Introduction

1.1 Purpose and focus

This report sets out to prove that policy measures aimed at improving the natural environment and investments in environmental assets can, and do, play a critical role in improving the well-being of the world's poor. It does so by showing that:

> poor people are poor because their assets are few, and often of low quality;
>
> a significant fraction of those assets comprise natural and environmental resources that provide valuable ecosystem services;
>
> environmental assets are highly vulnerable to overuse and external appropriation;
>
> it is extremely easy for local, national and global events and policies to trigger mechanisms that damage environmental assets, forcing the poor into "vicious cycles" of poverty and further environmental loss;
>
> although rich people can often protect themselves against many of the effects of environmental degradation, the poorest usually cannot;
>
> when carefully managed, the "social rate of return" from investments in environmental assets can be very high and of special benefit to the poor; and
>
> such investments need a favorable policy context to make them effective and sustainable.

The implication is that environmental improvement is not just a national need in poor countries, it is also a special need for the poorest within those countries. In short, environmental improvement is a requirement for sustainable economic development in its broadest sense, and an essential condition for poverty reduction. The report seeks to show that efforts to reduce poverty through economic growth can be thwarted unless those efforts also target improvements in the quality of the natural environment and the stock of natural resources.

Although these messages are understood by many in the development community, for others the case has yet to be made.[1] Thus:

> "…[sustainable natural resource management] is at time dismissed as an extra cost with low returns, or a desirable goal but with a low priority compared to other rural poverty alleviation needs such as health, education, infrastructure, water and sanitation, etc."[2]

In part, and despite several excellent recent efforts to convey the message,[3] the lack of recognition of the role of the environment in development reflects a wider failure of the environmental community to provide the substantive evidence for their claims. Several major contributions to the environment-development debate note

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[1] Thus, one of the world's leading environmental and development economists, Sir Partha Dasgupta of Cambridge University, in his Human Well-Being and the Natural Environment, remarks that he has long drawn attention to the neglect by development economists of environmental economics and that environmental economics has made "no contact with poverty in poor countries." "The two fields of specialisations had passed each other by and had weakened in consequence" (Dasgupta, 2001, p.viii).

[2] Gutman (2003), p11.

[3] For example, DfID and others (2002), and Duraiappah (2004.).

that environmental issues have not so far been fully integrated into strategies and policies for achieving the Millennium Development Goals.[4] The perception remains that the environment is something to be addressed at a later stage of economic development. Indeed, in some cases, addressing environmental concerns now is still seen as a restraint on economic development.[5] This view reflects an outmoded understanding of the environment-development nexus, and one that is not confined to the developing world. Even in rich countries, environmental improvement is often seen as the enemy of competitiveness and productivity. Clearly, if such a perception exists, there must be reasons for it. This report suggests that the perceived conflict between environmental management and pro-poor growth persists in part because, to date, the evidence showing that it is wrong has not been assembled in a robust and convincing way.

serves the same function, while indoor air pollution depreciates the asset and harms human health. Local forests provide many kinds of timber and non-timber products, and so on.[6]

The environment and natural resources

The asset approach also helps to explain what the report means by "environment" and "natural resources." Uses of these terms vary, but they can also be thought of as synonymous. Clean water is an environmental asset, as is soil, clean air, the ozone layer, and the global atmosphere. A forest, mangrove, wetland, coral reef, a waste disposal site, and wildlife are also environmental assets, as are coal, oil, natural gas, biomass fuels etc. The last few are perhaps more commonly thought of as "natural resources," but if the characteristic of a natural resource is that it functions as an asset and is natural in origin, then these natural resources are not conceptually different to the environmental assets listed earlier. Hence, environment and natural resources will also be used interchangeably in the report.

Finally, the asset approach underlines the variety and extent of environmental assets. The "environment" is not just about exotic birds and fine landscapes: They are indeed part of the wide panoply of environmental assets but only a small part.

1.4 Structure of the report

The report has the following structure:

Chapter 2	Briefly reviews the Millennium Development Goals and the role of environmental improvement in achieving them. A reflection on the environmental Kuznets curve hypothesis, which may have misled many into thinking the environment is a luxury, something that can be afforded only after poverty has been eliminated. An appraisal of the view that it is assets (wealth) that matter for poverty reduction.
Chapter 3	Investigates in more detail the asset-based approach to poverty reduction, showing how it links to the economics of sustainable development, the "sustainable livelihoods" literature and Amartya Sen's "entitlements" approach. Improving the asset base of the poor is seen to be vitally important, but asset inequality may also slow income growth generally.
Chapter 4	Explores the complex interlinkages in the poverty-environment nexus, showing how easily "vicious circles" can result from events such as natural disasters, climate change, misguided policy and external factors. Once environmental assets are degraded, incentives may arise that exacerbate poverty, leading to more environmental degradation. Institutional change may not be fast enough to halt the process of degradation.
Chapter 5	A brief look at some broad-brush estimates of investment needs to meet the Millennium Development Goals, which explicitly or implicitly address the environment-poverty nexus.

[6] For detailed descriptions and evaluations of these flows of services see UN Millennium Ecosystem Assessment (2005a, 2005b).

Chapter 6	Reviews the empirical evidence to show that investments in the environment can yield "high" economic rates of return.
Chapter 7	Outlines the policy context. Investments will not succeed unless the conditions for sound and sustainable investments are present. The "correct" policy context will vary, but some generalizations can be made. The broader issues required for any measures to work are only hinted at, since the chapter focuses on what is needed for environmental investments to work.
Chapter 8	Although the economic case for investing in the environment for poverty reduction is much stronger than is usually supposed, there are significant gaps in information and research. This chapter outlines some of the issues that still need to be addressed.

References can be found in the accompanying bibliography, which also includes material not necessarily cited in this report.

2 The Millennium Development Goals, Sustainable Development, and The Environment

2.1 The Millennium Development Goals

United Nations member states signed the Millennium Declaration in 2002 and, in so doing, committed themselves to its eight goals and 18 targets aimed at cutting extreme global poverty by 50 percent by 2015 relative to 1990. The Millennium Development Goals (MDGs) include Goal 7 (MDG7) which in turn embraces

Box 2.1 Population growth and poverty reduction

The Millennium Development Goal on poverty reduction is expressed in terms of halving the proportion of people in extreme poverty by 2015. Since population in poor countries is growing, meeting proportional goals can still mean that the absolute number of people in poverty may not decline and could even increase. The World Bank estimates that:

Between 1981 and 2001, the proportion of world population living on less than US$1 per day fell from just over 40 percent to 21 percent.

In the same period the proportion living on less than $2 per day fell from 67 percent to 53 percent.

In absolute numbers, the corresponding figures are 1.48 billion down to 1.09 billion ($1 per day), and 2.5 billion rising to 2.7 billion ($2 per day). Thus, using the $2 per day figure, absolute numbers in poverty actually increased over the 20-year period.

On both measures, sub-Saharan Africa shows marked increases in poverty; in each case close to doubling the numbers by 2001.

Technological change has the effect of raising the "productivity" of assets, enabling more well-being to be generated from a unit of wealth. The technology in question may be anything from machines to bicycles, from changes in crop rotation to the use of fertilizers and tractors, from faster growing trees to water filtration. In each case, more welfare-enhancing services are obtained from the same level of the relevant asset. Technology transfer is, therefore, an important additional component of strategies to reduce poverty.

Since the focus of this discussion is on poverty, the assets that matter most are those that are owned by or accessible to the poor. Ownership may not be essential. It is the use of assets, and how the benefits derived from that use are distributed, that matters. The poor make use of many environmental assets that are not owned by anyone ("open access" resources) or which are owned by the state but with limited enforcement of restrictions on access ("de facto" open access resources). These assets are vulnerable. If too many people make use of them, there is a strong risk of depletion. Like all individuals, the poor also make use of assets owned or managed at the communal level. These assets may be more secure, so long as communal management systems do not break down or are not overruled by external powers. Other assets, such as infrastructure and transport, also affect poverty and these may be owned by the state or local government. Here the poor may find that they have unequal access to available infrastructure (schools, hospitals, even roads and public buildings), although the picture is often complicated (see Section 3.8).

The aim of poverty reduction now becomes (a) increasing the asset base of the poor to give them the capability to increase their own well-being, and (b) raising the productivity of the assets they already have through technological change.

2.4 Environmental sustainability and the MDGs

Although MDG7 is the only MDG that explicitly addresses environmental issues, it is important to understand that the targets associated with MDG7 have a cross-cutting influence on the other MDGs. Without this understanding, MDG7 might be wrongly construed as a "stand alone" objective and secondary to the other goals. For example, reducing rural poverty requires increasing agricultural productivity, something that cannot be done if soil fertility is low and water is scarce. Child mortality is strongly linked to unclean water, and mortality generally to both indoor and outdoor air pollution. The health of the poor and, hence, their productivity cannot be ensured if water quality is poor or if women are forced to travel long distances to fetch meager water and fuelwood supplies. There is often a strong gender bias in the use of natural resources, with women in developing countries bearing the brunt of fuelwood and water collection and a disproportionate impact from indoor air pollution. Similarly, providing schooling for children cannot be achieved if they are in poor health or must spend long hours collecting fuel and water. The linkages between MDG7 and the other MDGs are not comprehensive – the case can be made for other goals being a condition of achieving environmental goals, while the environment has little or nothing to do with reducing HIV/AIDs. But it is clear that the environment is central to the MDGs in general.[10]

[10] The linkages among the goals are explored in World Bank (2002), DfID et al. (2002) and UNDP (2002). They are emphasized again in the report of the UN Millennium Project's Environmental Sustainability Task Force – UN Millennium Project (2005b).

Subsequent to the formulation of the MDGs, the United Nations commissioned the Millennium Project with 10 Task Forces to elaborate the implications of the MDGs.[11] The Task Force on Environmental Sustainability reported in 2005[12] and concurs that:

> "Environmental sustainability is essential to achieving all the other Millennium Development Goals" (p.1).

Box 2.2 summarizes the links between environmental management and the Millennium Development Goals.

2.5 The Millennium Ecosystem Assessment

Although there have been many reports on the state of the world's natural environments, the Millennium Ecosystem Assessment (MA) is unique in being so comprehensive and in linking the state of the world's ecosystems to human development.[13] The MA documents the changes that have occurred in global ecosystems, noting that many of those changes are due to human appropriation of ecosystem products and services, often on an unsustainable basis. Many wild plant and animal populations have declined in number, although at the same time there has been a reduction in the genetic diversity of domesticated crops and livestock. Overall, the MA argues that ability of natural ecosystems to meet current and, more importantly, projected future human demand is seriously limited. In line with the arguments presented in this report, the MA acknowledges that conventional measures of income and output (e.g., gross domestic product) can increase, even while underlying natural wealth is declining. The MA thus reinforces the emphasis placed on wealth accounting in this report. Ecosystem change self-evidently increases the potential for human well-being, e.g., forest land converted to agriculture supplies food resources. But the MA stresses the costs of this conversion process in terms of the forgone ecosystem benefits, with the additional observation that many ecosystem conversions fail to provide the hoped-for benefits. The immediate drivers of ecosystem change are often of less interest than the underlying forces (i.e., "indirect" drivers), which include population growth, income growth, exploitation by richer sectors of society, and distorted and missing markets.[14]

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[11] The Task Forces have produced 14 reports; four focus on HIV/AIDs, malaria, TB and access to essential medicines. In addition, there is an overview report – UN Millennium Project (2005a).

[12] UN Millennium Project (2005b).

[13]

Box 2.2 Environment and the Millennium Development Goals[15]

Environmental Management Measure	
Sound and equitable management of biodiversity and ecosystems	
—	
Ensure access to safe water and sanitation	
—	
Improve air quality and exposure to toxic chemicals	
—	
Mitigate natural disasters and resource-based conflict	
—	
Reduce and mitigate climate variability and change	

The MA constructs several scenarios to indicate likely future changes in the world's ecosystems. As long as the global community takes "proactive" measures, there is scope for ecosystem improvement. Otherwise, the future could be worse than the present. Future change is to some extent predictable, but there are changes that might occur in a sudden and fairly unexpected way. Human intervention tends to increase the latter risks. Scientific information on the interactions between ecosystems and human well-being remains weak. Among the many gaps in knowledge are (a) limited understanding of the economic value of ecosystems, and (b) the cultural benefits of ecosystems. Among many proactive measures suggested to prevent further loss of ecosystems are the expansion of protected areas and strengthening of international environmental agreements. There is no "plan of action," in the MA since this was not the aim of the study.

Given the compelling and disturbing story told by the MA and other similar studies, the question arises as to why so little is being done to reverse the loss of ecosystem products and services. One reason is the prevailing view that the environment is a luxury, something which can be addressed when nations are richer but not before. To some extent, this long-standing misperception has been reinforced by recent literature on the relationship between environment and economic development. This issue is discussed in more detail in Section 2.7 Other explanations for the neglect of the environment are documented in a useful commentary on the MA[16]:

> One long-standing explanation is that the environment is "pervasive": All economic decisions affect the environment, and many environmental changes affect the economy. As a result, it is difficult to "mainstream" the environment compared to, say, education or infrastructure or even health. There has accordingly been "insufficient coordination and leadership at the national level."[17] Where there have been local successes in improving the environment and well-being, all too often the lessons are not replicated at a national scale. Environmental issues are rarely integrated in national development policies.[18]
>
> There has been an overemphasis on "process" targets – for example, setting up decision-making procedures – at the expense of "output" targets, such as quantitative reductions in pollutant emissions or total area under protection.
>
> Directories or compendia of what works are lacking. It may be that what works in one location will not work elsewhere, but there is an urgent need to learn from practical case studies as far as possible.
>
> The balance between "policy" concerns and "investment" needs has swung too far in favor of the former. This report addresses this issue directly by showing that increasing wealth is a precondition for poverty reduction, and that increasing wealth requires increased investment, along, of course, with the corresponding policy context.

2.6 Is environmental improvement consistent with sustained economic development?

Despite all the efforts to show that environmental improvement is a precondition for poverty reduction, there remain concerns that the centrality of the environment to the MDGs has not been fully appreciated in all quarters. Perversely, it may be that some recent and fairly popularized work in environmental economics has contributed to this perception. The environmental Kuznets curve (or EKC) is an empirical construct which suggests that the environment degrades in the early stages of economic development and then improves later, once some income threshold has been passed.[19] The literature on the EKC is very large and the construct is easily summarized in the form of an upside-down saucer-shaped curve (see Box 2.3). The simplicity of the basic idea has contributed to its popularity. The temptation has been for some commentators to take the construct and use it to argue, incorrectly, that not only has poverty alleviation got nothing to do with the environment, but that the environment actually has to get worse, or should get worse, for the poor to improve their lot.[20] Even if some in the development community do not refer explicitly to the EKC, they may articulate the same argument by stating that the environment is a luxury, something the developing world cannot afford until it is richer.

Such a view is not only invalid in intellectual terms, it can bias development efforts against the environment,

Third, if environmental losses are irreversible, no amount of income growth will restore those losses. A clear instance is global climate change. All the economic-climate models show that the developing world will suffer more than the rich world in terms of damage as a proportion of income (see Chapter 4). Yet global warming is to all intents and purposes non-reversible. This is acknowledged in the international long-run climate targets. No one is arguing for the conservation of the "current" climate, as measured by concentrations of greenhouse gases in the atmosphere (currently around 370 parts per million). Long-run goals center on a warmer world with concentrations at 550 parts per million.[25] The corresponding temperature increase is effectively irreversible in policy terms. Yet even this long-run goal will impose disproportionate harm on the poor of the world.

The EKC also masks the incidence of poverty, since the measures used to indicate real incomes are averages. Economies may grow and average incomes rise, but the poor may not share proportionately in those rising incomes. Indeed, the original construct of a Kuznets curve linked real incomes to inequality rather than to the environment. The hypothesis was that the initial stages of economic growth would be accompanied by a worsening of inequality, which only later would decline. A related issue concerns human health. Rising incomes are normally associated with better health, but if the environment worsens as incomes rise, there will be an offsetting effect on human health. In some cases, the detrimental effects of environmental degradation on health can outweigh the beneficial effects of rising incomes.[26]

Finally, the evidence suggests that, even where the EKC broadly fits experience, it is highly sensitive to policy measures that enable a "tunneling through," as shown in Box 2.3.[27] This means that policy measures can be adopted which flatten the curve, avoiding the early environmental degradation and moving rapidly to the declining section where the environment improves. Tackling corruption is one way to flatten the curve.[28] It hardly makes sense deliberately to inflict environmental damage on the poor just because this was the way the rich nations developed hundreds of years ago. There is no need to repeat that unhappy experience. In short, the EKC is neither inevitable, nor does it describe a desirable path of development.

[25] This long-run goal has been adopted by the European Union.

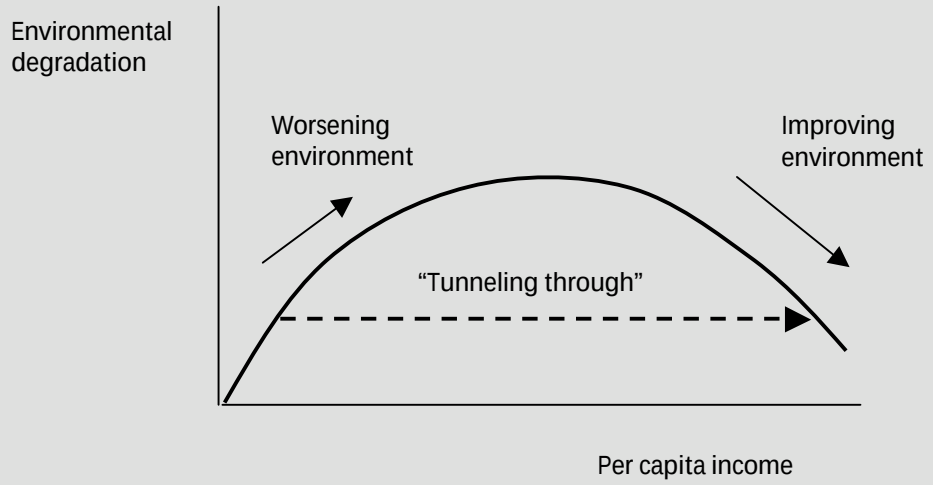
[26] See for example Gangadharan and Valenzuela (2001).

[27] For example, see Panayotou (1997).

[28] See López and Mitra (2000).

Box 2.3 Does the environment have to get worse for the poor to become rich?

The Environmental Kuznets Curve (EKC) shows how measures of environmental degradation vary with per capita incomes. The shape generally supposed to result is shown below as an upside-down saucer.



One implication, drawn by many casual observers, is to argue that we do not need to worry about the environment in poor countries. Once the poor have become better off, it is suggested, they will pay more attention to their environment and seek to improve it, correcting past degradation in the process. Indeed, such a process looks remarkably similar to the way that industrialized countries proceeded in the past – only in the latter stages of the Industrial Revolution were laws passed to protect water quality and reduce air pollution. But this interpretation of the EKC is both invalid and dangerous for the world's poor:

There is a debate as to whether the EKC is valid for more than a few forms of environmental degradation.

The rural poor tend to occupy environmentally marginal land. Degradation is often irreversible, although there are occasionally some "good news" stories, such as the case of Machakos District in Kenya.

At the global level, the poor suffer more than the rich from climate change. Yet global warming is to all intents and purposes irreversible – we can only aim for stabilized, but higher, temperatures.

If the environment worsens as incomes rise, so human health may actually decline if the detrimental effects of environmental degradation outweigh the beneficial effects on health of rising incomes.

The evidence suggests that, even where the EKC does broadly fit experience, it is highly sensitive to policy measures that enable a "tunneling through," as shown in the diagram above. In short, the EKC is neither inevitable nor does it describe a desirable path of development.

3 Poverty, Wealth and The Environment

3.1 Wealth, institutions and incentives

Chapter 2 sketched the elements of a theory of sustainable development in which future well-being depends on the accumulation of capital assets but where the nature of those assets extended across a broad domain of physical, social, environmental and human capital. The role of technological change in making assets more productive was emphasized. These assets and technologies define the potential capability of individuals and communities to generate well-being. Of course, for this potential to be realized, many other factors must be present: notably, the "right" institutions and the "right" incentives. For example, if communities have no secure rights to their land or other natural resources, they may quickly lose their livelihoods because they cannot prevent others from using or usurping them. Property rights matter. Situations where no exclusive rights exist – so-called "open access" – are not conducive to wealth creation. Communal and/or individual ownership is essential wherever resources are scarce relative to demand. Similarly, if prices in the local economy fail to reflect the scarcity of the resources being used, there will be incentives to overuse those resources, risking resource exhaustion. The presence of subsidies may distort price signals as well, as will laws that give title to land only if it is cleared of forest or a wetland drained, and so on.

Accounting for wealth is , therefore, only part of the analysis of environment and poverty links. The full story is more complex and must recognize, at the very least, the presence or absence of property and resource rights, and the structure of incentives. These factors define the "context" for wealth enhancement.[29]

Box 3.1 shows the links between this asset-based approach and other prominent approaches to sustainability and poverty reduction. Poverty reduction needs initially to focus on encouraging more wealth creation (or more wealth redistribution) for the benefit of the poorest sections of a community. Moreover, there is evidence to

Box 3.1 Approaches to sustainable development and poverty reduction

What this report calls the "asset-based approach" unites several strands of thought in the development, environmental economics and poverty reduction literature.

The ***a a*** , treats wealth increases as the basic requirement for sustained rises in per capita well-being through time. In this literature, wealth is construed broadly as man-made, human, social and environmental (natural) capital. The main body of this literature regards these forms of wealth as substitutable over the range of likely policy measures. As assets decline, however, their scarcity increases, and the rate at which they can be substituted by other assets will itself decline. In the limit, no-one would survive in the total absence of environmental, human, social or man-made assets, so it makes no sense to say that the rate of substitution between them is the same for all time. Additions to wealth are known as "genuine savings" which is simply the total savings in the economy minus the depreciation of all assets. Some refer to this as "genuine investment." The terms are interchangeable. If genuine saving is negative, depreciation exceeds savings (investment), so that the capital base of the economy must be declining; the asset base is being "mined." Since no one can live off capital forever, negative genuine savings is symptomatic of non-sustainability. The introduction of population growth to the analysis permits its reformulation in wealth per capita. The basic condition for sustainability is that the rate of growth of genuine savings (as a fraction of all capital) must exceed the rate of population growth. Although the theory was developed in a mathematical fashion, the basic intuition is fairly easy to grasp: The aforementioned rule derived above amounts to saying that the rate of net asset formation must rise in per capita terms. Importantly, the approach lends itself to quantification, i.e., it is possible to classify economies according to their degree of sustainability. This is the task of ***a a*** , , with the major exercise on this being conducted at the World Bank.

Recently, development economists have also focused on ***a - a*** , . This has strong similarities with the economics of sustainable development and focuses on asset growth as a precondition for long-run rising per capita incomes. The assets targeted in this literature have so far tended to exclude environmental capital, but there is no reason why the approach cannot be extended to include environmental assets. The literature tends to emphasize the role played by a major part of human capital – education. For any household, an indicator of ownership and access to assets is multiplied by a rate of use of the asset and then by the "price" of the asset. Income increases can then be achieved by (a) expanding the asset base, (b) increasing the rate of utilization of assets and (c) raising the unit value of the assets. For example, developing a labor market for school dropouts increases the value of education and the likely rate of use. As with wealth accounting, asset-based growth is capable of quantification.

The role of assets also figures prominently in the emerging literature on , - , . Pro-poor economic growth requires that growth in the economy benefits the poor by reducing their absolute poverty level. Perhaps surprisingly, given past development aid efforts to raise average incomes in developing countries, absolute poverty does not necessarily fall as economic growth takes place. Initial levels of inequality appear to have a lot to do with this result: The greater the initial inequality, the less likely are the poor to share in the benefits of economic growth. Low initial shares of wealth translate into low shares of future wealth. The policy implication is that measures to address inequality are important for growth to benefit the poor. How does initial inequality bring this state of affairs about? The suggestion is that limited access to assets - especially education, health and infrastructure - inhibits the poor from participating in the growth process. Changes in inequality for gro

Nobel Prize winner Amartya Sen developed his ***a*** , ***a***

The poor are poor because they have limited assets, inferior access to those assets that do exist, and limited access to technology. These factors preclude them from accumulating surpluses for investment in asset growth, trapping them in a vicious circle of low assets, low income, no re-investable surpluses low assets. An important extension of this focus on assets is the way in which the poor seek to supplement their asset base by using "free" assets. For example, in rural areas, forest products, and more generally the goods and services arising from ecosystems, are important assets. In urban areas, asset poverty shows up in the formation of slum dwellings that make use of waste land neglected by the market. The poor may also exploit others' waste as a "free" resource, e.g., collecting materials from waste disposal sites. Although these processes expand the asset base of the poor, the absence of well-defined property rights creates risks of overuse, overcrowding, degradation and risk of exploitation by others more powerful than the poor. Where ecosystems are in their early stages of widespread use, they generate "rents" (profitable opportunities) that attract outsiders such as loggers, large land owners and others who can easily displace the poor and exploit the ecosystems (see Box 3.2). As ecosystems degrade, so the supplemental asset base declines, and the poor once again find themselves in a vicious circle of asset poverty. In urban areas, the poor may easily be dispossessed as cities expand and marginal land rises in value to developers.

Box 3.2 Resource rents and the poor

Economic rent is the difference between the price of an ecosystem's products and the (marginal) cost of extraction. "Rent seekers" are those who try to appropriate, or "capture," as large a share of the rent as possible for themselves. Rent seeking is generally unproductive in that it does not generate additional wealth but simply redistributes existing assets. For example, the allocation of a forest area for logging creates potential economic rents wherever there is a significant difference between extraction costs and the market price of timber. Rent seekers such as those who vie for logging concessions often have more political power than the poor and are wealthier, although the poor themselves may be attracted by available rents. In general, however, the poor tend to lose out to other rent-seekers and are displaced from traditional uses of resources. In other cases, the poor may gain, for example, if a logging company opens up areas that were previously inaccessible. Once the logging company has taken what it wants (usually the highest value tree species), the forest may become an open access resource for the poor.

Natural resource discoveries – e.g., oil and gas deposits – also stimulate rent-seeking and arguments about rent capture. One reason that some countries make apparently poor use of natural resources is that massive efforts go into fighting over the division of the rents, rather than reinvesting the proceeds in future development. In many cases, resources rents accrue to the few and are consumed or taken offshore. A few countries – for example, Botswana – have adopted successful strategies for managing their natural resource endowments, using some of the proceeds to enhance current consumption, while reinvesting the balance in education, health and infrastructure.

Subsidies offer another example of rent-seeking. Although some subsidies may be designed with the aim of helping the poor, experience suggests that the poor usually lose out in the race to capture the rents that subsidies represent, with richer groups in society enjoying most of the benefits. Many subsidies are quite explicitly aimed at richer and more powerful groups, e.g., as rewards for political support.

Rent capture is about the distribution of power in society. Poverty reduction strategies must take account of this. Efforts to address the distribution of resource rents present some of the greatest challenges to poverty reduction. Governments must be persuaded to tackle corruption. The limited power of the poor has to be augmented – their voices must not only be heard, but their concerns acted upon. The power of rent-seekers has to be curbed. Democracy has to be encouraged. This often amounts to wholesale political reform in nations that corrupt in part, still enjoy sovereign rights over natural resources.[31]

[31] For an extensive discussion, see Rose-Ackerman (1999).

Wealth can be generated within the household or community and can also be conferred from outside, e.g., through official aid, charity or other transfers. In this way, asset formation becomes the "driver" of poverty reduction since assets determine the strategies that the poor can use to improve their well-being. Again, it is critical to understand the range of assets involved – for a rural agricultural household assets include housing, land holdings and soil fertility, water availability and quality, livestock and seeds, access to credit, personal woodlots, access to communally owned or open access forest, access to fisheries, indoor air quality, education, skills, personal health, capacity to express views and opinions freely, local infrastructure, agricultural machinery, access to technology and markets (location), and social and institutional linkages, including gender relationships. For the urban poor, the assets may be narrower in range, with more goods and services being secured through markets but with environmental variables still of importance, e.g., outdoor air pollution from traffic and industry may become more important than indoor air pollution. (Box 3.3 provides a classification of assets.)re f 173.28 539.52 106.08 -33.12f

Box 3.3 The nature of household wealth

	Household level	**Community level**	**National level +**

3.2 The role of children

The role of children as assets is stressed by some analysts.[32] Children often contribute labor while their parents are able to work, and provide informal social security when parents need care in older age. This suggests a positive role for larger family size until such times as labor markets develop more fully, and official social security systems are introduced. Others have suggested that population growth stimulates technological change, rather in the way that industrializing countries in the 18th century secured a stimulus to take off into economic growth as their populations expanded.[33] However, large family size can be detrimental to the health and nutritional status of the household, while rapid population growth generally dissipates available asset stocks, making sustainable development less, not more, likely. Family sizes that are optimal for the household need not be optimal when seen from the standpoint of society as a whole. Children as assets thus embody a duality – both a costly and beneficial role when seen from the household and the social viewpoint. Other complex factors are also involved in family size. Reproduction may not be freely chosen where the woman has inferior status within the household and where information and outside help is limited. The superior status of male children in some cultures can also produce family sizes larger than would be the case where gender equality is recognized.

3.3 Asset depreciation

All assets are subject to depreciation – they wear out with use or are superseded by superior assets. Human capital depreciates within every individual simply because people grow old and die. But the stock of skills and knowledge may be renewed by being passed on to later generations. Hence, human capital is a potentially renewable resource. Where knowledge is not passed on, as with many forms of indigenous knowledge, it can easily be lost. Care has to be taken to conserve this aspect of human capital while allowing it also to appreciate through education and other forms of investment. In the same way, many other assets are renewable and can appreciate so long as their rates of use do not exceed their rates of regeneration. Newly bred livestock replace old livestock, new trees replace felled or dying trees, rainfall replenishes water resources, and so on. But if the incentive structures are such that use rates exceed regeneration, then the innately renewable resources quickly become exhaustible, and exhausted, resources.

The brute fact that assets tend to depreciate, unless cared for and regenerated, further explains the vicious asset cycles that are faced by the poor. If they begin with a low asset base, and if the resulting incomes do not permit surpluses to be generated, then not only will they be unable to invest in the appreciation of assets, they will face the prospect of not even being able to maintain the assets they do have. Once this "model" of poverty is extended to the environment, it is easy to see that, unless the right context exists, environmental assets will also depreciate, worsening poverty.

3.4 Measuring wealth

The measurement of the asset base of nations, and more so of the poor, is in its infancy. Continuing work at the World Bank is building up a picture of national wealth.[34] Table 3.1 shows some of the early results. Broadly speaking, absolute levels of wealth and absolute levels of income are closely linked. But the links between wealth and "growth of incomes" are not so straightforward. Income growth might be expected to be conditional on wealth increases. Using assets more efficiently will raise incomes and raise the value of wealth.[35]

The message for poverty alleviation strategies is essentially the same. Those strategies must achieve a twofold goal:

Expanding the assets of the poor

Increasing the efficiency with which the poor's assets are converted into flows of well-being.

The only sustainable poverty alleviation strategy is to make wealth grow and, at the same time, generate rising incomes from that wealth creation. The focus on wealth permits this analysis of sustainability, whereas looking at incomes alone can easily disguise the fact that incomes are being generated from the depreciation of assets.

3.5 Asset inequality and income growth

Table 3.1 suggests that even the poorest countries may appear to grow in conventional income per capita terms. But growth unaccompanied by net asset creation is unlikely to be sustainable since it is based on the mining of assets. A second issue concerns the distribution of assets within a nation. Economists have long been interested in inequalities of income and the way they affect economic growth. Various interactions have been investigated. The literature suggests that income growth has little effect on income inequality. It is ambiguous with respect to the effects of income inequality on economic growth, some of the studies finding positive effects (more inequality produces more growth), some finding no effect, and some finding negative effects.[37] The literature also suggests that general economic growth produces much more poverty reduction in economies where there is low income inequality than in economies where there is high inequality of income.[38]

When the focus is switched from income to assets (wealth), a clearer relationship appears to emerge. Inequalities in asset holdings appear to worsen the prospects for economic growth and, hence, for poverty reduction policies based on stimulating the overall growth of the economy. The result is a kind of "poverty trap" – the poor have few assets, the higher the incidence of poverty, the worse is wealth distribution, and the lower are the chances of economic growth alleviating that poverty. Three results emerge:

The greater the degree of inequalities in land holdings the lower economic growth tends to be.

The greater the level of human capital, the greater is economic growth.

Investment in human capital, e.g., via education, has less effect in economies where assets are unequally distributed.[39]

It also appears to be the case that redistribution of wealth has positive effects on economic growth.

If all these associations are correct, then poverty reduction is most efficiently achieved by increasing economic growth. Increasing growth is best served by reducing asset inequality, and it follows that asset inequality is best served by investing in the asset base of the poor, creating a virtuous circle of growth and poverty reduction.

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[37] For a review of this literature, see Lopez (2004).

[38] For example, see Ravallion (2004) on the "growth elasticity of poverty." Ravallion argues that a percentage growth in income level is associated with significant reductions in poverty when there is low inequality and only very moderate reductions when there is significant income inequality. Kraay (2004) suggests most poverty reduction is accounted for by economic growth.

[39] These results can be found in Deininger and Olinto (2000) building on earlier work by Birdsall and Londoño (1998).

The asset-based approach suggests policy implications for poverty reduction that may differ from the conventional income-based approach:

> Wholesale wealth redistribution may be one way of reducing the growth-inhibiting nature of wealth inequality – e.g., land reform. The record of such policies is mixed, however, and in some cases has proved disastrous, especially for the poor.
>
> Although the previous analysis treats land as being of equal quality, investing in soil fertility and productivity in marginal land areas could have similar effects in reducing the inequality of land ownership.
>
> Public investments, e.g., in infrastructure, need to be further targeted at the poor.
>
> Existing policy measures should not worsen the bias of asset ownership.
>
> Policies to ensure access to credit markets and forms of insurance against local or other disasters need to be strengthened (see Chapter 7).

Other policies, e.g., broadening and deepening educational attainment, which are central to conventional approaches, are confirmed by the asset-based approach.

The central message is that policies aimed at increasing the assets of the poorest sections of the community will reduce asset inequality and simultaneously improve income growth prospects, thus further assisting poverty alleviation. Like national wealth, household wealth must be increasing through time for there to be a sustainable future for the poor. Further, the efficiency of interventions in improving human capital formation will also be increased, making a further contribution to poverty reduction.

Table 3.2 Some estimates of the composition of per capita wealth 2000 (2000$)

Income group (excluding oil states)	Man-made, or "produced" wealth	Environmental or "natural" wealth	Residual or "intangible" wealth	Overall wealth per capita	Environ-mental wealth as % of total wealth
Low income	1,174	1,925	4,433	7,532	26
Middle income	5,347	3,496	18,773	27,616	13
High income OECD	76,193	9,531	353,339	439,063	2
World	16,850	4,011	74,998	95,860	4

Source: Hamilton et al. (2005). For earlier estimates, see Kunte et al. (1998). Human capital is subsumed in the residual wealth category.

Table 3.2 shows clearly that environmental assets are far more important, relative to total wealth, in low-income countries, amounting to some 26 percent of wealth, compared to just 2 percent in OECD countries. Table 3.3 shows the decomposition of natural wealth. Crop and pasture land dominate the results for low-income countries at around 70 percent of natural wealth. The data are incomplete. For example, they do not cover wildlife resources, the value of biodiversity (other than indirectly through the value of protected areas) and the amenity value of the environment. Nor do they explicitly account for clean air and water other than indirectly via their effects on human capital and, hence, on output as measured by gross domestic product (GDP). Although the proportion of natural to total wealth declines as incomes grow, the absolute value of natural capital rises as incomes grow. As the data problems of accounting for natural capital are overcome, the value of natural capital is likely to increase even further. As incomes grow, there is a greater demand for environmental quality, but the evidence suggests that the percentage growth of this demand is less than the percentage growth of incomes.[42]

Table 3.3 The composition of natural wealth 2000 ($2000 per capita)

Income group (excluding oil states)	Subsoil assets	Timber and non-timber forest resources	Protected areas	Crop and pasture land	Renewable resources as % total natural wealth
Low income	325	157	111	1,332	83
Middle income	1,089	289	129	1,990	69
High income OECD	3,825	930	1,215	3,560	60
World	1,302	356	322	536	68

Source: adapted from Hamilton et al. (2005).

[42] The relevant economic concept is the "income elasticity of the willingness to pay for the environment." This is

There are two possible interpretations of the figures.

The first would focus on the fact that natural assets appear to be relatively unimportant in high-income countries, suggesting, as some have argued, that getting out of poverty and into sustained high incomes involves the sacrifice of natural capital and reinvestment of the proceeds in other forms of capital. There is an element of truth in this view, but it is not a robust argument. Section 2.5 reviewed the dangers in this environmental Kuznets curve approach to economic development. In any event, the value of per capita natural wealth rises as income increases, so that the declining fraction of total wealth simply means that other forms of wealth have increased at a faster rate. Moreover, many high-income countries exhibit high concern for the natural environment, suggesting that the process of substituting human and man-made assets for environmental assets may have gone too far.

The second is the view taken by the authors of the estimates in Table 3.2 and 3.3. They argue that:

"The large share of natural resources in total wealth and the composition of these resources make a strong argument for the role of environmental resources in reducing poverty, fighting hunger and child mortality."[43]

There are additional reasons for taking this second view.

The current comparative reliance of poor countries on natural wealth means that, whatever the composition of wealth in the longer run, addressing poverty now requires the careful management of environmental wealth. Moreover, regardless of how nations as a whole treat their natural assets, the focus on poverty reduction requires careful environmental management because the poor depend disproportionately on those assets. (See Sections 3.7 and 3.8).

This report shows later that the "rate of return" for environmental wealth can be very high, suggesting that the development process may not be best served by a wholesale emphasis on asset formation that is biased to other forms of capital (see Chapter 6).

Wealth accounting is very much a new subject. The preliminary estimates suggest that environmental capital is more important, relative to total wealth, in low-income countries than man-made capital, althou Ku48f0 -41 1ec8 dp1890 Ttal capital is morcy0.2

3.7 The importance of environmental wealth to the poor

Wealth accounting has not yet reached the stage where the nature of household wealth can be described in detail in different types of wealth. Nonetheless, a good deal of information exists. The previous sections argued that the environment is part of the asset base of the poor. Measuring household incomes without taking account of this fact will underestimate the wealth of the household. Although this may appear as a "good news" story – the poor are, in many cases, better off than we think – environmental wealth is vulnerable to rapid depreciation, often more so than other assets. Hence, if the story is to be truly good news, this part of the asset base has itself to be maintained and expanded if the poor are to become less poor.

Since uniform wealth accounts at the household level do not exist, some insight into the importance of environmental wealth to the poor can be gleaned from the perspective of income. Income is essentially the rate of return on wealth. A simple example suffices. Individuals with more knowledge and more skills than others are said to have more human capital or human wealth. They also tend to receive higher wages. The difference in their wages compared to someone who is less educated and less skilled, is the "return" to education.

As noted above, the available evidence suggests that environmental wealth grows in absolute terms as incomes grow, but declines as a share of total wealth

Agro-ecosystems

The high dependence of developing countries on agriculture is well known. It accounts for some 24 percent of GNP in low-income countries, 9 percent in middle-income countries and only 2 percent in high-income countries.[48] In Africa, some 90 percent of agricultural output comes from small-scale producers. Some 600 million poor people keep livestock, an important source of wealth. Tens of millions of poor people fish coastal and inland fisheries. And around 1 billion of the world's poor rely on forests for income or income supplements.[49]

Within the farm and fisheries sectors, three groups of the poor are likely to be heavily dependent on the assets embodied in agro-ecosystems: small-scale farmers, transhumant pastoralists and artisanal fishermen.[50] The empirical evidence for this dependence is mixed, however. These groups are likely to have less opportunity for non-farm, non-fishery incomes, i.e., the less poor have a more diversified portfolio of income sources.[51] This relationship appears to hold for Africa, but elsewhere the relationships are either ambiguous (Asia) or negative (Latin America – non-farm income gets larger for poorer households). But the general picture is that the poor frequently face barriers to entry to the non-farm sector, barriers that themselves largely arise because of the low asset base of the poor – i.e., the absence of resource rights and access to credit and insurance. If so, it might be expected that the poor have a strong incentive to invest in capital assets since they have few or even no alternatives for coping with the risks of climate variability and other shocks to agricultural production. But this incentive is then strongly constrained by limited assets – lack of cash, lack of access to credit, poor resource rights, lack of insurance, etc.

Forests

Several studies have measured the role that forest ecosystem services play in generating income. According to the Millennium Project, nearly 1.1. billion people depend on forests for their livelihoods.[52] Another major study concludes that:

> "The omission of forest environmental income in national statistics and in poverty assessments leads to an underestimation of rural incomes, and a lack of appreciation of the value of the environment. In areas where environmental income is important, this omission may also lead to flawed policies and interventions."[53]

The latter study 0 0 -0.24 0 792.0 1 –l stg320nnuisheA /F2.0 h 0 Tm rsysteme Tj E6f4 of -0.24ey to

Table 3.4 shows some of the more detailed results. Fuelwood and wild foods dominate the income flows, making up some 70 percent of all forest environmental income. The importance of forest income to total income shows some variation, being lowest for East Africa (16 percent) and highest for Latin America (35 percent). The analysis contains no information on whether the uses studied were sustainable: For example, there can be no presumption that the collection of non-timber products is managed on a sustainable scale. It is well known that high natural resource dependence in a context of de facto open-access can lead to rapid overexploitation of resources. In the Congo Basin, for example, bush-meat makes a major contribution to household protein intake, but the rate of harvest is threatening wildlife stocks.[54] Box 3.4 provides a case study of non-timber forest income showing how the benefits are divided among primary producers, intermediaries and retailers. A number of studies document the way in which sales of forest assets help to finance farm inputs and investments.[55]

Comparable meta-studies for most other ecosystems, which contain information on income group dependency, appear not to exist.[56] Resorting to reviews and individual case studies is therefore unavoidable.

Table 3.4 Sources of forest environmental income

Source	Value ($) per household per year	% of total forest environmental income
Wild foods	286	38

Mangroves and wetlands

Many mangroves are being converted to fish farms or are drained for land reclamation. Yet their ecological services are heavily relied upon by the poor. Direct uses of the mangroves include fisheries, transport, timber and fuelwood. Indirect uses include storm protection, erosion control and water filtration. There are also complex linkages that add to the direct and indirect economic values of the mangroves, for example, their role as a breeding ground and nursery for offshore fisheries.

Box 3.5 The poor and access to infrastructure assets

A detailed study of access to infrastructure assets in 15 countries in Asia, sub-Saharan Africa, Eastern Europe/Central Asia and Latin America/Caribbean found that the rural poor systematically had less access to electricity, in-house water, sewers and telephones than the urban poor.[63] Urban access to electricity in three SSA countries averaged 30 percent to 40 percent for the poor, but rural access was 0 percent to 8 percent. Urban access to electricity in Latin America and the Caribbean was 55 percent in Jamaica but 92 percent in Ecuador. Rural access ranged from 2 percent (Panama) to 63 percent (Ecuador). Urban in-house water supplies ranged from 23 percent to 44 percent in Latin 8 perce

Box 3.7 Urban and rural risks facing the poor

Risk	Rural	Urban
Air pollution		
Indoor		
Outdoor		
Water pollution/sanitation		
Waste		
Municipal		
Hazardous		

Nonetheless, the significant difference in environmental DALYs in poor relative to rich regions is clear. Poor water quality and lack of sanitation account for nearly 40 percent of all environmentally induced DALYs in developing countries, and around 7 percent of all-cause DALYs, underlining the dominant role that water plays in disease transmission. Second, poor water quality ranks first as an explanation of environmentally induced

There are strong links from environmental damage to the loss of human capital. One study estimates health costs for six different developing countries and East European cities and produces an implied value of a DALY of some $11,100.[69] Adopting that value for developing countries alone would produce a global estimate of human capital damage due to environmental causes of over $2 trillion per annum. Using a more conventional income per capita value for developing countries, the total loss of DALYs in the developing world would still be some $200 billion per annum. Even the lower limit suggests a formidable cost to developing economies from

Table 3.7 **Excess mortality due to indoor air pollution: under-5 mortality and adult female mortality**

Region	Excess risk: under-5 mortality	Adult female deaths as % of under-5 deaths

Table 3.8 Reliance by the poor on biomass fuels: percent reliance by the poorest and richest deciles

Country	Urban areas		Rural areas	
	Poorest 10%	Richest 10%	Poorest 10%	Richest 10%
Cote d'Ivoire	92	4	100	94
Ghana	69	20	100	82
Nepal	85	4	100	86
Nicaragua	95	28	99	87
Vietnam	88	27	99	88
Ecuador	13	0	56	22
Panama	10	0	99	11
South Africa	7	0	84	4

Source: Whittington et al. (2001)

Deforestation

On the basis of the environmental capital argument, if deforestation occurs, the poor are likely to suffer most from this resource loss. A comprehensive review of the various quantitative models that seek to explain deforestation concluded that low rural wages tend to be correlated with deforestation but that poverty generally was not clearly correlated with deforestation.[77] As indicated previously, if the links between poverty and resource loss are location specific, aggregate studies of deforestation may well obscure the exact nature of the poverty-environment nexus. A study of Mexico that used detailed municipio data found that, along with other factors, poverty was correlated with deforestation.[78] The only available meta-analysis of deforestation assembles some 152 studies of deforestation and indicates that poverty is cited as a causal factor in just over 40 percent of them, but the study does not assess the reverse sequences, i.e., that deforestation causes poverty.[79] Poverty tends in turn to be associated with higher than average population growth and population densities, and many studies find that there are also coexisting policy measures which encourage deforestation. Two thirds of the cases where poverty is important are associated with insecure or non-existent property rights. In short, the poor are agents of deforestation in a sizable minority of studied cases but not in the majority of cases. Care has to be taken in stating even this result: Being an agent of deforestation is quite different from being "responsible" for deforestation. Responsibility implies that an alternative course of action is feasible, and invariably this is not the case for those who practice slash-and-burn agriculture, for example. This explain some of the current emphasis on the policy of "paying for environmental services" (see Section 7.8) whereby those who benefit from

[77] Kaimowitz and Angelsen (1998)

[78] Deininger and Minten (1999).

[79] Geist and Lambin (2001) and Lambin et al. (2001)

forest conservation pay those whose options are limited to deforestation activities to switch into alternative land uses. The payments constitute the factor that enables the resource users to expand the range of options open to them.

Bushmeat

A large number of rural and urban dwellers rely on bushmeat for protein. Detailed information on hunting effort is often difficult to come by, due to the fact that hunting tends to be a mix of legal and illegal activities. Illegal activity occurs when there is a wholesale ban on hunting, when some form of licensing occurs but most hunters operate without a license, or when bush-meat is taken illicitly from protected areas. Sales of bush-meat can be an important source of supplementary income. Willingness to pay for bush-meat is often strong, either because the meat is preferred to that from domesticated animals or because bush-meat prices are lower than domesticated meat – despite often strong local demand. The problem with much hunting, however, is that the resource is effectively an "open access" one, unregulated and, hence, at risk of extinction. The vulnerability of the resource thus places household livelihoods at risk while simultaneously risking dramatic resource loss.

Evidence of the relationship between poverty and bushmeat consumption is limited. A number of studies have found that the importance of bushmeat in household consumption does not decline as income grows, suggesting that factors such as taste and variety may be important.[80] But at least one study, for Bolivia, has found the opposite relationship, with bush-meat consumption declining as incomes grow.[81] The income-consumption relationship is potentially important for policy. If bushmeat is a "normal" good – where consumption grows as income grows – then reducing poverty will have little effect on levels of hunting. If it is an "inferior" good – where consumption declines as income grows – anti-poverty measures could secure a "double dividend," reducing poverty and conserving the resource at the same time. Regulating the trade may save the resource but will tend to have disproportionate effects on poor households. In that case, regulation will have to be

40 percent to 75 percent, energy consumption rises to about 0.8 toe, and at 5 percent to 40 percent it rises to over 1.5 toe.[84]

As with others forms of assets, the quality of the capital matters as well as the quantity. Electricity and other modern fuels permit flexibility of location, enable transportation to be undertaken more easily, and generally improve household well-being. Life expectancy, schooling and nutrition are all directly correlated with the use of modern fuels. Reliance on biomass fuels using traditional combustion methods perpetuates the poverty trap. Fuels have to be collected and carried, with harmful effects on health, and especially women's health. As resource degradation occurs, collection times increase, exacerbating the heath effects but also displacing time that would otherwise be spent in production or leisure. The burning of dung and crop residues diverts them from being used as mulch and fertilizer, lowering agricultural productivity. Vicious cycles of this kind have been documented in a number of case studies.[85] Human Development Index scores rise very rapidly at low levels of development as electricity consumption increases. More than 1.6 billion people in developing countries have no access to electricity, two-thirds of them in Asia, nearly one-third in Africa. Excluding China, the number without electricity has actually risen since 1990.[86] An index of energy development – reflecting per capita consumption of commercial energy, the share of commercial energy in all energy consumption, and the share of population with access to electricity – is clearly correlated with the Human Development Index, again with the highest response of development to the energy index occurring at the lowest Human Development scores.[87]

The message is that investments in both the quantity and quality of energy for the poor substantially improve the chances of poverty reduction.

Water

As for energy, so with water. Those with access to safe water and sanitation enjoy more rapid increases in income.[88] One report suggests that countries with low incomes (below $750 per annum per capita) and with access to safe water and sanitation grew on average at 3.7 percent per annum, whereas countries with the same

Solid and toxic waste

In many respects solid and toxic waste is the neglected environmental hazard in developing countries. Collection systems in urban areas are often inefficient, while generally being non-existent in rural areas. The resulting health hazards take on several dimensions:[90]

> Since only a fraction of generated waste may be collected, waste is often left in heaps in open pits, by the roadside, in drains and ditches, which act as breeding grounds for mosquitoes and vermin, spreading disease;
>
> Uncontrolled waste may leach into water supplies, contaminating drinking water;
>
> Where there are landfill sites, the poor often act as scavengers looking for anything with economic value, but being exposed in the process to the risks associated with sorting through harmful waste. There are costs and benefits here: scavenging is highly labor-intensive and creates employment. The health risks are obvious.

The comparatively rich can avoid these risks, but the poor in general cannot. No estimates appear to exist that relate exposure to waste to human health impacts.

Global warming

The available economic studies of economic damage from climate change are consistent in showing that, relative to their income levels, the poor will lose far more than the rich. Measuring global warming damages in money terms is controversial. Moreover, because of the convention of measuring damages at a fixed point in time – identified as the time when atmospheric concentrations of greenhouse gases are roughly twice those of their pre-industrial level (say, mid-18

Women may also have unequal access to education: When a choice has to be made because of schooling costs, the male child is often preferred. The resulting human capital is thus gender biased. Lower social status may also mean that women's "voices" are heard less because of the barriers to speaking at local meetings, and the lower level of importance that may be attached to female opinion.

If women bear disproportionate burdens from loss and degradation of environmental assets, they have nonetheless shown themselves to be very resilient in many societies, increasingly asserting their rights to be heard and to have their views taken into account. But, just as wealth accounting needs to document assets at the household level, so it will be necessary also to show how that wealth is divided between men and women within the household.

3.10 The "resource curse"

Nations that are poor in income may nonetheless be relatively rich in natural wealth. Examples include those

3.11 The political economy of resource dependency

Many developing economies are heavily reliant on primary production: e.g., oil and gas, minerals, timber, fish and agricultural commodities. As these economies struggle to expand, so natural resources are depleted and/or converted to other uses (e.g., forests to agriculture). This process of deliberate depletion is often biased against the poor, with the main beneficiaries of the process being the rich and relatively rich. One study refers to this phenomenon as "dualism within dualism."[99] The first dualism refers to the dependence of the national economy on primary product exports. The second dualism refers to the dependence of the poor within the economy on primary products produced on marginal land. The main source of increased output will be land that is converted from environmental uses, such as forests and wetlands. The study found that many economies combine both types of dualism. The first shows up as a high dependency on natural resources for exports. The second shows up as a "20-20" rule, i.e., 20 percent or more of the population lives on fragile lands and 20 percent or more of the

4 Vicious and Virtuous Circles in The Poverty-Environment Nexus

4.1 A conceptual framework

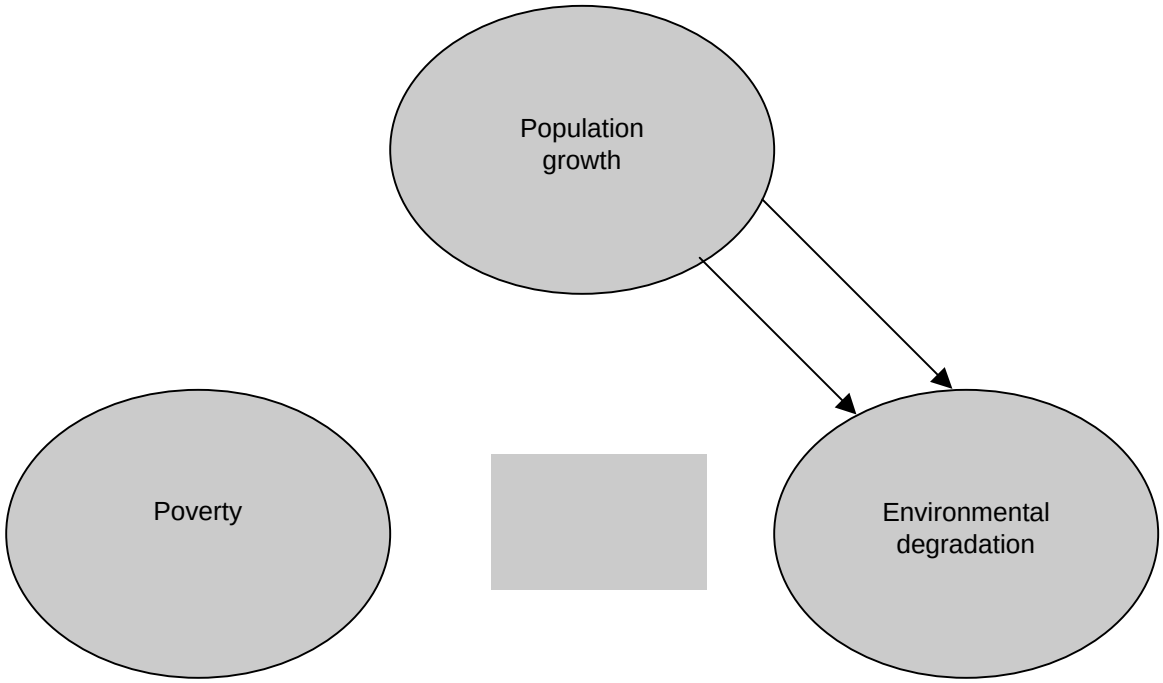
Enough has been said to show that what has come to be known as the “environment-poverty nexus” is complex. This section attempts to paint a schematic picture of the various linkages to better understand why the poor are poor. Unless there is a clearer understanding of the reasons for continued poverty, policies to alleviate poverty will tend to be “hit or miss” affairs. At worst, they may be wholly misdirected.

Chapter 3 suggested that poverty exists because of the low asset base of the poor. Escaping poverty , therefore, involves two activities: (a) investing in the asset base of the poor, and (b) encouraging those contextual factors that facilitate investment while removing factors that inhibit investment.

Figure 4.1 provides a schematic picture of the linkages. The arrows show the interactive mechanisms, with “+” denoting a compounding effect and “-” indicating an amelioration effect. Thus, population growth is likely to have a compounding effect (+) on poverty because existing limited assets become dissipated as they are shared among more people. This will be especially true for land, but it will also apply to open access resources such as fisheries. Communal management can be effective in limiting access to such resources, but the focus then shifts to the fate of those who are excluded. Others argue that there may be an ameliorating effect (-) if population growth triggers technological change, as suggested in the work of Esther Boserup. If both effects are present, then the net effect will depend on the scale of each offsetting influence: capital dissipation versus technological stimulus.

Figure 4.1 shows poverty as increasing population growth, partly because children are seen as assets. The argument is that, although children impose family costs in childbearing time and additional resource needs, they also generate income and enhance security. But poverty also worsens the environment if people adopt short-term coping strategies that involve “mining” resources. One way of thinking about the mining of resources is to argue that poverty is associated with high discount rates, an issue more fully explored shortly. Environmental degradation also worsens poverty directly or indirectly via ill-health and reduced labor productivity. Analysis of the poverty-population links in the top left of Figure 4.1 suggests a “vicious circle”: Population growth produces poverty (unless offset by the Boserup effect), and poverty induces higher population growth through the “children as assets” effect. The environmental degradation panel to the right of Figure 4.1 shows how the vicious circles can be made worse. Poverty induces resource destruction because the poor have high discount rates, which in turn stimulate “resource mining.” Environmental degradation makes poverty worse because the poor rely directly on natural resources, which can be depleted (fuelwood, water, soil, fisheries) or polluted (water, air, oceans). Resource depletion and pollution induce ill-health, which reduces labor productivity and life expectancy, further worsening poverty. Figure 4.1 shows that it is easy to construct a case for supposing that poverty, environmental degradation and population change are interlinked in such a way as to induce a vicious circle.

Figure 4.1 Population, poverty, environment linkages



Note: (+) indicates a positive feedback, i.e., the source of the arrow reinforces the effect at the target of the arrow.

But policy interventions within poor countries can change the situation, first, by acting directly on poverty itself through the creation of human

In many ways, the high observed discount rates simply restate the poverty of the people surveyed. If so, it would not be justified to make use of such high rates in formulating investment policy in, say, soil conservation. What the data do indicate is that measures to lower these discount rates are likely to be especially beneficial for the poor (and for the environment). The poor invariably lack access to capital and credit markets or, if they do have access, it is at very high interest rates. The poverty of borrowers itself may force lenders to charge high rates, as borrowers' lack of collateral assets makes loans more risky. The only remaining option is to deplete natural resources: The foregone benefit of resource conservation is now less than the interest rate they would otherwise have to pay to borrow money. These strategies arise because of the low asset base of the poor, and the lack of alternatives and safety nets (such as insurance) relative to those available to richer communities.

Improved access to credit, capital and insurance markets would do much to lower effective discount rates as would encouragement of social capital formation to promote collective action to conserve natural resources. A typical example of behavior in response to the lack of insurance is the holding of livestock. Herds tend to be larger in size than otherwise would be the case because of the need to have insurance against drought conditions. But larger herds impose more strain on ecologically fragile grazing lands, so the absence of an insurance market directly contributes to the depletion of pasture land.[102]

4.3 The poverty-environment nexus

The previous sections show how difficult it is to generalize about poverty-environment interactions. Efforts are gradually being made to secure better general understandings of the complexities.

One important attempt to impose some order on the complex linkages in the context of rural poverty is the Lopez model.[103] Lopez focuses on some central concepts: the environmental characteristics of the natural resources used by the poor, especially soil; population change; prevailing institutions; and the rate of change in institutions. He argues that one reason why so many different outcomes emerge from the various interactions is that "dynamics" matter. The primary issue is that, if the resource base begins to degrade (perhaps because of rapid population change), how fast can institutions change in order to cope with the new scarcity? If institutional change lags behind environmental change, chances are that the community concerned will fail to make the transition to cope with resource scarcity. The environment will degrade further and poverty will be worsened. If, on the other hand, institutions are flexible and capable of change, a sequence is possible whereby increasing scarcity is met with technological change and changed institutions. What matters then is "the race between institutional dynamics and environmental dynamics." In turn, success or failure depends on the factors encouraging or inhibiting institutional change.

The first element is the prevailing set of property or resource rights. If resources are open access (OA), whereby there are no owners or rules of access to the resource, then population growth will threatenoenrs (OA), whereby

The strength of these incentive systems determines whether the CP system survives, reverts to OA, or changes to some private property arrangement. CP is more likely to survive if it is free from external interference by central governments or larger-scale commercial activity and if it has access to some form of extension or advice that supports goals of sustainable management of the resource. Vulnerability could be especially high if the CP system does not have registered tenure or resource rights since it may still risk being expropriated by others.

The conditions necessary for CP to change to a private rights regime are also many and varied. A CP system with a large population is less likely to survive because large groups are more difficult to monitor, manage and control than small groups – a feature in common with international agreements, which work best when there are few "players." Moreover, although private property rights might secure the resource against further degradation – because owners have an obvious incentive to manage the resource – private rights may come at the cost of dispossession and relocation of the weaker members of the CP system. Also, if owners' discount rates are high, even a private resource manager will have an incentive to deplete the resource and move on, depending on available alternative opportunities.

For these reasons, designing and implementing a sustainable CP system has many advocates. Since CP systems have evolved over long periods, "blueprints" for turning OA systems into CP systems exist, but are subject to local variation since conditions are rarely identical in any two locations. No CP system can be perpetually static. Lopez's model stresses the need for constant reflection on the existing system as conditions change.

Lopez argues further that one of the dominant factors determining progression or collapse of land-based agro-ecosystems is the fragility of tropical soils. The less resilient the soil ecosystem, the more likely it is that

The degree of integration between the community and the outside world. Lopez's argument here is that such integration makes life more difficult, not less, for CP systems. But the linkages can work both ways. Off-farm work, for example, could result in male household members working away from the rural area, reducing the labor needed for the transition to a new system. Equally, off-farm work results in cash income, which is often repatriated to the benefit of the rural community and may be invested in management changes (e.g., the case of Machakos District in Kenya);

Lack of access to credit and insurance to finance transitions to new agricultural systems;

External influences. There are numerous examples here: land grabs by local or national governments (especially the latter, in the name of nationalization) and by commercial enterprises; a refusal by government to register customary land rights; export taxes on crops which, like tree crops, are generally good for the environment; subsidies to land clearance or mechanization; and deliberate relocation and resettlement or urban communities as in Brazil and Indonesia ("transmigration") – the risk being that migrants are not familiar with local ecological conditions and fail to account for them.

Factors that are likely to assist the required transition include:

More resilient ecosystems, buying time to make the transition;

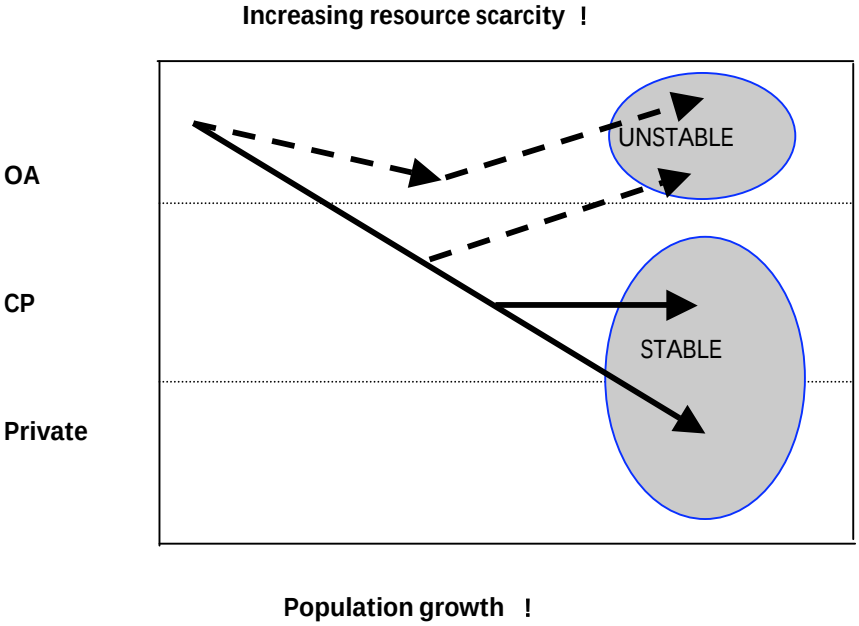
Community controls on population change;

Outside assistance from NGOs or specialized agencies;

Past experience of resource "shocks";

Strong CP bonds that nonetheless permit an openness to new ideas and challenges;

Figure 4.2 The Lopez model



Note that the position of private property relative to common property is not intended to indicate any relative desirability of these forms of property rights. The arrows show private property as an "end point" simply because that is how many rights regimes change, i.e, private property emerges from common property but not usually the other way around.

What does the Lopez analysis tell us by way of policy implications? One essential conclusion is that resource scarcity does not, of itself, guarantee that the "right" institutions will emerge "naturally" to cope with that scarcity. There is, therefore, no justification for a laissez-faire approach to resource degradation. People and institutions will not automatically adjust. Resource rights clearly matter. Whatever happens to all other causal factors, if local communities are denied rights to land and to the resources they need, the prognosis for sustainable institutions is very poor. This suggests that continued pressure for benign land reform is needed. It cannot be assumed that CP systems will work perfectly. They may be inefficient and in need of external assistance to improve management techniques. Although this form of "interference" has justification, most other forms do not. CP regimes will work best when governments keep out of the way or confine their attention to preventing others from usurping CP rights. Above all, incentive systems that encourage resource degradation – such as subsidies to inputs used for extraction of resources, or on resource extraction itself – must be avoided or dismantled. When CP systems work they need to be defended. Involvement of people within the community in decisions about institutional change is important. Local democracy is to be encouraged, but it may also be necessary to signal the need for rapid institutional change to cope with resource scarcity. Privatization should only be encouraged where it is clear that CP systems are not going to work: Care is needed to avoid the poorest members of the community losing out in a "race for property rights." Credit regimes, such as micro-credit, should be encouraged so that savings eventually take the form of cash rather than livestock and so that discount rates can be reduced. Measures to slow population growth need to be encouraged if the CP system does not have population control in place. The establishment of women's groups and female education is important.

Private property may also be an efficient outcome of institutional development. By and large, it is efficient in the sense that the owner of private property has an incentive to maximize the returns from the resource. However, unless regulated, what is maximized is the private returns to the owner, rather than the returns to society as a whole. Regulation, e.g., through taxation of any "externalities," can help to minimize this potential gap between

private and social returns. Similarly, private property could be equitable if there are fiscal instruments designed to tax away some of the private gains and reallocate them to others, e.g., in the form of public goods such as education, health care, etc. Where these reallocation mechanisms do not exist, however, private ownership may well be at the expense of the poor, as a number of case studies demonstrate.[104]

The Lopez model provides an organizing framework for assessing the chances of success or failure of community management of natural resource scarcity. If the poor are to cease being poor they must have a rising per capita stock of wealth. The chances of achieving that are clearly lower the faster population changes. So the capital assets approach bears out Lopez's emphasis on avoiding, where possible, rapid population change. In the same vein, social capital plays a strong role in the Lopez model. Strong community ties are seen be vital to managing CP regimes, although the same strong ties could result in inflexibility and resistance to change. Human capital development contributes to slowing population change (education, especially of women), and environmental capital conservation is clearly central to the Lopez approach.

[104] For example, see the case study of Botswana in Cullis and Watson (2005). Gradual privatization of communal livestock lands has taken place. Cullis and Watson argue that the losers have been both the poor and the wildlife.

made, i.e., some 550 million people would need to benefit. In practice, it seems likely that it would need to be more than this. At a minimum, then, some $11 billion p.a. would be consistent with the overall MDG goal.[113]

Climate change

Numerous studies have estimated the costs of tackling climate change. Costs clearly vary with assumptions about the least-cost combination of emission-reduction or sequestration technologies, the potential for "win-win" policies such as energy efficiency, the timing of such measures, the targets assumed, what policy instruments are in place, and the way in which measures change energy prices.[114] Unsurprisingly, therefore, there are numerous estimates of costs.[115]

The costs of complying with the Kyoto Protocol

Table 5.3 provides some recent estimates of the costs of complying with the Kyoto Protocol.[116] The figures are heavily influenced by assumptions about the extent of emissions trading. Global trading is very unlikely to happen before the compliance period. Limited trading already exists, however, e.g., the European Union carbon trading scheme started in 2005.

Table 5.3 Costs of complying with the Kyoto Protocol $(2000) billion per annum

	No trading	Limited trading	Global trading
Annual costs 2001-15	253	108	49

Source: Martin-Hurtado (2002)

The Kyoto Protocol is universally acknowledged to be the first step in a series of protocols to the Framework Convention on Climate Change. By itself, the Kyoto Protocol has little effect on rates of warming.[117] Several studies find that the Protocol itself does not pass a cost-benefit test, i.e., its rate of return is negative.[118] However, if the Protocol is a first step, then it makes more sense to look at the costs and benefits of meeting longer-run targets.

[113] 550/2500 million x $50 billion p.a.

[114] For example, radical measures to reduce fossil fuel energy consumption in compliance countries may reduce energy prices, which may then induce non-compliance countries to increase their energy consumption and emissions – the "leakage" effect. Even in compliance countries, there is evidence that large-scale energy efficiency measures lower the effective price of energy with users taking the benefits in the form of increased energy comfort, e.g., higher household temperatures – the "rebound" effect.

[115] A neglected issue is whether, given the disproportionate impact of global warming on poor countries, it is better to spend scarce resources on mitigating emissions or expanding aid to those countries. Tol (2005) argues that the rate of return to expanding development aid is probably significantly higher than the return to the developing world from reducing emissions.

[116] Martin-Hurtado (2002).

[117] See Wigley (1998) for a demonstration of this.

[118] For example, see Nordhaus and Boyer (2000).

Costs of meeting the 550 ppm target

Although there are alternative "stabilization" targets (in atmospheric concentrations of greenhouse gases), a goal of 550 ppm has been adopted in several policy arenas.[119] The Intergovernmental Panel on Climate Change has estimated the costs of meeting this goal.[120] Table 5.4 estimates annual costs of meeting the 550 ppm target, based on the IPCC data. The wide range – from $2 to 17 trillion in present value – partly reflects the fact that there are different emission control paths to secure the target. Table 5.4 indicates annual costs, ranging from $78 billion up to $1.1 trillion. In terms of current world income, the range is 0.2 percent to 3.1 percent of world GDP. In costs of control, the estimates mentioned are consistent with marginal costs of around $20 to $80 per ton of carbon. Chapter 6 looks in more detail at the likely cost-benefit ratio for securing this target.

Table 5.4 Costs of meeting a 550 ppm atmospheric greenhouse gas concentration target

Table 5.5 Costs and benefits of reducing desertification. $2000 billion, per annum.

	Costs of a 15-year program	Benefits = avoided production losses	Benefit-cost ratio

on forgone income rather than forgone assets.[127] The derivation of the estimates in Table 5.6 is not always clear. The revised estimates suggest a global cost of, say, $25 billion per annum for terrestrial conservation. The cost relating to developing economy PAs might be some $15 billion p.a. Such an estimate is not dissimilar from other estimates for creating new PAs in developing countries (i.e., ignoring compensation needs for existing PAs) of some $20 billion.[128] However, the other source cited suggests very much higher costs at more than $90 per ha. p.a. for expanded areas, 10 times the developing country estimate in Table 5.6.[129]

Table 5.6 Estimates of Protected Area costs: developing countries only ($2004) billion per annum

	Total costs	**Required expend-iture**	**Shortfall**
LDC costs			
Management costs	0.8	2.1	1.3
Opportunity costs	n.a	n.a.	n.a
Total	n.a	n.a	n.a
Hypothetical expansion 3.4 million km^2			
Management costs		1.8	1.8
Opportunity costs		4.5	4.5
Total		6.3	6.3
Total financing needs (ignoring retrospective compensation for existing PAs)			**7.6**

Source: Adapted from Bruner et al. (2004) which updates earlier estimates in James et al. (1999), Balmford et al. (2002) and some other sources. Opportunity costs for the expanded area relate to compensation needed for displacement, etc. This will tend to understate true compensation needs, which should be based on replacing lost environmental assets. Compensation costs are recorded as $9 billion p.a. for 10 years in Bruner et al. (2004):

Box 5.1 Protected Areas and the poor: a conservation dilemma?

The Millennium Development Goals speak of progress toward ending poverty and also conserving biodiversity. This suggests a strong synergy between the two goals. One historically popular means of biodiversity conservation is the establishment of Protected Areas. But "protection" can mean restricting the access of local communities to the Protected Area to ensure against unsustainable extraction of natural resources. Communities previously relying on the Protected Area as an asset may then suffer significant losses, exacerbating poverty unless there is an adequate means of compensation. The loss of assets shows up as:

- Loss of cash income from sales of marketable products previously harvested from the PA.
- Loss of directly consumed products.
- Loss of land that might now be designated to be within the PA.

Responses to these losses may actually cause environmental damage elsewhere and conflict by:

- Extracting similar or other products from adjacent areas
- Illegally entering the PA.
- Suffering damage from the associated increase in wildlife in the PA.

For example, in the Lake Mburo National Park in Uganda the local community received in a single year (1998) some $230,000 from the national park. But its measured losses amounted to some $700,000, producing a benefit-cost ratio for them of just 0.3. They were worse off with the Park than without it. In other cases, the PA may well generate sufficient revenue to make all parties better off, but the poor may still lose out if their voices are not heard. In the Western Serengeti in Tanzania, local communities received just $75,000 of the substantial revenues derived from tourism, but

contribute financially to panda conservation but did not wish to visit the reserves, (c) the managers of the reserve and local and international conservationists, (d) the local, and extremely poor, farmers who lost cultivable land because of its protected status, and (e) the poorly paid wardens who protect the wild pandas but who are strongly resented by the farmers. Careful studies of tourists' willingness to pay for conservation by (a) raising entrance fees to the reserves and (b) paying for a "panda stamp" on visas issued by the government showed that substantial sums could be raised, in the tens of millions of dollars each year. The current budget of the reserve was just a quarter of a million dollars per year. Since the tourists were willing to pay these sums, they would be

Slum dwellings

The Millennium Development Goals require that, by 2020, there should be a significant improvement in the lives of at least 100 million slum dwellers. The World Bank and UNCHS have estimated the costs of upgrading slum dwellings at some $500 per person in a slum dwelling.[130] This suggests a cost for the minimum target of 100 million slum dwellers of $50 billion or around $4 billion per annum. The 100 million target is, however, modest when account is taken of likely "trends continued" in the rate of formation of slum dwellings. One influential report suggests that the 870 million people who currently occupy slum dwellings will rise to 1,400 million [1.4 billion?] in 2020 without action, an increase of more than 500 million.[131] If the target is rephrased as 770 million people remaining in slums in 2020 (870 minus the 100 target), then action would be needed to address the situation of more than 600 million slum dwellers, a very much larger goal that would require six times the suggested budget, or roughly $24 billion per annum.

5.3 Summary of investment needs

Table 5.7 draws together the various estimates of investment need. It is tempting to add the figures up, but it needs to be remembered that the MDGs are not precise as to actual targets so there is room for interpretation of what the goals mean quantitatively. Also, some of the costs probably overlap – e.g., improved access to water and sanitation tends to be part of the costs of upgrading housing for slum dwellers. Overall, however, and ignoring climate change for the moment, the sum required over the coming 15 to 20 years to meet MDG7 (or goals consistent with MDG7) is probably between $60 billion and $90 billion per annum.

The picture changes dramatically with the addition of actions to address climate change. Since it is widely accepted that "Kyoto alone" will not address global warming risks, the more meaningful range of figures relate to the 550 ppm target. Even the lowest estimate for this target requires another $78 billion per annum, effectively doubling the cost of all the other actions. At worst, the high cost estimate for addressing climate change, assuming a 20-year transition period, would dwarf all other costs.

[130] World Bank and UNCHS (Habitat) (2000).

[131] Sachs (2005).

6.2 The economic importance of environmental assets

A technical note on poverty-weighted rates of return[138]

In what follows, rates of return are reported in conventional terms, either as a ratio of money values of benefits to money values of costs, or as a percentage rate of return. Benefit-cost ratios greater than unity show that the investment generates a positive rate of return. Percentage rates of return can be expressed in various ways but should, technically, be expressed as an "internal rate of return" – i.e., the rate of interest that makes the present value of benefits equal to the present value of costs. In both cases, the attractiveness of the investment depends on the benchmark rate of interest that is regarded as the minimum acceptable rate. For example, if the prevailing market rate of interest in the economy is 10 percent per annum (expressed in "real" terms, i.e., after deducting the rate of price inflation), then this rate of interest (the "discount rate") is used to calculate the present value of benefits and costs in the benefit-cost ratio approach. For the percentage rate of return approach, the estimated rate of return from the investment needs to be compared to the 10 percent discount rate. The larger the difference between the rate of return and the 10 percent rate, the more attractive the investment.

It follows that simply reporting benefit-cost ratios and rates of return is not quite enough to show that investments are attractive. The general rule is that the higher the benefit-cost ratio, the better. Similarly, the higher the percentage rate of return the better. But it may still be the case that non-environment investments do even better. Moreover, since there are no hard and fast rules about the choice of the cut-off discount rate for individual countries, ratios greater than unity and positive rates of return still need to be compared to the ruling discount rates and profitability of other investments in the country in question. Such detailed comparisons are not possible here, so judgment is used to say whether the reported benefit-cost ratios and rates of return are likely to be attractive relative to other uses of investment funds.

Two other comments are appropriate. The first is that the relevant measure of benefits and costs should relate to the nation as a whole. Financial rates of return are what a private investor would secure, but this need not be the same as what society at large gets, especially if some of the benefits accrue in non-market form, as is the case with most environmental investments, or if the market prices of some important inputs or outputs are distorted due to government policies (e.g., subsidies). As far as possible, social rates of return and benefit-cost ratios are reported.

A second caveat is also important. The focus of this report is on environmental investments that benefit the very poor. The rates of return and benefit-cost ratios reported in the literature almost exclusively assume that $1 to the poor is as valuable as $1 to a richer person. This is self-evidently not the case. Ideally, the benefits to the very poor should be weighted more highly than those to the richer parts of society, to produce a modified benefit-cost ratio or rate of return. One dollar to the very poor would therefore be weighted by a factor above unity to indicate that it is more important than $1 to a richer person. These weighting procedures were once common in cost-benefit appraisal, went out of fashion, and now have resurfaced. The critical point is that the measures reported in this chapter do not adopt this weighting approach, and, hence, the social rate of return is highly likely to be underestimated. This bias does not matter much if the implicit comparison is with other non-environmental investments that have a similar "profile" for who gains or loses. However, weighting might also have the effect of altering the structure of environmental investments, if the distributional incidence of those investments varies by type of investment,[139]

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[138] This section can be ignored by the general reader. It does, however, contain some potentially important points that technical readers will want to consider. The weighting procedures are discussed extensively in Serret and Johnstone (2005).

[139] For an assessment of how the benefit-cost ratios of 30 World Bank environmental investments might change when income-weighting is used, see Bucknall et al. (2001).

6.3 Rates of return to environmental asset investment by sector

Water and sanitation

Chapter 5 detailed WHO estimates of the rate of return to investments in water and sanitation. Table 5.1 suggested that not only does the Millennium Development Goal for water and sanitation achieve a very high rate of return (benefit/cost ratio of 7.5:1) but comprehensive coverage inclusive of water treatment and storage would raise that return even further (benefit-cost ratio of 14:1). There is substantial regional variation about this average. For the MDG goal only, the ratios are: Africa 11:1, Central and Latin America 10:1, Eastern Mediterranean 35:1, and SE Asia 3:1. In short, the benefit-cost ratios for investments in water and sanitation reveal very high rates of return.

Energy

Chapter 5 considered two major program of investment: the first to extend electricity to more than 500 million people by 2015, the second to provide modern cooking and heating fuels to perhaps 700 million people by the same date. No attempt appears to have been made to estimate the benefits of such measures. Taking the aggregate cost of $28 billion p.a. (see Table 5.7), and a coverage of 500 million to 700 million people for these

Table 6.1 Average per capita expenditures on energy. $ per annum

Country	Urban	Rural

Table 6.3 Rates of return to soil conservation measures in Caribbean and C. America

Country	Conservation measure	Crop	Rate of return %
Cost Rica			
Barva	Diversion ditches	Coffee	Negative
Tierra Blanca	Diversion ditches	Potatoes	Negative
Turrubares	Diversion ditches	Coco yam	84
Turrubares	Terraces	Coco yam	60
Dominican Republic			
El Naranjal	Diversion ditches	Peas, peanuts, beans	17
Guatemala			
Patzité	Terraces	Corn	

A detailed econometric study has shown that soil quality significantly affects the productivity of agricultural labor.[149] Good soils and climate generate a 28 percent increase in output per worker relative to poor soils and climate in sub-Saharan Africa, a 34 percent increase in Asia, and a 22 percent increase in high-income countries. The global average effect is 13 percent. The relevance here is that land degradation has the effect of lowering soil quality, so significant reductions in output can be expected, as is generally confirmed by other studies and by data such as those in Table 6.3.

Terrestrial ecosystem conservation

Whereas reversing land degradation involves remedial measures to land that has already been damaged, terrestrial ecosystem conservation aims to resist the pressures to convert land with generally diverse features and species to uses that result in less diversity (e.g., mono-cropping). Studies that allow for costs and benefits of Protected Areas or other conserved land (or marine) areas are few. At least two recent surveys have claimed that the benefits of conservation exceed the costs of conservation.[150] Unfortunately, the claims rest on unwarranted generalizations from very few case studies and other studies that use discredited methodologies.[151]

Forests: the role of carbon values

Table 6.4 summarizes the findings of a meta-analysis of forest ecosystem values. The survey suggests that the dominant economic value of forests lies in carbon storage and sequestration. Present values of carbon storage of $360 to 2,200 per hectare would more than compensate for many, although not all, conversion values for tropical forests, i.e., conservation would pass a cost-benefit test. The role of carbon payments in raising the returns to conservation has been shown to be crucial in a number of studies. The idea here is that payments would be made to communities that convert forest land to other uses in return for the value of the carbon saved. Table 6.5 summarizes the results of studies that estimate "switchover" values for carbon, –,i.e., the minimum value per ton of carbon that would have to be paid to prevent the land being converted. The carbon values shown are, therefore, the difference between the profits from converting the land and the profits from conserving it, allowing, as far as possible, for the costs of managing the conserved areas. The sums are fairly consistent and suggest that payments up to around $30 tC would make a considerable difference to the comparative economics of conservation and conversion.[152]

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[149] Wiebe et al. (2000).

[150] Balmford et al. (2002) and Turner et al.(2003).

[151] The Balmford et al. (2002) study concludes that "our synthesis indicates that, at present, conversion of remaining habitat for agriculture, aquaculture, or forestry often does not make sense from the perspective of global sustainability." The paper surveyed more than 300 case studies but found only five in which the information permitted a valid comparison of costs and benefits, i.e., the net benefits of conservation compared to the net benefits of land conversion. Thus this conclusion rests on just five papers, one of which relates to Canada. The paper then makes use of a discredited study – Costanza et al. (1997) – which sought to estimate money values for most of the world's ecosystems. Critiques of this study can be found in Pearce (1998), Toman (1998) and Bockstael et al. (2000). Unfortunately, Balmford et al. (2002) further use the Costanza et al. estimates to claim that an expanded protected area regime costing $45 billion p.a would be a "a strikingly good bargain."

[152] Smith and Scherr (2002) identify other studies where the cost of "supplying" carbon, i.e., the value of crops and other outputs forgone if carbon is conserved, might be up to $50 tC. Thus the economics will be location-specific.

Table 6.4 Summary economic values for forest services ($ ha/pa unless otherwise stated)

Forest good or service	Value in tropical forests
Timber	
conventional logging	200 to4400 (NPV)[1]
sustainable	300 to2660 (NPV)[1]
conventional logging	20 to 440[2]
sustainable	30 to 266[2]
Fuelwood	40
NTFPs	0- 100
Genetic information	0-3000
Recreation	2 to 470 (general) 750 (forests near towns) 1000 (unique forests)

Table 6.5 Illustrative switchover values for carbon to make conservation profitable

Type of project	Switchover value $ tC	Comment
Agro-forestry, Peruvian Amazon	8-31	Assumes farmers would forgo some payment in return for non-carbon forest environmental services.
Agroforestry, Mexico	15-31	For enriched fallows
Agroforestry, Sumatra	3-11	Lower bound required to compensate for forgone

Fourth, for conservation to perform better than conversion, non-market values must generally be captured through some market-creation mechanism, i.e., non-cash flows of benefits are turned into cash flows.

Fifth, the non-market values almost certainly fail to capture the economic value of biodiversity which, apart from the value of genetic information, tends to be omitted from the analyses.

Sixth, carbon storage is of considerable importance to the economic case for forest conservation.

Seventh, the benefits of ecosystem services from conserved forests may not all be lost when conversion takes place: It depends on what the forest is converted to. Hydrological benefits may not be very different if conversion is to plantations, for example.

Table 6.6 lists the results of various studies that record costs and benefits. Some studies show significant benefit-cost ratios from conservation or sustainable use, but others suggest that conversion may be profitable. This is likely to be the case, especially when the alternatives being considered are conventional logging/agriculture versus sustainable timber management (see following table for further analysis). Domestic benefits alone may not justify forest conservation: They need to be supplemented by other payments for environmental services, especially biodiversity and carbon.[154]

[154] Chomitz and Kumari (2003) conclude from this that the Global Environment Facility has an especially important role to play.

Table 6.6 Costs and benefits of conserving forest land

"Development" use of land	Benefit-cost ratio Conservation to Development	Comment	Source

Table 6.6 omits some ecosystem services that have been considered in the literature to be potentially important. Biodiversity values have generally only been addressed by looking at global willingness to pay either through tourism or through payments into hypothetical funds. Expressed in per hectare terms, these values have tended to be small. But the economic valuation of biodiversity benefits is generally unsatisfactory – the issue is addressed later.

Table 6.6 shows that forest conservation may not always be beneficial. However, the alternative land use is important. The contexts where conversion clearly pays tend to be ones where the conservation option is sustainable timber management. As shown below, sustainable forestry systems are often less profitable financially than conventional logging systems. For the sustainable option to be socially preferable, non-timber benefits need to be monetized, shown to be larger than the financial deficit between the two systems, and the difference captured in market terms. The current state of information does not permit a clear conclusion on this issue. Some authors are very skeptical of the role that non-timber product extraction can play in justifying conservation. They argue that extraction is labor intensive and typically of low economic value.[155] However, only further collection of data on individual case studies can determine the extent to which this pessimistic view is correct. Table 6.4 suggests that there are some significant rates of return to be earned.

Forests and genetic information

Table 6.7 Estimates of the pharmaceutical value of "hot spot" land areas (maximum willingness to pay by bioprospectors, $ per hectare)

Area	Simpson et al. (1996)	Rausser & Small (2000)
Western Ecuador	20.6	9,177
Southwestern Sri Lanka	16.8	7,463
New Caledonia	12.4	5,473
Madagascar	6.9	2,961
Western Ghats of India	4.8	2,026
Philippines	4.7	1,973
Atlantic Coast Brazil	4.4	1,867
Uplands of western Amazonia	2.6	1,043
Tanzania	2.1	811
Cape Floristic Province, S. Africa	1.7	632
Peninsular Malaysia	1.5	539
Southwestern Australia	1.2	435
Ivory Coast	1.1	394
Northern Borneo	1.0	332
Eastern Himalayas	1.0	332
Colombian Choco	0.8	231
Central Chile	0.7	231
California Floristic Province	0.2	0

Source: Simpson et al., 1996; Rausser and Small, 2000.

Sustainable forestry and agro-forestry

A number of studies seek to establish the financial and economic profitability of sustainable forestry relative to conventional logging practices. The profitability of uncontrolled logging can be a significant obstacle to sustainable forest management, especially in the tropics.[158] Timber logging also attracts "rent-seekers" in several of the major forest nations, resulting in corrupt practices that further accelerate the removal of tree cover and neglect of investment in forest renewal. Many forest conservation options incorporate measures aimed at sustainable forestry.

Rates of return to sustainable forest management (SFM) have been extensively reviewed, and it is clear that sustainable forest management can provide reasonable rates of return.[159] But conventional timber harvesting is often more profitable still. This implies that without additional incentives, one cannot expect forest companies to adopt sustainable management practices. Those incentives require either (a) that consumers pay a premium on the price of sustainably logged timber, such that the premium compensates for the forgone rate of return, and/or (b) other forest services are brought within the scope of created markets, i.e., forest ecosystem services are paid for. In the absence of such incentives, the myopia (high discount rates) of many loggers, the low rate of growth of natural forests, the slow rise in international timber prices, political uncertainty, and tenure insecurity tend to reinforce the financial non-viability of SFM. SFM tends to perform better in terms of carbon storage and biodiversity conservation than in conventional logging, as well as producing more timber.[160]

Several case studies of the costs and benefits of agro-forestry are summarized in Table 6.8. The Sudan and Nigeria cases compare agro-forestry with crop schemes that do not integrate trees. The Peruvian study compares slash-and-burn agriculture with agro-forestry.

Table 6.8 Costs and benefits of agro-forestry schemes.

Scheme	Rate of return (%)
Sudan: Acacia Senegal with crops (Barbier 1992)	Positive for all regions. A. Senegal yields gum Arabic, fixes nitrogen and provides fuelwood. Acts as risk aversion strategy.
Kano, Nigeria: Shelterbelts Farm forestry (Anderson 1987)	 B/C ratios 1.7 to 2.9 B/C ratios 2.3 to 6.1
Peruvian Amazon (Mourato and Smith 2003)	Agro-forestry systems generate worse returns than slash-and-burn agriculture if time horizons are limited to a few years, but higher net returns over longer periods. High discount rates lead farmers to take a short-term view. Once account is taken of the value of forest services to farmers and of the potential for global payments for carbon storage, the returns to agro-forestry can exceed those of slash and burn. Carbon payments of $8-$31 tC would be needed to tip the balance.

[158] Definitions of sustainable forestry vary. Conventional timber harvesting is taken to refer to existing practice, which typically pays little attention to maintaining long-term timber supply. Sustainable timber management implies taking steps to ensure forests continue to produce timber in the longer term. Sustainable forest management also includes maintaining the environmental services and non-timber forest products, as well as consideration of social impacts.

[159] See Pearce at al. (2002a, 2002b) and Pearce (2003)

[160] The contrary view has been expressed by Rice et al. (1997) but on the basis of a small sample of forest areas.

Coral reefs

As with other ecosystems, considerable effort is being made to estimate the economic benefits of coral reef protection. Estimates suggest that, already, some 27 percent of all corals have been destroyed. But the same story emerges – few of the available studies consider the returns to the activities that destroy the reefs. An exception is a comprehensive study for Indonesia.[161] Table 6.9 shows the results. It suggests a considerable rate of return to conservation compared to current practices, which are degrading the reef. A study of coral reef improvement

Table 6.10 Possible global values for the world's coral reefs ($ million)

	SE Asia	Caribb-ean	Indian Ocean	Pacific	Japan	USA	Austral-asia	World
Reef area 000km²	89	19	54	67	3	3	49	284
Fisheries $ million	2281	391	969	1060	89	70	858	5718
Coastal protection $ million	5047	720	1595	579	268	172	629	9009
Tourism $ million	4872	663						

revenues from the reefs are substantial. Sustainable harvest of coral-related fish is estimated at $300 million p.a., tourism benefits (especially dive tourism) at $2.1 billion, and shoreline protection at $0.7 to $2.2 billion. But the total benefit of $3.1 to $4.6 billion p.a. is threatened by reef degradation and losses totaling $350 to $870 million p.a. are estimated if current trends continue.[163]

A study of a coral reef marine reserve in Malaysia shows clearly that careful design of entry fees to the reserve would enable significant sums of money to be raised for conservation.[164] Estimated mean per person willingness to pay to enter the reserve was 20 ringits for foreign tourists and 9 ringits for local tourists, suggesting a two-tiered pricing system would extract the largest revenues. Taking an average of 16 ringits per person, the total revenue raised would be 1.5 million ringits, or about $0.4 million per annum. The main cost (not estimated) of the conservation area would be a sewage disposal system.

Wetlands and mangroves

Table 6.11 assembles the results of some case studies of mangrove and other wetland conservation. Table 6.11 suggests that the net benefits of wetland conservation exceed the net benefits of conversion to other uses. There are two caveats to this conclusion: (a) studies might suffer a "censoring" bias whereby wetlands with costs and benefits that are unlikely to favor conservation either tend not to be studied or might not be published, and (b), in one case (the Kuantu wetland in Taiwan), the value of the alternative use is measured by the cost to the government of purchasing the wetland: This may not be the same as the value in alternative use.[165]

Other studies of wetlands have focused on the nature of property rights and the value of the wetland. Thus, a wetland may appear to have a low asset value because existing property rights have resulted in the loss of component assets within the ecosystem. One study found, for example, that open access conditions in a Mexican wetland resulted in over-fishing, which had the effect of reducing the economic value of the wetland by over one-third.[166] The example underlines the importance of valuing assets according to their potential value when a rational resource-rights regime is in place, rather than their observed value when a non-sustainable regime is in place.

[163] Burke et al. (2004).

[164] Yeo (2002).

[165] The second point is acknowledged in the study in question.

[166] Barbier and Strand (1998).

Table 6.11 Cost-benefit ratios for wetlands conservation

Study	Scenario	Benefit-cost ratio	Source
Cambodia:			
Ream National Park	Sustainable use vs. depletion of resources	1.2	Estimated from De Lopez et al. 2003, Emerton et al. 2002.
Koh Kong mangroves	Conservation vs. shrimp farms	Shrimp farming unprofitable	Bann 2002b
Cameroon:			
Waza Lagone flood plain	Re-inundation of the floodplain, damaged by dam building	4.7 to 6.6 2.0	IUCN 2001 Loth 2004
Thailand mangroves	Conservation vs. shrimp farms	3.0	Sathirathai 1998
Philippines mangroves	Conservation vs. aquaculture	Negligible. Biodiversity benefits not valued	Janssen and Padilla 1999

Fisheries

Like many other renewable resources, fisheries tend to be open access or common property assets. Unless communal management is strictly enforced, the de facto situation is one of open access and the consequence is over-fishing.[167] It is estimated that some 25 percent of the world's fisheries have stocks below the level corresponding to maximum sustainable yield, indicating sustainability, but 47 percent at are maximum sustainable yield, and 28 percent are above this level. Thus, a quarter of the world's fisheries are seriously over-fished, and a further half is on the verge of being over-fished.[168] Most fishermen are poor, and around 20 percent of the world's fisheries are fished by small-scale household and communal enterprises. Many fisheries are actively managed by communal interests, but even where Exclusive Economic Zones (EEZs) have been used to control access to marine fisheries, over-fishing still occurs, showing that proper national and communal management is still wanting. Policies to control fishing effort take many forms, including controls on mesh size, seasonality of fishing effort, and tradable quotas ("individual transferable fishing quotas"). Thus over-fishing is a problem shared in rich and poor countries, but rich countries have also sought access to developing country waters, generating a conflict with local fishermen. Much-needed licence revenues for coastal states come at the price of added pressure on limited fisheries. The incentive to over-fish is made all the worse by extensive subsidies to developed country fishing fleets, notably in the European Union.[169]

Cost-benefit studies of fisheries compare the benefits of better management regimes with the costs of establishing those regimes. Since sustainable management regimes for currently over-fished stocks will necessarily involve reductions in fishing effort, the costs of such regimes tend to show up as unemployment among fishermen. One study of marine fisheries in the Philippines that directly estimates the unemployment effect is illustrative. The study showed that significant over-fishing exists, and a substantial reduction in catch effort of some 65 percent would be required to secure maximum profits of around 20 billion pesos (around $670 million).[170] But some 466,000 fishermen would become unemployed due to the reduced harvesting. The cost of this unemployment would have to be greater than $1,400 per fisherman for costs to exceed benefits. As a reference point, income per capita (in 1994) was some $800. No policy that generated this much unemployment would be feasible. Instead, a gradual policy is required, involving (a) establishment of a strong monitoring and licensing regime; (b) efforts to prevent recruitment into the industry growing, so that retirements result in a gradual decline in fishermen numbers; and (c) possibly a transferable quota scheme to encourage high-cost fishermen to sell quotas to low-cost fishermen and to exit the industry.

An example of a successful state/fishing industry partnership to overcome over-fishing problems, and embracing new institutions of the kind discussed above, is the shrimp fishery of Madagascar.[171] In response to

Wildlife

Investing in wildlife can help the poor in two ways. First, the development of wildlife tourism can generate significant revenues that can benefit the poor provided that benefits are shared fairly. Various property rights regimes may operate for such investments: Ownership may be by the state, by private sector interests or by local communities. In turn, ownership may be divorced or partially divorced from management: State-owned areas might be leased or licensed to local communities or to private sector interests. Second, the poor in many areas – rural and urban – depend heavily on bush-meat. Bush-meat tends to be hunted under de facto open access conditions, risking the local extinction of the food species. Hence, investment in licensing and resource-rights regimes could help to ensure a sustainable supply of bush-meat.

As with other investments in environmental assets, what matters is the overall rate of return to wildlife conservation and the way in which net returns are distributed among various stakeholders. The basic requirement is familiar: Unless local communities are actively involved in the schemes and do not lose because of them, there will be disaffection and potential conflict over the wildlife resource. Box 6.1 illustrates the problem.

Box 6.1 Does wildlife conservation pay at the national level?

Kenya is rich in wildlife and has invested heavily in the provision of tourist infrastructure to support wildlife-based tourism. But wildlife occupies land that could be used for crops and livestock. Hence, the benefits of wildlife conservation should be compared to the costs of administering and managing wildlife areas, any damage done by wildlife, and the forgone GDP due to the displacement of food production. One study in the early 1990s estimated that Kenya's "profit" from wildlife conservation amounted to only $42 million per annum compared to the forgone GDP of $203 million,[172] a benefit-cost ratio of just 0.2. A study for the Kruger National Park in South Africa suggests the opposite conclusion, with benefits exceeding forgone output and a benefit-cost ratio of nearly 18.[173] There are several reasons for the difference. First, much of the revenue from wildlife in Kenya goes out of the country to outside licensees. Second, the Kruger Park has limited alternative agricultural productivity, although land disputes are nonetheless not uncommon. Third, willingness to pay to see Kenya's wildlife is substantial, so that part of the problem is that only part of this willingness to pay is being captured in game park charges. A separate study placed this aggregate willingness to pay at $450 million p.a.[174] If all this willingness to pay could be captured, the Kenyan benefit-cost ratio would change from 0.2 to 2.2. This suggests careful analysis of park fees with a view to "extracting" more of the willingness to pay. Since these studies, entry fees have indeed been raised. The analysis shows the importance of measuring benefits rather than simply counting current revenues. There are implications too for looking at the structure of ownership and licensing within the resource-rich country, with a view to encouraging local entrepreneurs, so long as this can be done without damaging the wildlife asset. A study of Zambia's Protected Area estate suggests that current revenues of about $3.5 million p.a. are significantly less than current costs of $5 to $6 million p.a., producing a financial benefit-cost ratio of 0.6 to 0.7. But current lack of profitability tends to reflect the earlier stage of development of the park system, with revenues per hectare being far less than in more tourist-mature countries. This suggests that infrastructurerk system,

Table 6.12 assembles some of the information on rates of return to wildlife conservation. Conservation is construed widely. For example, crocodile farms have as their main justification skins and flesh from the crocodiles themselves, plus some associated tourism. However, by diverting attention away from wild crocodiles, farms may also reduce the pressure on wild populations.

Table 6.12 Rates of return to wildlife conservation ventures

Country and venture	Source	Rate of return or benefit-cost ratio	Comment
Namibia	Pearce (1999)		
Farm scale mixed wildlife/livestock.		3.9-5.8%	Financial internal rate of return: various studies. Low returns.
Game viewing.		4.2%	
Conservancies.	Barnes et al.(2002)	8 to 19%	Financial rate of return
		22 to 131%	High economic rate of return
		23 to 230%	Rate of return to communities
Botswana	Barnes (2002)		
Tourist lodge		27.5%	Very attractive return
Ostrich farming		11.0%	
Crocodile farming		19.0%	
Safari hunting		38.0%	Very high return
Game harvesting/trophies		28.0%	
Comparator investment - cattle		2.0%	Many wildlife ventures more profitable than cattle
Zimbabwe	Pearce (1999)		
Wildlife ranch		21.5%	Many wildlife ventures more profitable than cattle
Comparator investment - cattle		13.1%	
Kenya			
Community wildlife sanctuaries	Mburu and Birner (2002)	0.8 to 1.5 (B/C)	Some economic values transferred from other studies
State managed national parks		0.6 to 8.9 (B/C)	

Note: Where possible economic as opposed to financial rates of return have been estimated. Economic rates of return allow for distortions in exchange rates, etc.

Estimating rates of return provides only limited information on the returns to the poor. As noted above, benefit sharing is very important. All too often, wildlife conservation does not benefit the local community. For example, it is estimated that less than 1 percent of tourism revenues in the Maasai Mara National Reserve in Kenya accrue to local Maasai.[176] Reference was made earlier to conflicts between local communities and conservation authorities because of inadequate revenue-sharing and because of livestock and crop damage due to wildlife. Even where revenue-sharing is practiced, neglect of the reasons why local communities may not be motivated to conserve wildlife in the first place can put such schemes at risk. If the asset base of the poor is low, wildlife will tend to be seen as an exploitable resource. If conservation benefits are received in the form of social infrastructure this will benefit the poor if they can make use of it but will often not do much for the underlying reasons that poverty persists. Participating in community-based wildlife schemes may also come at the cost of forgone productive activity. In short, simply making reference to "benefit-sharing" as a precondition of sustainable wildlife investment is insufficient. Great care is needed in designing the schemes and ensuring that the asset base of the poor is enhanced rather than reduced by the schemes.[177]

A study of community-based wildlife conservancies in Namibia shows who has gained and lost from wildlife conservation.[178] First, the conservancies have improved local well-being through cash and non-cash income (especially meat distribution) and through community benefits. Second, in some cases, the poor have gained proportionately more than the less poor. In other cases, the benefits have been neutral with respect to income groups. Third, those who participate in the schemes have gained but not significantly more than those who did not participate. Fourth, the early conservancies have attracted most participation and local benefit, suggesting that as awareness increases and experience is gained, local benefits will increase. The analysis shows that such schemes can be designed to be at least "poor neutral" but with the possibility for them to be pro-poor as well. Table 6.10 shows the very high rates of return that have been earned on most of the conservancy schemes in Namibia. The returns to local communities are especially noteworthy.

The evidence suggests that wildlife conservation can certainly generate positive rates of return. Table 6.12 suggests that for Africa those rates of return exceed the more traditional forms of land use, such as cattle ranching. Recognition of this fact explains why a number of major conversion activities have taken place in Southern Africa, away from cattle to mixed ranching and tourist-based conservation. But the story on benefit-sharing is not so clear. As with the previous discussion of Protected Areas, conservation schemes can harm local communities. The issues that matter are:

> ensuring that local communities are at least no worse off than before the conservation project, making full allowance for shared revenues and losses from wildlife damage.
>
> Ensuring as far as possible that the asset base on local communities is enhanced.
>
> Paying careful attention to the form of any asset-base increase, i.e., increasing assets that give the poorest in the community help to generate future income.

Far less attention has been paid by economists to the bush-meat trade. Yet the problems associated with the trade are very serious.

First, the poor rely extensively on bush-meat. In equatorial Africa it is estimated that some 1.2 million tons of bush-meat are consumed each year, equivalent to 35 kilos per capita.[179]

Second, although bush-meat hunting is ostensibly licensed in some countries, the de facto situation is that it is an open-access resource, so that the prospects of sustainable hunting are very low and risks of some of the larger species (e.g., great apes) becoming extinct are correspondingly high.

Efforts to control the trade, both within national borders and across them, are under way.[180] However, there are formidable problems of:

Knowing just what trade is going on.

Counteracting current preferences of consumers for bush-meat over farmed meat, especially given price differences.

Inducing changed behavior by hunters, given that it is a low-cost, potentially high-return activity. Not "compensating" hunters will render conservation efforts very unlikely to work.

Farming of the most desired species, which has not always been successful.

Policing the very large area of land (and water) that is involved.

Implementing any viable compliance scheme.

Securing the collaboration of the various agents involved, ranging from the hunters themselves, intermediaries and retailers, the consumers, forest authorities and local government.

Implementing community-based schemes when those outside the community are involved in hunting. Outsiders do not face community incentives to cooperate.

Invoking any legislation that may exist.

Established international controls via Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES) operate only when cross-border trade occurs.

No cost-benefit studies of bushmeat control measures have been identified.

Ecosystems, diversity and resilience

Although ecologists have long considered the relationship between biodiversity and the ability of ecosystems to respond to external shocks and stresses ("resilience"), economic analysis has been slow to respond to the challenge of assessing the economic importance of diversity per se. In the view of some, the main consequences of biodiversity loss lie in the loss of resilience that in turn will show up mainly in losses to local communities rather than to the global community. Moreover, once the focus is on the way ecosystems change in response to

[179] DfID (2002b). Equatorial Africa is Cameroon, Central African Republic, Democratic Republic of Congo, equatorial Guinea, Gabon and the Republic of Congo.

[180] For a brief review, see DfID (2002b).

stresses and shocks, it is important to note that the processes of change may not be “linear.” For example, a modest change may result in some dramatic effect rather than an equally modest one. The process of change is marked by discontinuities and potential irreversibilities. Equally, some major changes may have little effect on the system. Resilience measures the degree of shock or stress that the system can absorb before moving from one

7 Policies for Successful Environmental Investment

7.2 Assets and policy

Chapter 5 outlined the nature of the investment challenge to meet MDG 7 or associated goals. Investment creates assets, and assets offer the opportunity to escape poverty, providing other conditions hold. For investments to work, the right policy context must be in place – i.e., there must be a capacity to manage the investments, ensure that they continue beyond the period of involvement of any aid or government agency, and are not distorted by prices that markedly diverge from the true costs of production.

Chapter 2 suggested that the poor are poor because they do not accumulate assets, where assets need to be very broadly construed in social, man-made capital, environmental and human capital terms. Much of the evidence suggests that the most important asset is human, i.e., education and health status.[182] But such an emphasis should not lead to neglect of other assets, especially environmental assets.

> Chapters 3 and 4 argued that environmental assets are an important part of household wealth – e.g., access to forests and wetlands, the protective functions of many ecosystems (watershed regulation, for example), and the role of these assets as insurance in times of economic distress.
>
> The different assets interact. Access to natural resources and environmental quality are vital ingredients of human health, and ,hence, human capital.[183] Resource scarcity and poor environmental quality add to the chances of morbidity and early mortality. There may be other, more complex, links – land degradation and low productivity may force families to withdraw children from school to work on the land or collect natural resources, thus impairing human capital. In short, asset formation cannot be seen in terms of isolating "the" highest return asset since, even if human capital does dominate in social rates of return, environmental (and other) assets influence human capital formation.

The next question is why is it so often the case that the poor do not accumulate assets? The poor face a substantial array of perverse incentives that force them into the "non-accumulation" mode. Incomes can be thought of as depending on:

> The ownership or access to capital assets;
>
> The rate at which those assets are used to generate income;
>
> The market value (price) of income-generating assets;
>
> The non-market (in kind) value of the non-market assets (especially social and environmental assets); and
>
> Any income transfers.[1]

focus on the last – income transfers – is unlikely to be a sustainable poverty-reduction strategy since it ignores asset formation. Indeed, such transfers might (understandably) be taken up as additional consumption in contexts where discount rates are high and access to credit and insurance is low.

This chapter looks at some of the main "contextual" factors affecting the profitability and sustainability of investments.

7.3 Social capital

Social capital is the most difficult capital asset to measure. Social capital relates to sets of interpersonal and inter-institutional relationships in society. The better these relationships, the greater the degree of trust, the lower the transactions costs of economic exchange and, therefore, potentially, the higher the chances of sustained development. In the absence of trust, any contract between different agents in the economy will be subject to uncertainties about completion. Distrust, therefore, requires institutions and the rule of law to ensure that contracts are honored. Valuable resources are devoted to these monitoring and enforcement activities rather than to wealth creation itself. As such, there should be a positive association between social capital and economic development. The available literature is inconclusive on this link: Some authors find distinct and significant effects on economic growth; others find limited evidence to support the view that social capital matters. Even less appears to be known about the links between social capital and poverty reduction.[185]

Numerous indicators have been suggested for measuring social capital. Social capital may often be recognized through indicators of its decay – e.g., crime rates – as measures of social insecurity. Even expenditures on policing might give some measure of social insecurity. At the political level, there are now quite widely used indicators of political freedoms, corruption and good governance. These tend to rank whole countries, and various statistical efforts have been made to determine the role that they play in securing or inhibiting rising living standards. Widely used indicators of social capital come from international social surveys that include standard questions about the degree of trust among individuals. Finally, the early literature identified the number and population density of voluntary organizations as an indicator.

Social capital is readily destroyed by perverse incentives. For example, subsidies constitute rents and rents generate "rent-seeking," a process whereby interest groups seek to maximize their share of the rents rather than engaging in any economic activity that increases overall well-being. Rent seeking involves lobbying and, ultimately, corruption. In turn, corruption destroys trust in institutions: People no longer trust governments, regulators and government agencies, knowing them to be overly influenced by those who can exercise political power and influence. Bribes become central to the "working" of bureaucracies and the less privileged have less capacity to pay the bribes. Thus there is both an overall economic inefficiency – a diversion of resources into unproductive activity – and an equity issue: The poor are generally excluded from the process that allocates the resources.

Environmental degradation is also linked to the destruction of social capital. Where communal management works, environmental assets are frequently well managed through local associations and community groups. As resource scarcity and environmental degradation set in, community cohesiveness comes under strain and there is a temptation to abandon the rules governing access and use of communal environmental assets and to pursue individual gain at the expense of the group as a whole. In this way, social capital tends to break down under conditions of environmental degradation. In turn, losing social capital amounts to losing the relationships of care and concern for fellow human beings. Societies that are more selfish also tend to be less caring of the

natural environment. Although these may be the anticipated relationships, empirical links between social capital and environmental quality have been difficult to determine. Analysis of the formation of collective action suggest the rapid growth of groups dedicated to environmental improvement, while other communal arrangements have been destroyed by various factors, including nationalization and privatization of resources.[186] The policy lesson relates to what can be learned from these gains and losses in social organization. In Nepal and India, for example, the granting of access rights and concessions to forest use produced more than 20,000 user groups, i.e., a reallocation of resource rights produced the social capital necessary to protect and manage those rights.[187] Others have questioned whether there is any significant link between social capital and environmental quality.[188]

Can social capital be created by policy? Here again, the messages seem fairly similar to those for institutions and property rights in general. There are no "blueprints" that can be imposed from the outside. Recognition that there is an environmental problem may bring a society closer together – a problem shared might be a problem lessened. But there will also be the risk of a "race to the bottom" as people chase after what is left of increasingly scarce assets. Creating a collective interest in resource conservation – a form of collectively agreed mutual coercion – is thus very difficult. Analysis of the history of cooperative movements suggests that governments have no advantage in "stimulating" social capital, and efforts at intervention may in fact be counterproductive[189]. "Bottom-up" cooperation, emerging on a voluntary basis, tends to be more sustainable than "top down" initiatives, which may work initially but tend to be short-lived. If this is correct, and that part of the literature that addresses the issue of "creating" social capital tends to suggest it is,[190] then social capital formation is a slow and long process, and not something that can be enforced or even stimulated significantly by external forces. But the Nepal example and others show that removing obstacles to communal organization can generate spontaneous formation of social capital. In short, government actions are best focused on creating the right conditions for communal management, rather than looking for ways of actively producing local entrepreneurs and community spirit.

7.4 Governance

It is now widely accepted that governance matters for effective policies to address poverty, and that it matters for the efficiency and sustainability of investments.[191] The more democratic the institutions, the more likely it is that economies will respond to external shocks and crises.[192] Thus, democracy facilitates any change in political rule, enables politicians to listen to popular concerns, without which any new regime will face further instability, and gives the greatest assurance of a consensus. Corruption militates against any sense of fairness and injustice, prompting instability or inviting the non-corrupt to adopt the same behavior. Corruption implies that substantial efforts are being made by the corrupt to secure larger 792 c1 injustice,

Indicators of governance have been developed and tend to include:[193]

Corruption and anti-corruption measures;

"Voice" and accountability, e.g., the extent of human rights;

Political instability;

Violence;

Effectiveness of governments – quality of public services, competence of the bureaucracy;

Quality of regulation – the extent to which regulations inhibit market forces;

Rule of law.

For current purposes, what matters is the extent to which the quality of governance affects the effectiveness of pro-poor investments and pro-poor policy. One obvious way in which poor governance inhibits pro-poor policy is through the creation of rents arising from investments and which are then captured by the better-off. The degree of capture will be greater the more corrupt the political system. In the extreme, some investments may never actually be "delivered" at all if the finance is diverted elsewhere.

On a more positive note, all the studies of governance and income growth support the view that better governance is strongly associated with higher income growth. In so far as income growth "trickles down" to the poor, then the poor will benefit from better governance. The issue is complicated by the fact that the causal association works both ways: Better governance creates a better policy environment, which enables opportunities for asset formation to increase, but higher incomes generate a demand for better governance as well. But the available evidence seems to suggest that the former causal link is stronger than the latter. The intuitive judgment that governance matters for economic development is borne out by the evidence.

7.5 Resource rights and institutions

"Institutions" refer to the social and legal norms of behavior in a society. These norms, and the ways in which they are enforced, determine the extent to which individuals combine to undertake collective action. If institutions are inefficient and cannot cope with changing conditions, then societies cannot adapt and what may already be a situation of poverty may simply get worse. This was the essence of the "Lopez model" outlined in Chapter 4. In the environmental context, the most obvious issue is the presence of "open access" conditions for many natural resources, i.e., conditions in which no one owns or collectively manages the resource in question. Institutionally, there are no rules to restrict exploitative behavior to the resources. If there were, open access would be converted to communal or private property. Provided the rules can then be maintained and enforced, they may enable the resource to be used sustainably. For this to happen, however, mechanisms are needed for dealing with rapid population growth (natural or migratory), which can quickly return the resource to open-access status. In short, institutions must emerge to change the resource rights and to enforce them.[194]

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[193] Kaufman et al. (2005)

[194] The usual term for resource rights is property rights. Resource rights is the term generally used here since it makes it clear (a) that rights extend over a very wide range of assets, and (b) ownership is not always involved. More relevant than ownership is control. Ownership without control is ineffective. Control without ownership can be effective.

Box 7.1 Resource-rights regimes and the incentive to invest

Which resource-rights regime is best for environmental improvement? In some cases

All this points to the

may not recognize the factors that have generated the scarcity. Again, intervention needs to have a “light touch” – gently probing the problem and the community’s responses to that problem, being sure to bring the community to its own solution rather than an externally imposed one.

Land titling may often be a requirement for better resource management. Secure titles can provide security for investments in soil and water conservation, provide collateral for credit (see below) and encourage land to move to its highest product use if a land market develops. Although this is the theory, practice has not always

Table 7.1 Global subsidies 1994-8 ($ billion per annum)

	OECD	Non-OECD	World	OECD subsidies as % of World subsidies

Two broad effects of subsidies are relevant:

Table 7.4 Some environmental effects of subsidies or subsidy removal

Study	Nature of scenario	Environmental impacts
Cristofaro et al. 1995 USA	Removal of $8.5 billion energy subsidies. Removal of $15.4 billion energy subsidies.	- 10 mtC by 2010 - 37 mtC by 2035 - 64 mtC by 2010
Gurvich et al. 1995 Russia	Removal of energy subsidies: effects in 2010	76% reduction in TSP 39% reduction in CO2 43% reduction in NOx 66% reduction in SOx
IEA, 1999	Removal of consumer subsidies in Russia, China and 6 other countries	16% reduction in CO2
Larsen and Shah, 1994	Removal of world energy subsidies of $230 billion	21% reduction in CO2
GREEN in Michaelis 1996	Removal of global subsidies of $235 billion	- 15 billion tons CO2 in 2050
DRI in Michaelis 1996	Removal of coal subsidies in Europe and Japan	- 10 to -50 mtCO2

Source: Pearce (2002) which also references the original studies

Policy on subsidies

In policy, The Earth Summit of 2002 called for reductions and the eventual removal of rich country subsidies in the name of developing country progress. Although the policy goal is fairly easily stated, far less attention has been paid to the ways in which subsidy removal might be effected in practice.[205] Since subsidy regimes are entrenched in rich countries, they have attracted considerable lobby groups in their favor. Removal almost certainly requires a long educative process, political trading among countries, and even paying off subsidy holders through some form of "compensation." Box 7.2 provides some discussion.

[205] For a discussion, see Pearce and Finck von Finckenstein (1999).

RecentI

How do market-based approaches, such as environmental taxes, affect the poor? The fact that tax burden may be a larger proportion of income for the poor than for the relatively rich is an obstacle to the introduction of such measures in rich countries, let alone developing ones. To some extent, however, this probl

Box 7.2 Financial flows for global environmental benefits

Developing countries have sovereign rights to their natural resources. Environmental protection is often not their priority concern, although the arguments in this report suggest that they should have a far higher profile than is often the case. Yet developing countries are also the repository of many resources that have global benefit – biodiversity and carbon storage are two clear examples. The rest of the world should , therefore, be willing to pay the developing nations to conserve the natural assets that generate these global benefits. Two major examples of this willingness to pay are the Global Environment Facility (GEF) and debt-for-nature swaps (DfNSs). In the former case, the GEF pays host nations the "incremental cost" of changing an investment, so that it confers global benefits. Thus the incremental cost of using a renewable energy source compared to, say, coal would be paid by the GEF. The world would gain because of the avoided carbon dioxideaT5would gain

More relevant from the policy standpoint is the extent to which government intervention is required in the deals. If the beneficiary-pays principle is at work, and if markets are fairly freely functioning, then any payment for environmental services should be mutually advantageous and there would not be any apparent role for government. Transaction costs could be minimized by brokers without government being involved. But there are problems in assuming that mutually advantageous bargains will simply emerge. The downstream farmer may not be able to anticipate the effects of upstream deforestation, i.e., there may be uncertainty about the benefits. Most importantly, the downstream farmer may be too poor to pay the forest owner's minimum requirement for compensation. If so, from the standpoint of the parties jointly, the bargain should not occur. But since that risks the livelihood of the poor, an equity issue arises. Since legal contracts are involved, it may also be necessary to have government (local or central) sanction the deal. Finally, there may be problems of getting the downstream farmers to act collectively, given that the benefits are shared among them (the benefits take on the form of a "public good"). These factors – uncertainty, legality, publicness, and equity – are the justifications for government intervention in PES schemes.

So long as PES takes the form of a "pure bargain," both the resource owner and the beneficiary should be better off with PES than without it. If so, one could conclude that the rate of return to the resulting conservation activity is "high" in the sense that each party is willing to make the bargain.[213] Once governments act as intermediaries, this outcome is less guaranteed since governments may themselves be influenced by special interests: If the poor are the owners or guardians of assets, they may have less power to bargain for more than the minimum value of their assets. If the poor are the non-paying beneficiaries, the asset owner may use any influence to extract higher payments from the government than are warranted by the true asset value. Until a systematic databank of PES schemes is established it will be hard to know just how socially beneficial such approaches are.

A matrix of PES

Actual mechanisms of payments for environmental services (PES) have already been developed, on a case–by-case basis, for:[214]

Carbon storage – e.g., avoided deforestation.

Carbon sequestration – e.g., from afforestation and reforestation.

Watershed regulation – e.g., avoided downstream effects of upstream deforestation or agro-chemical use.

Biodiversity-friendly agricultural products (e.g., shade-grown coffee, etc.), the mechanism here usually being the payment of a price premium on the final sale of the product.

Conservation activity via direct payment.

Offsets (tradable development rights).

In most cases, reducing poverty is not the prime motive for the market creation. The motive is to secure environmental benefits. But as PES has evolved, even over a short period of a few decades, the issue of how they can be managed to benefit the poor has also become important.

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[213] This argument can be found in Pagiola et al. (2005).

[214] For an extensive discussion of the various applications, see OECD (2004).

The elements of efficient design of a PES scheme that serve both environmental and poverty reduction goals are

Are existing examples of PES pro poor?

Like so many policies, how far they serve multiple goals depends on their design and implementation. The evidence on the pro-poor nature of PES schemes is limited. Self-evidently, if the poor are poor because of their limited resource rights, they may have no assets to sell to beneficiaries. They simply do not participate, and a biased picture can then emerge because the PES that are observed must necessarily be confined to those with resource rights, unless the government acts as intermediary. If the poor have low opportunity costs, then one might expect PES to gravitate naturally toward them rather than to those richer landowners who will need large

Box 7.3 Who participates in the Costa Rican PES Program?

Studies of participation in Costa Rica's Pagos de Servicios Ambientales (PSA: Payment for Environmental Services) program suggest that, to date, those receiving payments are primarily large-scale farmers and forest owners. Between 1997 and 2001, some 4,460 beneficiaries received payments. Most of the payments were for forest protection (more than 84 percent of the land area affected), with about 10 percent of the land being devoted to sustainable management and the remainder (about 7 percent) to reforestation. An econometric investigation showed that participation in the PSA was heavily influenced by farm size, the educational level of recipients, the extent of farm debt, on and off-farm income, and the extent to which participants had either attended informational and promotional meetings or were approached by intermediaries acting for the program. The influence of farm size suggests that there are "economies of scale" in PES – the costs of transacting the deal are spread over a larger area, lowering average costs per hectare. The influence of farm debt suggests that the certainty of the payments acts as a form of insurance against uncertain returns from agriculture or forestry. Recipients who have off-farm incomes and who enjoy secure title to their lands are far more likely to participate.

One problem with these studies is that they focus on who receives payments rather than who benefits from the resulting ecosystem conservation. If the poor are the primary beneficiaries, then there is still a good case to be made for regarding the program as pro-poor. Otherwise, the program needs to look at how poorer people can be encouraged to participate as recipients of payments.

See Zbinden and Lee (2005)

Box 7.1 The credit problem and some solutions

Development economists have made extensive studies of credit markets in poor countries. The low asset base of the very poor severely restricts their ability to secure credit. Much of the demand for credit is to finance consumption during periods when incomes are very low – e.g., before the

Directing credit to investment thus means finding out why households might divert loans into consumption. The answers may lie in the uncertainty attached to investment returns, problems with the scale of the investment, and the fact that income needs are more pressing than anything else, especially in times of crisis. Since the focus here is on environmental assets, the issue becomes one of ensuring that such investments are secure and yield sensible rates of return. Property rights to the environmental asset obviously contribute to security – ownership of land, livestock or other assets provides collateral for any loan. But resource rights may also mean rights to some off-take from the natural resource – e.g., access to a protected area in order to secure

How do environmental assets fit into the picture of the insurance needs of the poor? The answer is that environmental assets frequently function as risk-reducing assets. Various studies have shown that, as subsistence agricultural income falls due to expected and unexpected risks, so environmental assets may be exploited to smooth the fluctuations in income. Box 7.2 illustrates with an example from the Brazilian Amazon.

Box 7.2 "Natural insurance" in the Brazilian Amazon[220]

The role played by non-timber forest products (NTFPs) in supplementing the incomes of the poor has already been discussed. But not only do forests act as providers of general income supplements, they also serve an important function in "smoothing" income and consumption. As agricultural incomes fall, so households resort to gathering more forest products. The reductions in agricultural income may be anticipated, e.g., during the crop growing season, or unanticipated, as with a sudden weather crisis or external event. Hence,, if forests act as "natural insurance" one would

relationship. These communities are isolated from markets but households nonetheless collect forest products for.000n0 792 cm BT 41 0 0 -41 300 1192 Tm /F2.01 Tf (relaommuare isolated from mark

8.3 Policy design

The “menu” of policy instruments available to decision-makers and advisers is generally very well known. Perhaps the major challenge is how to adapt those policy instruments to developing country institutional capabilities. As institutions evolve, so a greater range of instruments can be employed. In the meantime, caution

8.6 Environmental effects of subsidy regimes

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