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Paying for Environmental Stewardship

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Using Markets and Common-Pool Property to Reduce Rural Poverty while Enhancing Conservation

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TABLE OF CONTENTS

EXECUTIVE SUMMARY

Two of the 21st century's most important challenges are the elimination of absolute poverty and the sustainable management of the environment. However, these challenges are rarely linked in policy or practice. The failure to address poverty alleviation and environmental sustainability in a holistic manner is a reflection of flawed conventional wisdom. Decision makers have traditionally believed that environmental sustainability is not an important concern of the poor, is not tied to poverty, and is a luxury that can only be addressed once higher levels of income are attained. These views are incorrect.

This paper will demonstrate that there are many ways that environmental improvements can help the poor, and that poverty alleviation can go hand-in-hand with achieving a better environment. To achieve these goals, decision-makers need a deeper and clearer understanding of the value of environmental services and the role that poor people can play in enhancing those services. We will explore innovative ways to increase the rural poor's control over natural resources and their capacity to manage those resources sustainably. In addition, we will examine how markets can be manipulated to engage people in environmental stewardship and compensate them for their progress.

About three billion people live in poverty, spending less than $2 a day by World Bank estimates. One billion exist on less than $1 per day. Most poverty occurs in rural areas, where poor people depend on natural resources for their livelihood. In both developed and developing countries, the presence of extractive industries and the pressures of population growth marginalize many rural poor, making the sustainable use of their resources difficult.

Among the most important factors explaining this phenomenon are the failures to properly value environmental services; to assure the appropriate allocation of property rights; and to design systems to compensate stewards, who will usually be drawn from the rural poor, to maintain those environmental services. Market mechanisms often can be used to achieve these goals. There are many examples in both developed and developing countries that offer hope that poverty and sustainability can be addressed through such approaches. These mechanisms alone, however, will not fully solve either problem. Instead, they must be incorporated into broad strategies of poverty alleviation and environmental sustainability.

The point of departure for designing programs to encourage environmental stewardship is recognizing the value of environmental services. Throughout history, most environmental goods and services have been viewed as so abundant that they can—and should—be taken for free.[1] We can no longer make such an assumption. The combination of population growth and the pattern of economic expansion leading into the 21st century has resulted in the consumption of environmental resources at a rate that exceeds sustainable levels. If the Earth's entire population were to live at the median level of an Organization for Economic Cooperation and Development (OECD) country, it would require the resources of three Earths to provide that livelihood sustainably.[2]

On a global level, it has been estimated that the value of quantifiable environmental services, such as water purification and flood control, exceeds global GDP.[3] Local

studies have demonstrated that, in many cases, the value of services provided by intact ecosystems exceeds the value of extracting the marketable natural resources they may contain. Intact forest ecosystems, for example, could be more valuable than the logs they contain.[4] Since few environmental services are ever properly valued, decision-makers cannot evaluate their choices properly. The first step in promoting stewardship of natural resources is to assign natural resources and the services they provide their true value.

The next step is making environmental services more marketable. Markets are based on individual property rights to assets, goods, and services. While this concept works for most produced goods and services, there are a number of shortcomings when it is applied to natural resources and the environment. Property regimes differ widely among countries. In many countries, rights to natural resources, such as timber, minerals, water, and hydropower sources, are claimed by the state. The state often grants these rights to individuals and corporations outside the local community. The local people who have traditionally earned their livelihoods from the resources are rarely compensated, although they have first-user claims and typically have something akin to ownership rights under their own customs and governance structure.

Natural ecosystems function as an integrated whole, producing a wide variety of benefits to different groups of people. Allowing the disruption or removal of major components of ecosystems can diminish or destroy many of the services the ecosystem may have provided to people. Extensive logging, for example, can cause siltation and flooding downstream, diminishing the forest's water purification services; building a dam will flood a large area and change the local environment in many ways, and so on. When most of the residents of a particular area depend on an ecosystem for its services, the ecosystem constitutes a "common-pool" resource. Community management systems should be applied in these areas, particularly where the rural poor are the local people most severely affected. Understanding the complexity of property rights in ecosystems and reforming the approach to recognize common-pool property is the second important step in developing sound stewardship systems.

Market analysis is based on the idea that goods are characterized by *rivalry*, which means that when the owner uses the good it is no longer available for use by anyone else, and *exclusion,* which means that the owner can prevent others from having access to his good. Goods that lack rivalry and exclusion are called public goods. Everyone benefits from *public goods.* For example, everyone benefits from the flood protection that forests offer or the joy of scenic vistas. All people can enjoy these benefits, and the benefits that any one person derives do not keep any other person from also deriving those benefits. Conversely, people cannot be prevented from spoiling environmental public goods, such as polluting air or water. These cases are called *public bads.* Many environmental goods and services fall into public 'goods/bads' category to a greater or lesser extent. Normally functioning markets, therefore, will undersupply public goods because the producer/owner cannot gain all the value created, and the owner/producer will oversupply public bads because they are not charged for their negative impacts.

Once this market imperfection is understood, society, usually through its government, can sometimes intervene and create conditions that introduce exclusion or rivalry, thereby creating market conditions. Environmental goods or services can be traded in a market, helping to curtail the production of bads. In both developed and developing countries, markets have been created for the services ecosystems provide, such as improved water or air quality. As the stewards of many ecosystems and the potential sellers of those services, the rural poor can benefit financially from the establishment of such markets. Creating environmental markets is the third step in developing stewardship programs.

Setting up these markets is not easy, and is not an end in itself. Markets are simply the best-known mechanism for the efficient production and allocation of goods. Markets do not take into account issues such as equity,[5] sustainability, or aesthetic values. These are social and cultural concerns. Good governance and strong institutions are critical to ensuring that these cultural values are represented in markets, and to promoting the objectives of poverty alleviation and environmental sustainability. Markets require appropriate regulations and institutions that operate with integrity. These regulations and institutions must reflect society's values, and they must assure that the goals of sustainable development are met with acceptable equity among all members of society.

The cases cited in the paper demonstrate that it is possible to create markets for many forms of environmental stewardship. These market structures can benefit the rural poor by compensating them for the environmental services they provide. Those who pay for the services benefit as well. Creating these arrangements is not easy, and does not always work. But there are many opportunities to be explored and exploited.

Several important and pragmatic tools are discussed in detail to assist interested parties in developing programs of environmental stewardship. These include:

- Educating stakeholders about the value of environmental services to individual and community well being
- Reforming property rights to recognize and encourage community property systems where appropriate
- Involving local people in resource management wherever possible, and paying them sufficiently for their services
- Improving methods for valuing environmental services so that market-based principles can be used to compensate for environmental stewardship and pay for environmental mitigation
- Strengthening mechanisms for structuring and enforcing stewardship agreements

In too many cases, opportunities to maintain the livelihood of the rural poor have been destroyed by non-sustainable activities promoted by outside investors interested in extracting the area's natural resources

- Strengthening procedures to assure that local people are adequately compensated for the exploitation of resources in their areas
- Establishing appropriate funds to pay for stewardship services, especially for global environmental services and services whose benefits are too diffuse for market-based mechanisms

Living in the modern world, it is easy to forget that all our well-being and creature comforts are entirely dependent upon the extraction, transformation, and delivery of natural resources. The challenge we face is not to stop using environmental resources. We couldn't survive without them. Nor is the challenge to set arbitrary limits on their use, which would prevent others from attaining acceptable standards of living. The challenge is to manage our environmental resources so that they can contribute to improved standards of living in ways that promote sustainable use of environmental resources for all people. The vast variety of goods and services available in modern economies are highly desirable; indeed, they are the aspiration of the three billion people living in poverty. And as incomes rise, people come to value preserving unspoiled nature wherever possible. ➡

I

INTRODUCTION

Two of the 21st century's most important challenges are the elimination of absolute poverty and the sustainable management of the environment. These goals have been recognized in the Millennium Development Goals of the OECD for 2015. These goals, however, usually are not linked in the policies and practices of many stakeholders. The failure to address poverty and environmental sustainability in a holistic manner is a reflection of flawed conventional wisdom; decision makers have traditionally believed that environmental sustainability is not an important concern of the poor, is not tied to poverty, and is a luxury that can only be addressed once higher levels of income are attained. These views are incorrect.

There are many ways that environmental improvements can help alleviate poverty, and many ways that poverty alleviation can go hand-in-hand with achieving a better environment. In this paper, we will explore some innovative ways to increase the rural poor's control over natural resources and their capacity to manage those resources sustainably. In addition, we will examine how markets can be manipulated to engage people in environmental stewardship, and compensate them for their progress. Assuring basic equity in access to environmental resources and services is an essential element in such transformations.

In the following section, we summarize the extent of rural poverty and explore the connections between poverty and environmental sustainability. The third section explores the economic value of sustainable environmental services. The fourth section reviews property rights—particularly common-pool property approaches—as tools that could be used to increase the rural poor's control over natural resources and enhance their opportunities to manage those resources sustainably.

There are many ways that environmental improvements can help alleviate poverty, and many ways that poverty alleviation can go hand-in-hand with achieving a better environment.

In the fifth section, we discuss market failures in the handling of public goods that lead to the abuse of natural resources and to the growth of poverty in many rural areas. The sixth section briefly discusses market and equity considerations, and section seven suggests ways to use market instruments to compensate environmental stewards.

Throughout this paper, we illustrate recent successes and failures in adapting market practices to promote environmental sustainability. Examples are drawn from both developed and developing countries. ➡

II

THE RURAL POOR AND THEIR ACCESS TO NATURAL RESOURCES

At least 3 billion people survive on less than $2 per day. Over one billion live in absolute poverty, defined by the World Bank as spending less than $1 per day. Nearly a billion people suffer from malnutrition.[6] In all developing countries for which data is available, save two, the incidence of rural poverty exceeds urban poverty, often by a factor of two or three.[7] Globally, well over half of the poor live in rural areas and depend on access to natural resources for their subsistence. In addition to income measures, other measures of well-being, such as health care, basic education, and access to electricity and communications are lower in rural than in urban areas. These areas also tend to have much less influence in government decisions, which can be attributed to a combination of lower education levels and more limited information about and voice in national matters.

People living in rural areas are often marginalized by reduced access to natural resources and public services. Close to half of the rural population, approximately 1.5 billion people, live on fragile, marginal land.[8] These lands are classified as marginal due to terrain that is mountainous, forested, arid, or composed of poor soils. In many cases, rural people have been forced onto these lands by population pressures, displacement from their traditional living areas, political forces, or by their inability to find other means of supporting themselves. On these marginal lands, rural poor are typically engaged in some type of pastoral activity, with subsistence agriculture as their primary source of income. Those not engaged in subsistence agriculture are engaged in extractive industries such as logging or mining.

Although the overwhelming majority of rural people depend on natural resources for their livelihoods, land use rights for rural communities are rare. While accurate data is not available, it is estimated that most of the rural poor in developing countries do not have clear title to their lands.[9] Few rural dwellers have legal rights to

BOX 1 - INDONESIA: THE GRASBERG MINE

The Grasberg mine, located in eastern Indonesia, is the world's largest open-cut gold and copper mine. PT-Freeport Indonesia owns and operates the mine, with approximately 80 percent of the shares owned by Freeport McMoRan (a US corporation) and 10 percent owned by the Indonesian government. The government granted mineral rights to the mine with no recognition of the rights or livelihoods of the Amungme people, who had lived in the area for centuries and depended on its agricultural and animal resources. The extensive mining practices destroyed many of their sources of livelihood and forced many, often entire villages, to relocate with little or no compensation. Neither local leaders nor environmental experts were consulted on how to minimize the mine's social and environmental impacts. As a result, the mine has destroyed a sacred mountain, damaged local water quality, and poses serious long-term environmental threats such as spilling toxic wastes over large areas. In addition, PT-Freeport has been implicated in grievous human rights violations. The local inhabitants, represented by the Amungme Tribal Council, have been persistent in protesting their treatment by PT-Freeport. In response to the change of power in Indonesia in combination with pressure from communities and activists, PT-Freeport has made some changes in its policies. Amungme tribal leaders, however, are waiting to see how many of the changes will be implemented.
Source: Kennedy et al, 1998

natural resources extracted from the land where they live. These rights are usually claimed by the state and often granted to large firms, which take little or no responsibility for the welfare of people living in the areas they exploit. The Grasberg Mine in Iryan Jaya, Indonesia, (see Box 1) is one of the most striking examples of the abuse of both the environment and the local people. In this example, the Amungme people had neither legal rights to the resources being mined nor legal recourse to make the company that held the rights responsible for the social and environmental consequences of its actions, which disrupted or destroyed their sources of livelihood.

In too many cases, opportunities for the rural poor to maintain their livelihood have been destroyed when outside investors extract an area's natural resources and offer little, if any, compensation for the extracted resources. When the area's resources are exhausted and the outside investors move on, local inhabitants are usually left with neither jobs nor a resource base on which they can support themselves. These conditions occur in developed as well as developing countries, as illustrated by the history of West Virginia, USA (see Box 2).

In the last 50 years, rapid population growth has greatly increased pressure on rural resources, led to unsustainable farming practices, and pushed more people into marginal areas. When such pressures cannot be restrained and density increases beyond normal carrying capacity, land tenure regimes often degenerate into open access situations. Local inhabitants (which may include immigrants) use whatever resources they can to provide for immediate survival needs. The resource will be over-exploited as a growing number of people try to extract as much as possible.[10] Additionally, many new nation-states have claimed rights to the natural resources traditionally managed by local communities and granted exploitation rights to government or private agencies from outside the local areas, further impoverishing local communities, which are rarely compensated.

The marginalization of the rural poor raises important equity issues. In the cases cited above and in many others, the rural poor are deprived of access to the natural resources that have long been their primary source of livelihood. In other cases, expanded use of natural resources reduces or eliminates environmental services on which they have depended. Although this may occur under prevailing national laws, as discussed below, it deprives the poor of sources of income without proper compensation. As a result, the poor are often forced to exploit more marginal land and resources in order to survive, further compounding the problems of sustainability. ➡

BOX 2 - WEST VIRGINIA, U.S.A.: RESOURCE EXTRACTION AND EXTERNAL INVESTMENT

In the mid-nineteenth century, a nearly unbroken forest that spanned more than 15.5 million acres covered West Virginia. However, between 1880 and 1920, the state was almost completely deforested by absentee landowners who logged and sold the timber. The influence of large absentee landowners continues today. From the turn of the century, external capital investment was employed to exploit natural resources. 'Foreign' or 'absentee' owners and firms acquired a disproportionate influence over West Virginia, both economically and politically.

Once the forests were cleared, local West Virginians were left with a state ravaged by severe water pollution, flooding, fires, and landslides. Much of the employment that had been created by the logging was temporary and transient, and few opportunities were left after the timber was extracted. The subsequent expansion of coal mining offered some employment opportunities, at further cost to the environment and local health.

Extractive industries, such as mining and timber, still provide employment opportunities within the state, but advancements in timber and mining technology have eliminated many jobs previously performed by human hands, and most of the profits and benefits accrue outside of West Virginia. A major mountaintop removal coal mine employs only 70-90 workers in all, many from other states. As of 1998, West Virginia ranked 50th in the nation in terms of median household income and 3rd from the bottom in terms of the percent of population below the poverty line.

Source: US Census Bureau, and Lewis, 1998

III

THE ECONOMIC VALUE OF A SUSTAINABLE ENVIRONMENT

Studies have shown that the current rate of use of most natural resources exceeds sustainable levels, providing only one-sixth of the world's population with an affluent lifestyle and about one-third with an acceptable one. The current systems of natural resource use far from adequately provide for the needs of the poorest half of the world's population.

One vivid illustration of this is the concept of the *footprint* of environmental consumption, or the total land area required to support a country's level of consumption. It demonstrates the disparities in natural resource use among rich and poor countries.[11] The environmental footprint of wealthy nations greatly exceeds the land area of those countries. To accommodate their large footprints, wealthy nations are drawing on the environmental resource base of the rest of the world, exhausting reserves of environmental wealth.[12] In fact, it has been estimated that if the whole world's population were to live at the level of a median developed country, the world's environmental footprint would be the equivalent of at least three Earths, given today's consumption patterns, institutions, and technology.

Important technical improvements and changes in consumption have reduced the resource use per unit of national output (Gross Domestic Product or GDP). Contrary to expectations when the population explosion began, improvements in agricultural technology have resulted in an increase in food production that, if distributed evenly throughout the world's population, would be enough to feed everyone.[13] These improvements, however, have not been sufficient to reduce the total number of people living in poverty. Nor have these changes occurred fast enough to reduce the overall consumption of resources, which is still growing. World output growth exceeds the rate of efficiency and productivity gains, so total consumption of resources continues to grow. The implications of these patterns are obvious: either consumption patterns, institutions, and technology must change drastically to reduce demands on resources, or management of those resources must be improved to ensure their sustainability, or a mix of the two is needed.

From an economic perspective, this over consumption of natural resources can be attributed to the fact that throughout history, most environmental goods and services[14] have been treated as free to be used as needed. In earlier times, the environment was vast in relation to human use, and extractive activities had little impact.[15] Environmental goods could be had for the taking on a first-come, first-served basis. This perception of the environment as an inexhaustible, free resource has persisted long after the reality has changed.

It is important to keep certain characteristics of the environment in mind when considering the economics of environmental goods and services. Most market goods and services are produced and maintained as discrete objects that can be separated from other goods and services. Environmental goods and services, in contrast, are part of ecosystems, which function as complex, integrated systems in delivering their services, rather than as a collection of separate elements. Ecosystem services, such as water purification, climate moderation, and siltation control, do not stem from a particular component of an ecosystem (such as a group of trees or pile of minerals), but from the functioning of the whole system. Removing or significantly changing one part of an ecosystem can disrupt the functioning of the whole system.[16]

Assuring environmental sustainability cannot be accomplished by protecting a specific area or a discrete set of resources, though such protection may be necessary in certain circumstances.

Assuring environmental sustainability cannot be accomplished by protecting a specific area or a discrete set of resources, though such protection may be necessary in certain circumstances. Ecosystems must be addressed in a holistic manner to ensure that they continue to provide their desirable services over time. Ecosystems, however, are generally too large to be owned by an individual or even a corporation, and may include both public and private lands. Indeed, ecosystems may be interconnected in such an elaborate manner that it is not possible to define precise boundaries. A broader community viewpoint is required to balance different needs and uses, taking proper account of the benefits and costs of competing uses and placing values on the systemic effects as well as on the various individual components.

All the above helps explain the difficulty that markets and society face when trying to assign value to environmental services. Economists, however, have begun attempting this difficult task. One recent study estimated that the global value of environmental services provided by ecosystems totals about $33 trillion a year, or slightly more than the world's GDP of $29 trillion in that year.[17] These values were calculated by estimating the costs of providing equivalent services through technology and investments, such as building water purification plants, and the costs imposed on consumers by

BOX 3 - INDONESIA: FOREST VALUATION

Indonesia has established an extensive system of national parks to protect its environmental resources. To justify the costs of maintaining these parks, efforts have begun to estimate the value of the services the parks provide. In 1999, Conservation International sponsored a study of the Mt. Gede-Pangrango National Park located in central Java. This park is among the oldest in Indonesia and encompasses more than 15,000 hectares of forest reserve. It is surrounded by several hundred thousand hectares of buffer zones (designated as production forests), transition areas (where agriculture is allowed), and watershed zones that benefit from the services of the park.

Careful monetary estimates were made of the benefits provided by sound park management due to tourism, water supply for agriculture, water for household use, and sediment control. Benefits were also recognized but not measured for nontimber forest products, biodiversity, air quality, carbon sequestration, risk management, research and education, and other values. The quantified benefits were compared to the costs of park management and the opportunity costs of foregone timber extraction in the park. The benefits totaled nearly one and a half times the costs of management and foregone logging revenues. The savings would have been even larger if the other benefits could have been quantified.

This exercise demonstrates that environmental services of ecosystems can be very valuable in terms of improvements in the production of local goods (such as providing sediment control or water for agriculture) and improvements in people's quality of life (such as providing water for households or tourism opportunities). However, in many cases, these services are rarely treated as market goods that can be bought and sold, as, for example, timber is bought and sold. Although the Mt. Gede-Pangrango National Park is not in danger of being exploited, the calculations demonstrate that for many unprotected areas, the benefits from logging, which accrue to very few, are probably outweighed by the costs imposed on local people through loss of water, sedimentation, and other costs, creating negative results and increasing local poverty.

Source: Conservation International (Indonesia), 1999

Studies have shown that the current rate of use of most natural resources exceeds sustainable levels, providing only one-sixth of the world's population with an affluent lifestyle and about one-third with an acceptable one. The current systems of natural resource use far from adequately provide for the needs of the poorest half of the world's population.

the lack or pollution of environmental services, such as the health costs of breathing polluted air.[18] Obviously, many valued environmental services cannot be quantified in market terms, and are excluded from the estimates. These numbers are only estimates, but even allowing a large margin of error, they indicate that environmental services are very valuable. Viewed as a provider of services, nature is a gigantic enterprise that deserves careful management to avoid significant losses in the value of the services it provides.

Many local studies have also found that the values of the services rendered by an ecosystem as a whole greatly exceed the values of specific goods extracted to make commodities, such as timber or minerals. Box 3 summarizes a detailed calculation made for a forest in Indonesia to this effect. Such studies demonstrate in concrete terms the value of environmental services in local areas, and indicate which services are the most valuable and most in need of protection. Proper valuation of local resources is an important foundation of environmental stewardship.

Effective environmental stewardship also requires understanding not only the ecosystem-based nature of environmental goods and services, but also the unique, and often long-term, time frames upon which ecosystems operate. Some of the benefits offered by ecosystems, such as annual crops, can be enjoyed over a relatively short time frame. Other benefits of healthy ecosystems, however, can take decades to accrue, such as tree regeneration or fish stock recovery. Still other benefits, such as the reformation of topsoil, extend well beyond human life spans. And some effects of poorly managed ecosystems are irreversible, such as species extinction. To better manage environmental resources, political decision makers and economic markets will need to become more accustomed to assigning value to environmental services and must accept the long-term nature of environmental benefits. ➡

IV

PROPERTY RIGHTS AND COMMON-POOL RESOURCES

Market economies are based on private ownership of goods. The concept is relatively simple when applied to most produced economic goods, which are well defined, do not have deep connections to any place or any other goods or services, and have a life span shorter than their owner's life span. The issue of property or tenure rights for land and natural assets, however, is more complex, and inherent flaws in the application of property rights to natural resources create serious threats to both sustainability and rural poverty alleviation.

PRIVATE LAND TENURE REGIMES

Different countries have allocated land use rights in different manners. In some countries, all land is claimed by the state and then allocated to specific uses, either by transfer of ownership or transfer of use rights. In others, some land may be held in reserve by the state for conservation or other purposes, some may remain in public ownership but be licensed for specific uses,[19] and some may be transferred to private ownership[20]—all with varying degrees of enforcement. Once lands are privately owned, they are treated as a private good, subject to some limitations. The result is a variety of mixed regimes, and there is no strong evidence that any one is better for assuring environmental sustainability, poverty alleviation, or economic growth.

The economic success of private property regimes depends on the availability of an extensive legal and governmental infrastructure, on whether property owners or claimants to use rights can afford the costly legal system, and on whether there are mechanisms to recognize public goods and enforce community interests. Unfortunately for many developing countries, and particularly for the rural poor, these conditions are rarely realized in practice. Registration of land for individuals, especially for the poor, can be exceedingly burdensome, if even possible.[21] Numerous environmental problems can result from misguided registration rules, such as requiring the conversion of land to commercial uses such as pasture to obtain a title, regardless of the best use of the land. Another problem in areas with weak institutions is that even if property rights can be assigned to local individuals, often the rights are not enforced and individuals are left without legal recourse.

Furthermore, many states use land titling as a way to ignore traditional land rights and management techniques, thereby depriving large numbers of rural poor of their traditional natural resources and access to sustainable livelihoods. Lack of clear individual or community property rights in many rural areas is a major cause of poverty. Individuals who do not have secure access to their resources have little incentive to manage their land sustainably for future benefits. They may not be eligible for credit, may not have access to extension services, and may not have the ability to access markets to sell their products.

Most modern property rights regimes do not hold property owners responsible for the impacts of their use or abuse of environmental resources on those outside of the property line. Spillovers of negative environmental impacts, such as pollution, water diversion, and siltation, can also arise when different components of an integrated environmental system are separated from the system and sold as property. For example, mineral, timber, or other rights can be sold or licensed independent of the rest of the ecosystem. The specific good is often exploited without concern for the impact of that exploitation on the remaining components of the ecosystem, or on the related human communities. When these impacts are significant, communities should have

a right to act. This action would usually occur through the government, but when governance is weak, such action is unlikely. The tension between the use of private property and the impact of such use on others may lead to conflict between individual property rights and society at large, as exemplified by the case in Box 4.

COMMON PROPERTY REGIMES

Most private property systems allow natural resources to be separated from the ecosystems of which they are a part, and ignore the impacts of that single-purpose use on people and communities outside the property line. Proper ecosystem management requires considering entire ecosystems, which can be spread across large areas, and considering a wider range of possible impacts of natural resource use. In some cases, state management can fulfill these functions, but not always. One type of property regime that provides local, even poor, people the means to manage community assets is common-pool property.

The analysis of common-pool property regimes by Elinor Ostrom and her colleagues has greatly enriched our understanding of the value of community approaches to natural resource management issues.[22] According to Ostrom, common-pool property is characterized by several attributes. First, it is larger than one individual owner can afford. Second, there are multiple beneficiaries of the property's output. Third, producing that output is a result of integral functions of the property as a whole. As a result, management of the property as a common unit produces greater output more efficiently than division into many discrete units managed independently, and there are inherent incentives for equitable allocation of the benefits.

Both global and local ecosystems have many characteristics of common-pool property and would benefit from common property management techniques to assure sustainability. The challenge is finding ways to meld common-pool approaches with conventional private property systems. At the simplest level, this involves encouraging communities to identify where there are aspects of common-pool property and then to manage these resources sustainably for their common benefit. This is likely to enhance equity and begin to reduce the marginalization of the poor, who lack resources to acquire private property and who are often excluded from access to what should be governed as common-pool property.

Often, changes can occur voluntarily when a group of users join in common property management. For example, rice and sugarcane producers in Colombia organized to create 12 water-user associations that voluntarily agreed to increase water user fees to finance the

BOX 4 - UNITED STATES: CONFLICTS OVER PROPERTY RIGHTS AND THE ENVIRONMENT

Within the United States, conflicts persist between private and community interests. The rights of owners include the right of possession; the right to control how the land is used; the right to enjoy the benefits of the land (including tangible benefits such as income and intangible benefits such as the enjoyment of a view); and the right to give or sell, encumber, or bequeath rights to others. The state retains the right to tax the land, the right of eminent domain, the right to control use to ensure protection of public interest, and the right to claim the land if there are no legal heirs. In addition, the state lays claim to wildlife that inhabits private lands. Where the state wants to exercise a public interest, such as protecting endangered species or water quality, it has to take account of these property rights. For example, the Endangered Species Act of 1973 made it a crime to "take" an endangered or threatened plant or animal species. This conflicts with a "taking" under the Fifth Amendment of the US Constitution, which requires that the government pay "just compensation" when a property owner's rights are lost due to government action, such as the construction of a road through private property. These disputes have resulted in long court battles and a significant impact on local populations, as in the well-publicized spotted owl debate in Oregon. This brief discussion simply highlights the complexity of these property rights issues in a well-developed legal system. There are many aspects not covered here.

Source: McEvoy, 1998

BOX 5 - ATTRIBUTES OF COMMON-POOL RESOURCES

Attributes of the Resource:

- Feasible improvement: The resources are not so deteriorated that it is useless to organize or so underutilized that little advantage results from organizing
- Indicators: Reliable and valid indicators of the conditions of the resource system are frequently available at reasonable cost
- Predictability: The availability of the resource is relatively predictable
- Spatial extent: The resource system is sufficiently small, given the transport and communication technology in use, so community members can develop accurate knowledge of the system

Attributes of the Users:

- Salience: Users are dependant on the resource for a major portion of their livelihood or other variable of importance to them
- Common understanding: Users have a shared image of the resource and how their actions affect each other and the resource system
- Discount rate: Users have a sufficiently low discount rate in relation to the future benefits to be achieved from the resource (The discount rate is the interest rate at which the value of the resource in the future is converted to its value today.)
- Distribution of interests: All users, regardless of their economic or political assets, are similarly affected by a current pattern of use
- Trust: Users trust each other to keep promises and treat each other fairly
- Autonomy: Users are able to determine access and harvesting rules that are respected by external authorities
- Prior organizational experience: Users have learned at least minimal skills in organization through participation in other local associations or by learning about the ways neighboring groups have organized

Source: Ostrom, 1999

improvement of stream flow and reduction of sedimentation in their irrigation canals.[23] In the Dominican Republic, when farmers linked deforestation to the reduction of seasonal stream flows, they voluntarily adopted limits on tree cutting that were more stringent than government requirements.[24] But more frequently, some external encouragement is required, as in the case of the forest management project in India presented in Box 7.

Common or community property land management systems have evolved throughout the world in a variety of circumstances. Within a community, use rights can be assigned in a variety of ways. For example, the use of particular plots of land may be assigned to families over long periods of time. The amount can be adjusted based on family size and need, and each family can be allotted plots in different areas to offset risks of climactic variation during the year. These systems seek to address efficient production needs, as well as equity considerations and risk management. They tend to assure that no one who is able to work falls into poverty.

Success depends on strong community institutions, enforceable rights to resources, and the capacity to limit access to members of the community. Common property systems perform well if the broader national institutions permit and encourage such arrangements, such as the formation of community-managed forests in Nepal (see Box 6). Community property systems are particularly adapted to managing resources such as community forests, irrigation systems, and other assets that have to be managed on a scale too large for individual ownership, but which require cooperation from the whole community to enjoy the benefits.

The scope for expanding community property regimes in developing countries is quite large, but it requires the adaptation of legal systems in many countries. Government bureaucracies also have to accept delegation of authority to these communities – *subsidiarity*. In many cases, substantial efforts to build community institutions and relations would be required to create and expand the necessary social capital to exercise effective management of the common-pool assets. Conditions for developing common-pool resources within a community are shown in Box 5. Not only is the adaptation of this approach likely to

lead to more sustainable management of the natural resources, but it will also provide improved and more sustainable livelihoods for the communities involved.

EXAMPLES OF SUCCESSFUL COMMON-POOL SYSTEMS

Since 1978, Nepal has been creating community-managed forests by transferring limited property rights from government to community control (see Box 6). Nationwide, the legal rights to manage over 250,000 hectares of national forest have been transferred to user groups, creating economic incentives for locals to sustainably manage their resource base. Similar programs have been successful in India (see Box 7) and Thailand.

Common-pool asset management offers valuable lessons in how to improve sustainability and increase compensation to the poor. Common-pool systems move beyond conventional market systems to embrace common goals and benefits, and they illustrate the possibility of using market tools to achieve more sustainable results. For stewardship arrangements of the kind discussed in this paper, common-pool property schemes depend on recognition of demand for environmental benefits, on infrastructure that encourages common-property-based transactions, and on mechanisms that reinforce the trust necessary for such transactions to take place.

BOX 7 - INDIA: A COMMUNITY FOREST PROJECT IN MADHYA PRADESH

In the province of Madhya Pradesh, India, local communities (with financial support from the government and the World Bank) undertook a joint forest management project that included a transfer of timber harvest rights from the state to joint community management. Nearly half a million families now participate and receive 100 percent of the value of nontimber forest products as well as revenues from the sustainable harvest of the timber, estimated in total to be worth $125 million per year, or about $280 per household per year. Migration has declined, local investment has increased, and numerous environmental benefits have resulted. Five and one-half million hectares of forests are being protected from grazing and unmanaged forest use. Villagers have reported an increase in the water table, as well as in wildlife populations and biodiversity, benefiting both the environment and local inhabitants.
Source: Arnold, 1998

BOX 6 - NEPAL: COMMUNITY FOREST USER GROUPS IN THE MAKALU BARUN CONSERVATION AREA

In 1978, the Government of Nepal embarked on a program to transfer limited property rights from previously nationally managed forestlands to community forest user groups. Within the Makalu Barun Conservation Area, the Mountain Institute helped the government transfer 6,250 hectares of forestland from government control to 71 community user groups. Although the government still retains title to the land, the transfer of control gave locals a legal means to increase their revenue from natural resources. The cost of the transfer of limited property rights is borne by the national population in terms of lost revenues from the sale of natural resources. In order to receive management authority, user groups were required to show that the forest resources would be sustainably managed.

Before the change in ownership, local people paid a high price to the central government to use the forests. In addition, villagers had high incentives to illegally extract forest resources due to both lack of personal consequence and the inactive stewardship role of the government. Consequentially, significant resource degradation as well as negative social repercussions occurred. Now the groups have the authority to set user fees, collect fees, and impose penalties for community members who violate management practices. As of 1996, more than 2,000 households had been given stewardship rights and have received the revenue generated from these resources. The majority of user groups have generated funds that are being invested back into the community, and resource degradation has been greatly reduced.
Source: The Mountain Institute, 1997

V

MARKETS AND ENVIRONMENTAL SERVICES

Belief in markets has become conventional wisdom throughout much of the world today. Indeed, markets have contributed a great deal to increasing incomes, improving standards of living, and delivering more efficient production. However, there is no single model of a market-based economy. Different cultures and societies place different relative weights on values outside the markets and create regulatory structures to balance those values with the functioning of the market.

Well-functioning market systems are not self-creating and have not yet proven to be the 'natural' economic system that will arise in the absence of any regulation. In fact, well-functioning market economies require a great deal of institutional infrastructure and regulation to operate. Part of this infrastructure and regulation is to assure that the conditions necessary for markets to function, such as contract enforcement, are in place. And part of the infrastructure and regulation is designed to offset market imperfections and to assure that non-market values are respected. These structures determine how markets deal with other goals, such as the environment and poverty alleviation.[25] Thus it is important to understand the basic imperfections in markets in order to be able to design beneficial interventions to overcome the imperfections.

Market theory is based on the production and trade of discrete private goods. These goods have the characteristics of rivalry and exclusion. Rivalry means that the owner's use or consumption of a good reduces the amount available for anyone else to consume. Exclusion means that whoever owns the good can exclude others from its use. Pure public goods, on the other hand, are characterized by the opposite: non-excludability and non-rivalry. No one can be prevented from using a public good, and use by one person does not reduce its availability for use by another person. A lighthouse is a classic example of a pure public good—once in place, no one can be prevented from benefiting from it, and anyone's benefiting from it does not prevent another from benefiting. Scenic views have similar characteristics.[26]

In practice, there are few pure public goods, but there are many partial-public goods, which have elements of public goods. Education is an example of a partial-public good. An educated individual obtains a private benefit from education, for which (s)he may pay. But society at large also benefits from having educated individuals, and the provider of the education does not capture this benefit. Because the public benefits from basic education are greater, it is more frequently provided by the state. Higher education, on the other hand, has more individual benefit, and is more likely paid for by the individual.

Conversely, markets can also produce things that cause harm, called negative goods or bads. In the case of private bads, the producer pays the recipient for the harm produced, as in the case of payment for liability in a car crash. There are also many public or partial-public bads, for which individuals often do not pay. Pollution is a well-known example. If a farmer applies a pesticide to his field that damages his neighbors farm due to runoff, that would be a negative externality. The pesticide-using farmer usually would not have to pay for the harm produced. At best; society at large may compensate some of the costs of pollution, but usually the harmed party has little recourse.[27]

Private markets tend to under produce public goods because private producers cannot capture all the benefits that these goods deliver. By the same token, markets tend to over produce public bads, because their producers are not charged for the damage they inflict upon others. The positive or negative impacts of public goods not captured

by or charged to the producer are often called *externalities,* or costs and benefits that are external to the normal market transaction. Unless these externalities can be incorporated into the transaction or 'internalized,' markets generate flawed or 'sub-optimal' outcomes.

Environmental goods and services have many properties of public goods in that they typically have significant non-rivalry and non-excludability characteristics and produce significant external benefits for a large number of people, both directly and indirectly. And conversely with 'bads.' As a consequence, markets will not by themselves devote adequate resources to stewardship of ecosystems that produce environmental public goods and will not constrain production of environmental public bads.

External intervention is needed to rectify these market imperfections. Such interventions can range from command-and-control legislation that demands certain actions, such as the Clean Air Act, to creative instruments that use market incentives to achieve environmental goals, such as the creation of SO2 permit trading markets. In this paper, we are particularly interested in exploring market opportunities to pay the rural poor for the provision of environmental services and functions. In both rich and poor countries, markets have been used to compensate people for their stewardship of environmental services, and we believe that there is an enormous potential to expand the use of these arrangements. [28]

Two general steps must be taken to adapt environmental public goods or bads to market instruments. First, some external intervention is needed to make the environmental good or service marketable. Means need to be found to increase the rivalry or excludability of the environmental public goods in question and grant some rights to the stewards of that good so that they can market the environmental service. Second, the profits generated by

BOX 8 - BOLIVIA: THE NOEL KEMPFF CLIMATE ACTION PROJECT

Bolivia's Noel Kempff Mercado National Park covers over 1.5 million hectares in one of the most biologically diverse areas in the world. Since 1997, almost half of this area has been managed through the *Noel Kempff Mercado Climate Action Project,* the largest forest-based carbon sequestration project in the world. Project participants include the government of Bolivia, Fundación Amigos de la Naturaleza (FAN), the Nature Conservancy, and three U.S.-based energy companies. The project has been given US$9.6 million for the first 10 of 30 years, including a permanent endowment of $1.5 million. This is one of several prototype projects designed to develop markets for reducing carbon in the atmosphere and increasing carbon sequestration.

The project is designed to foster incremental expansion of forested areas and growth of more trees compared with what would have been the case without the project. These activities have contributed to biodiversity protection through park expansion, and improved soil, water, and air quality through the cessation of logging on two million acres of land. The most recent estimates indicate a potential net carbon sequestration equivalent to 6-8 million metric tons of carbon removed from the atmosphere over 30 years. The sequestration of carbon by the project is calculated and used to generate "carbon offsets" which can be credited against carbon released into the atmosphere in other activities or traded (sold) to other producers of CO2 as regulations on carbon emissions are imposed and markets created. The carbon offsets generated from this project are shared among the government of Bolivia and the three energy company investors. In the case of the offsets allocated to the government, proceeds from their sale would be allocated to various specified biodiversity priorities in Bolivia.

Local participation is emphasized in this project. FAN has hired approximately half of the park guards from the local communities and established revolving funds for microenterprises, such as heart-of-palm plantings, to help take pressure off of the forestlands. In addition, the project is assisting the local communities in their efforts to attain legal status as indigenous peoples and to secure land tenure.

Carbon benefits from the project are expected to last in perpetuity, considering both that the site lies within the National Park and a permanent endowment has been established to fund protection activities beyond the 30-year life of the project.

Source: The Nature Conservancy, 2000

Enhancing community rights to local resources addresses many stewardship and poverty-alleviation objectives, but by no means all issues of resource management.

the creation of these markets need to be equitably distributed to the stewards that provide the good and to the community at large. This will provide the necessary incentives to invest in environmental sustainability.

For example, a "virtual" market can be created for certain environmental services by placing a limit, or cap, on the production of that good or bad, thereby creating a marketplace for trading units of that capped good. In the case of air pollution, for example, an acceptable level of emissions may be established for a given area, and permits can be issued to participants to emit up to that level. These permits can then be traded among emitters to obtain the most cost-efficient reduction in emissions. This approach has been effective in reducing sulfur emissions in the U.S., and is being proposed for CO2 emissions.[29] In effect, the process converts the public-good value of clean air to a marketable good—emission permits—which are scarce and can attain a market value. Non-market forces determine the number of permits issued based on public health information and public opinion on how clean the air should be. Within such a framework, markets work.

Variations of this model have been applied in developing countries. In Chiapas, Mexico, the International Automobile Federation finances the Scolel-Te ("growing trees") Pilot Project for Community Forestry and Carbon Sequestration with revenues from a greenhouse gas mitigation agreement. The International Automobile Federation is committed to offsetting the carbon emissions resulting from sponsored car races. Farmers receive 60-80 percent of the proceeds as payment for their stewardship, and the remaining funds are used for administration costs.[30] In Bolivia, the largest forest-based carbon project in the world has created a potential net carbon sequestration benefit equivalent to extracting 6-8 million metric tons of carbon from the atmosphere over 30 years. The incremental sequestration of carbon (called carbon offsets) generated from this project are shared among the Bolivian government and the three energy company investors. The government offset proceeds are allocated to specified biodiversity priorities in Bolivia (see Box 8).

A common approach to creating a market for an environmental good is to charge for use of what was before a free environmental service, such as access to a national park or other protected area. For instance, in the Annapurna Conservation area in Nepal, visitors now pay an entrance fee of $12, which is channeled back to local people through the King Mahendra Trust for Nature Conservation, a local NGO. As of 1997, over $400,000 had been collected, enough to cover the park's operation costs as well as regional development programs. In Kigali, Rwanda, the national park office charges a user fee of $200 per day to tourists who want to view the mountain gorilla in its natural habitat. Funds are used to cover park expenses and salaries for the staff.[31] In these cases, closing a park and limiting entry has imposed excludability.

In both the case of air pollution and national parks, public intervention has created supply or access limitations, allowing prices to be established. Individual agents can then respond in a quasi-market situation. When considering user or entrance fees to fund environmental stewardship, however, it is important to assure that the funds are channeled directly back to participating local communities. The local reinvestment of these funds can create strong incentives for increased local stewardship activities.

Enhancing community rights to local resources addresses many stewardship and poverty-alleviation objectives, but by no means all issues of resource

management. The challenges of sustainable resource management often extend beyond individual communities. Better environmental management may require stewardship actions by those in an area where the benefits originate (let us say upstream), while the beneficiaries are located in a different area (let us say downstream). Unlike the common-pool property cases described in Boxes 6 and 7, where the stewards are also the beneficiaries of the sustainable management, the common-pool resources in cross-boundary cases can span two or more communities. In these cases, the communities must find ways to work together to increase their mutual benefits. The situation becomes more complicated since the benefits of improved stewardship accrue to those downstream, not to the stewards, who are typically upstream. Two relatively distinct communities share a common-pool resource, and a transaction external to each community is required to achieve the enhanced common benefit. The beneficiaries have to compensate the providers.

There are a number of good examples of how pairs of communities have arranged for those downstream to pay for a public good by financing environmental stewardship upstream. The partnership between New York City and the Catskills farmers (see Box 9) is a good example of a downstream community compensating an upstream community. In France, Perrier-Vittel, the world's largest bottler of natural mineral water, has succeeded in reducing pollution through payments to upstream farmers who agree to switch to less intensive dairy farming technology. Payments are based on the reduced profitability of the farmers associated with the change in technology.[32] In Quito, the capital of Ecuador, funds raised through a small increase in water fees were used to maintain protected areas within the city's watershed.[33] In Costa Rica, two contrasting case studies illustrate the potential of these negotiations between upstream and downstream residents (see Box 10).

BOX 9 - NEW YORK CITY, U.S.A.: WATERSHED AGRICULTURE PROGRAM

In the early 1990s, New York City and the Environmental Protection Agency (EPA) were concerned about the potential decrease in water quality due to runoff from barnyards and faulty sewage treatment systems upstream from the city. As a result, New York City faced the possibility of having to build a $6 billion water filtration system to clean the city's water. A recent partnership between New York City and the Catskill mountain farmers who inhabit the city's watershed, however, now protects 1,900 square miles of watershed from further degradation while still allowing for the growth of upstate communities. What started out as a potentially expensive and exhaustive battle has turned into a model project. In January 1997, the historic NYC Watershed Memorandum of Agreement was signed, bringing together the rural and urban inhabitants of New York with the hope of benefiting the mountain inhabitants, city dwellers, and the environment.

New York City agreed to fund $35.2 million for farmers in the Catskills to purchase or build pollution abatement devices. Participating farmers must convince at least 85 percent of the 400 farmers in the watershed to join them. On average, a farm will receive $75,000 for improvements such as cement manure pipes, fencing to improve cattle feeding, and riverside tree planting. The Watershed Agricultural Council, consisting of 21 members, meets to disburse the city funds to participating farmers. The program is voluntary and completely run by the farmers.

Numerous benefits are already materializing through this partnership. The primary social benefit is renewed trust between upstate farmers and city residents. Income for farmers is not only increased due to city funding, but their productivity is expected to improve in nine out of 10 cases due to the improvements made on their properties. Downstream water consumers benefit by avoiding the cost of building a water filtration system, and the incentives for conservation have been created by direct payments to participating farmers. The price of water has increased slightly, but by far less than would have been the case if the treatment plant had been built; and the revenue has been reinvested in protecting the watershed. This case study illustrates the benefits possible across the board when downstream users must pay the costs of upstream stewardship.

Source: The Mountain Institute, 1997

The impacts and benefits of environmental goods and services can be experienced at local (such as water pollution), national (such as biodiversity loss), or global levels (such as climate change). Efforts to compensate for the public aspects of these goods and services, therefore, should occur at all levels, depending on the good involved, the extent of the impacts, and the interests of the public. The challenge is in finding ways to encourage beneficiaries of environmental goods and services to compensate those whose stewardship can enhance the provision of that public good. A large portion of the rural poor live in environmentally sensitive areas and are well placed to help provide better stewardship and improve environmental services, so focusing on these groups will achieve the twin goal of enhancing sustainability and reducing poverty.

When environmental services accrue mostly to a local community, a common-pool system of resources management, as described in section IV, may be all that is needed. Locally used environmental goods and services plus the revenues of sales outside the community would be distributed within the community by agreed mechanisms.

For cross-community stewardship services, where the benefits are directly enjoyed by a distant group, as in the cases described in Boxes 9 and 10, more complex arrangements are needed. Values must be assigned to the stewardship service provided, and the service providers and beneficiaries must agree on an acceptable compensation payment. These functions can occur between communities, between a single agent and a community, through an independent third party such as an NGO, through government action, or through some combination of these options. Since environmental services typically have public-goods attributes, the state or the larger community will usually have to intervene to assist markets to function properly, or to allow community-to-community arrangements to work. ➡

BOX 10 - COSTA RICA: HYDROELECTRIC INVESTMENT IN UPSTREAM STEWARDSHIP PRACTICES

In Costa Rica, the National Government and Energia Global, a private hydroelectric company, compensates private landowners when they maintain or increase forest cover in watershed areas. To help pay for these services, the government of Costa Rica established a fund, consisting largely of a 5% tax on fossil fuel through the National Forest Office and National Fund for Forest Financing (FONAFIFO). The help of a local NGO, FUNDECOR (Fundacion para el Desarrollo de la Cordillera Volcanica Central), was enlisted to provide volunteer administrative expenses. One important point to note with the FONAFIFO case is that the hydroelectric company Energia Global was concerned about sedimentation and stream regularity, not simply water yield, due to limited water storage capacity. It hopes both to increase the regularity of stream flow and to reduce reservoir sedimentation by paying for landowner services. The company believes that increased forest cover will help achieve both of these objectives. Payments of $48 per hectare are made directly to individual landowners through the local NGO. Payments are not based on the value of the hydroelectric services, but on the approximate equivalent of the opportunity cost of foregone land development, which is primarily cattle ranching.

On the national level, the Ministry of Environment is attempting to expand this project to the national electricity and water utility companies. Expanding this concept, however, will require much more complex changes in institutional and regulatory arrangements. In this case study, FONAFIFO and FUNDECOR were already established and willing to participate.

For example, in another case in Costa Rica, Arenal, an attempt to create a similar program did not succeed. The proposed combination of government payments for reforestation and the elimination of ranching subsidies did not provide enough financial incentive to landowners to reforest steep slopes. The return from logging and then running livestock exceeded the potential fees for stewardship. Downstream, the electricity generating company determined that the increased water yield resulting from the deforestation outweighed the costs of sedimentation. So no agreement was possible. Despite the many similarities between the two projects in Costa Rica, cattle ranching was found to produce a higher net present value than reforestation for landowners in Arenal, and the downstream hydroelectric company valued water yield over decreased sedimentation.

Source: Chomitz et al, 1998

VI

MARKETS AND EQUITY

We must recognize that markets by themselves do not address equity issues, yet equity considerations must be brought to bear on markets. Markets function to generate the most efficient allocation of production (most output for least cost). They generate this outcome for any initial distribution of assets and resources. They are not concerned about whether the initial distribution is highly distorted or roughly equitable or fair by the values of a society. Establishing what is fair or equitable is highly judgmental. Assuring that people have access to means of earning or producing a reasonable livelihood and that they are not deprived of traditional use of resources without compensation have been broadly accepted as core equity values. There is nothing inherent in the functioning of markets that assures core equity is achieved, but societies, through government regulations or other means, can encourage or force markets to address equity issues.[34]

This paper addresses two issues where markets can contribute to improving equity. The first—a property rights issue—involves taking steps to assure that the poor are not deprived of their rightful access to natural resources so that they can assure their own sustainable livelihoods. The second—a public good issue—involves encouraging and developing ways to compensate the poor when they act as stewards of environmental resources for downstream beneficiaries. Such adaptations of market practices will not address all equity and poverty-alleviation concerns; instead, this approach should be part of a comprehensive strategy to combat poverty.

Addressing equity issues does provide a powerful additional reason to promote compensation for environmental stewardship. As previously discussed, population pressures and economic development have forced many poor into marginal areas where they may not be able to achieve sustainable livelihoods. In some cases, their attempts to do so many lead to further environmental degradation. In other cases, they are in a position to help provide more sustainable environmental management if they are given the right incentives. As noted above, unaided markets are not able to properly value and compensate for these services. Additional interventions are needed.

Establishing markets that support stewardship requires that the providers have certain rights and responsibilities in the ecosystems where they do their stewardship. Perhaps more important, people living in areas with valuable natural resources must benefit from the resources, even if they do not have the means to exploit the resources. A number of countries collect taxes or royalties on the extraction of resources, and part of those funds may be earmarked to go back to the area affected.

We must recognize that markets by themselves do not address equity issues, yet equity considerations must be brought to bear on markets.

There is nothing inherent in the functioning of markets that assures core equity is achieved, but societies, through government regulations or other means, can encourage or force markets to address equity issues.

Since these are often poor, rural areas, however, such transfers rarely take place, which increases inequity. This must be rectified so that the rural poor receive a fair share of the revenues from exploitation of their resources.

International equity issues also should be addressed. Many of the most pressing challenges to improve stewardship for both local and international environmental services occur in poor countries. However strong the desire in these countries to improve environmental services, they often lack the resources to generate adequate compensation. This is particularly true when the environmental degradation is due to extraction and exportation of natural resources to developed countries. In those cases, world prices set by the wealthy countries determine the value of the benefits from exploitation and exports. However, the local prices that are used to express the value of the lost benefits and damage that occurs as a result of the resource extraction are set in local market prices and based on much lower income levels. Local people may not be able to raise enough funds to prevent the exploitation and compensate potential stewards for improving local environmental services.[35] This inequity in incomes should be addressed through international compensation where the potential damages are significant. Moreover, the benefits from environmental sustainability on a global level are likely to be valued at a higher level by those with higher incomes and more to spend on these benefits. This is particularly true for global environmental issues such as climate change and protecting biodiversity.

Markets and private property systems will not inherently pursue equity among individuals. Concerns about equity stem from more fundamental human and cultural values, and those values must be imposed on economic systems to achieve the desired results. The stewardship approaches proposed here are potentially powerful instruments that can be used to enhance both environmental and income aspects of equity. The next section will examine in more detail the tools that can be applied effectively in this quest. ➡

TOOLS TO LINK POVERTY REDUCTION AND SUSTAINABILITY

NGOs, aid organizations, civil society, and committed governments can promote stewardship programs by taking action on several fronts. The following actions should proceed in parallel using the most appropriate means, which will vary by country and circumstances:

- Educating stakeholders about the value of environmental services to individual and community well-being
- Reforming property rights to recognize and encourage community property systems where appropriate
- Involving local people in resource management wherever possible, and paying them sufficiently for their services
- Improving methods for valuing environmental services so that market-based principles can be used to compensate for environmental stewardship and pay for environmental mitigation
- Strengthening mechanisms for structuring and enforcing stewardship agreements
- Strengthening procedures to assure that local people are adequately compensated for the exploitation of resources in their areas
- Establishing appropriate funds to pay for stewardship services, especially for global environmental services and services whose benefits are too diffuse for market-based mechanisms

Let us now examine what needs to be done in each of these areas.

EDUCATING STAKEHOLDERS

Programs should be expanded to educate the public about the importance of conservation, environmental stewardship, and the possibility of using market, quasi-market, and non-market means to achieve the benefits of a more sustainable environment. The voluntary programs enacted by communities in the Dominican Republic and Colombia (discussed above), once it was locally understood that their clean water was in danger, illustrate the importance and possibility of using education programs to give local communities the facts. It is important that people understand the role of the environment in providing the basic resources that support life and improved living standards, the current threats to the environment's capacity to meet expanding needs sustainably, and the ways in which more sustainable practices can be implemented effectively. Part of this goal can be achieved through expanded education programs to build public awareness. Even in developing countries, polls show growing concern about environmental issues.[36]

Public education campaigns should be directed at the general public, governments, and business communities. The content should be adapted for each audience, and should focus on how they can work individually and together to achieve greater sustainability. Successful programs should share their lessons learned with others, encouraging other groups to follow their example. General education programs should be augmented with more direct work with communities and businesses that are directly involved in stewardship agreements and other means of improving sustainability. [37]

Environmental groups and other organizations already provide education programs like those described above, but more are needed. These programs should emphasize the links between poverty and the environment and highlight the potential for positive compensation programs modeled on the examples provided above. Successful programs have the potential not only to empower local communities, but also to eventually affect both markets and governments as public opinion changes. Innovation of new techniques should also be encouraged.

REFORMING PROPERTY RIGHTS

Property rights are essential for potential stewards to exercise adequate control over the natural resources they might manage. In most cases, establishing these rights requires specific legislation recognizing some form of community property and clarifying the rights of communities to exercise control over the critical environmental aspects of their resources. In countries where there is extensive private ownership of natural resources and rural land, it may be sufficient to encourage cooperative use of the land, as is the case in the New York City watershed (Box 9). However, if the ownership is largely outside the community, then it will be important for legislation to recognize certain rights of indigenous people to control use of their local natural resources. This legislation can help avoid the worst impacts of degradation and pollution, and can help assure that local people are adequately compensated when degradation cannot be avoided.

Expanding the role of communities in managing their local resources requires a fundamental recognition of both the rights of local residents to be protected from degradation and loss of the sources of their livelihood, and of the public-goods aspects of environmental resources. The transfers of limited property rights from the government to communities in both Nepal and India (Boxes 6 and 7) are good examples of establishing local management and of the ensuing benefits.

Revising property legislation can be a lengthy task, and it requires support from both local and international groups in developing countries. Aid agencies can promote these changes as parts of their overall efforts to assist governance reforms.[38] Local groups can help implement improvements by expanding the interpretations of existing legislation as well as helping design new regulations. International NGOs can offer expertise and broader experience as needed. Once the capacity for community management is enlarged, it is important to provide increasing official and civil-society support for community ownership programs. In addition, local people will need help developing means to earn sufficient incomes from use of local assets, including by marketing sustainable yields from local products. In all activities, potential and actual environmental stewards should participate as full partners with concrete incentives, instead of being treated as marginal and impotent, as is often the case today.

INVOLVING AND COMPENSATING LOCAL PEOPLE

Local people are often very knowledgeable about managing their local environments, and they are adaptable to innovations that can increase their ability to manage their resources. The knowledge, skills, dedication, and creativity of local people are perhaps the most important resources we have to improve sustainability. These resources can be tapped in a variety of ways, depending on the circumstances and flexibility of national systems. Options range from involving local people in park management to helping expand production of specialized products.

Creating national parks is an important aspect of conserving environmental resources. Rather than trying to exclude traditional dwellers from parks, local people should be used to manage and protect these lands. Indeed, the more that local people can be involved in managing conservation areas, the greater their interest in protecting the resources. Projects in Nepal's Makalu-Barun Conservation Area (discussed in Box 6) and in Peru's Huascaran National Park are good examples. In an even more striking case in Rwanda, local residents working as rangers in the Varunga Park—home of an important population of mountain gorillas—protected the apes and the park during years of civil strife because they had a vested interest in the long-term preservation of the park and the tourist income it generates. By getting local people involved, governments and NGOs can greatly improve conservation and increase incomes of the indigenous people living around protected areas. To be successful, the programs must generate income from fees or other means, and the local people must be directly compensated with that income.

Even without the creation of parks, significant reductions in rural poverty and environmental improvements can be achieved by granting communities rights to their local resources and establishing community management programs such as those undertaken in Nepal and India (see Boxes 6 and 7). Enhanced common-property schemes offer many benefits.

In addition to within-community common property management, environmental resources can be managed across communities through agreements between upstream stewards and downstream beneficiaries to enhance environmental services. Some of these develop on their own between private-sector agents, such as the Vichy water experience. Some arise with public involvement, such as in Costa Rica, to help organize individuals and groups to reach mutually beneficial agreements. Still others arise through the intervention of international NGOs and agencies, as was the case with the Nature Conservancy in the climate project in Bolivia (see Box 8). And others arise from public-private-sector agreements, as in the case of New York City (see Box 9).

Successful arrangements assign value to public goods, market the goods, employ aspects of common-pool property management, and make use of supportive institutional arrangements. As the benefits of such arrangements are more widely known, there will be fertile ground for further innovation. NGOs and aid agencies can play an important role in designing and encouraging such activities by spreading information, helping create the arrangements, providing supplemental funding, and monitoring results. For their part, governments can provide more institutional structures to facilitate their operation.

As the market demand for environmental services grows, private-sector firms become more interested. Demand for environmental services can be either direct, such as the demand for clean water, or indirect, such as the demand for organically grown food. A variety of products illustrate that when consumers are willing to pay a premium for goods that are produced in environmentally sound ways, markets can generate demand for the stewardship services. Timber from forests certified as sustainably managed, for example, is beginning to penetrate markets in Europe and North America under programs fostered by the Sustainable Forestry Initiative or the Forest Stewardship Council. A growing number of products are being marketed under 'fair trade' programs that encourage production and marketing of environmentally sustainable products that generate positive returns for low-income producers. The Starbucks Corporation has made an agreement with sustainable coffee producers in the Chiapas region of Mexico under an arrangement promoted by Conservation International. And The Body Shop has purchased products from sustainable local producers in a number of developing countries since the early 1990s.

As public awareness of these programs increases and as more producers and intermediaries are attracted to sustainable production, these programs will more effectively promote sustainability and improve the incomes of the rural poor. Many of these programs also have the advantage of marketing tangible goods rather than environmental services. In addition, many NGOs and international agencies are helping develop carbon-trading markets in developing countries, as demonstrated in Bolivia (see Box 8).

Governments and NGOs must exert a great deal of effort to start and maintain market-based conservation measures. The need for this effort reflects both the public-goods aspects of many of these services and the great effort that is normally required to develop new business models. The successes, however, suggest that more effort is warranted.

The growing interest in sustainable business models will increase the business sector's interest in many of these activities. A number of leading business schools are developing and expanding concentrations in environmentally sustainable business, such as the Corporate Environmental Management Program at the University of Michigan and the Center for Sustainable Enterprise at the University of North Carolina. NGOs should strengthen partnerships with these programs to promote more activities in developing countries.[39] Such activities are among the most promising avenues for NGOs and aid agencies to work with governments and the business community to promote better environmental stewardship.

IMPROVING THE VALUATION OF ENVIRONMENTAL SERVICES

Once there is demand for environmental services, some mutually agreeable value has to be placed on the service in question. Since many environmental goods and services do not trade in a normal market, typical market forces, such as supply and demand, cannot establish a price. Other mechanisms that can be used include establishing the costs of replacing the environmental service (as in the case of building a water treatment plant to

replace New York City's watershed), determining the actual direct costs of supplying the stewardship and the cost of opportunities foregone (as in case of carbon sequestration in Bolivia), assigning value based on survey research about how much people would be willing to pay for services, and other forms of estimation.

In cases where caps on emissions can be established and enforced, it is possible to create virtual markets that determine prices for rights to emit, as in the case of sulfur emissions trading in the U.S. Similar programs are being proposed for carbon trading both nationally and internationally. This method requires clear caps and adequate monitoring, and poses a difficult question of how to distribute the initial permits. Giving permits to the current polluters, or grandfathering, represents a windfall to those who have created the problem, but is a politically easy route. A more equitable solution is to auction the permits and use the revenues to support other public activities, including remediation of past harm from the emissions and compensation for those adversely affected. This allocation question will be critically important for carbon trading, as the amounts involved will reach into the billions of dollars.

In the end, the pricing and marketing mechanisms have to be negotiated by the supplier and user groups, often with the help of the government, environmental agencies, or NGOs. In some cases, full costs are borne by the direct beneficiaries. When the benefits are much broader, intermediary groups such as governments or NGOs should provide some payments where the public-good aspects are important. Where beneficiaries are poor, the government or other source may need to assist in making payments. This is not a case of welfare, but of providing necessary public services, such as clean water or air. Where stewards are poor, the payments must be sufficient to ensure that the stewards secure adequate livelihoods, providing incentives to perform the stewardship services and to discourage cheating.

Governments can help determine the value of environmental goods by improving data collection and dissemination. Local and international NGOs can also conduct appropriate studies and analyses to try to determine values of natural resources and ecosystems. These studies help set priorities and establish the basis of subsequent negotiations. Where possible, communities that may be involved in stewardship agreements should be included in these studies to increase their ownership of the results. As noted above, it may not always be possible to set specific values on environmental services, but relevant ranges can be established to serve as a basis of negotiations.

Although valuation work at both global and local levels has begun, it needs to progress much faster and farther. Where values are calculated, they need to be more broadly publicized and incorporated into economic decision-making. Even if a compensation plan cannot be worked out, the costs and values of environmental services can influence decisions and inform the public about the impacts of the loss of those services. Important work along these lines has already been done. For example, the World Bank has developed an indicator of genuine savings, which measures the net level of savings of a country, taking into account use of natural resources and development of human capital.[40] For nearly all countries, the level of genuine savings is substantially below conventional measures of savings, indicating their development paths are less sustainable than otherwise indicated. The World Bank also has calculated annual losses due to environmental pollution and degradation for several countries, which are about 4-6 percent of each country's GDP, another indication that real development is proceeding less rapidly than previously thought. At both local and national levels, more efforts should be made to value environmental services and make the results widely known.

STRENGTHENING STEWARDSHIP AGREEMENTS

Providing fair compensation for environmental stewardship requires solid institutional arrangements, particularly when the agreements span more than one community. Such agreements might arise out of conflicts over the use of a resource, or over the allocation of its benefits. Some of the parties involved may not be educated and may be distrustful of authorities. They also may have been the objects of discrimination in the past. Thus, effective community institutions are essential to form a common position for negotiations on one or both sides. Communication and trust must be established between participants, and agreements need to be monitored and enforced. If done well, such community-building is likely to

spread beyond the particular agreement in question and help achieve broader development goals. For example, in the case of the New York City watershed agreement, city residents and Catskills farmers had to overcome years of distrust before they were able to work together. Their willingness to overcome this obstacle resulted in a partnership that is being watched by policymakers internationally. Similarly, the agreements in Costa Rica benefited from external assistance and funding to bring conflicting parties to the table to reach an agreement.

Both national and international NGOs should be involved in providing support for stewardship agreements, as each brings different attributes and skills. National groups would have more local knowledge and a better rapport with local communities, while international groups probably would have access to more resources and contacts. In addition, most international organizations are less susceptible to pressures from national interest groups and are better able to bring international attention and support for desirable programs. It is essential, however, that national and international groups play a supporting role and allow the local stewards to play a central role in the creation of stewardship agreements.

It is vitally important for national government to permit appropriate stewardship contracts, provide necessary enforcement of the terms, and monitor results. In addition, governments can encourage such arrangements to achieve national environmental and poverty-alleviation goals with a modest provision of public resources. Payments between private groups, even if supplemented by the government (such as the fund set up in Costa Rica's case discussed in Box 10), allow the state to achieve the same level of poverty alleviation and environmental improvement at a lower cost. And the resulting improvements in stewardship and community development will, in turn, offer other low-cost benefits.

In addition to helping with community-building and promoting individual stewardship agreements, NGOs and civil society should work to promote the necessary complementary reforms in government and the enforcement of environmental polices. While different governments' receptivity to such reforms will vary, demand for stewardship programs and the benefits they offer should encourage many governments to participate.

COMPENSATING LOCAL PEOPLE FOR RESOURCE USE

Government appropriation and reallocation of access to local resources is a common cause of rural poverty. While the extraction of resources may be justified in the name of development and national interests, impoverishing local people who have depended on those resources for their livelihoods cannot be not justified. Indeed, economically viable resource-extraction operations should compensate local people with traditional rights and still generate a profit. If local people with traditional rights to a resource are not compensated, the operation amounts to a forced transfer of assets from the local people to the exploiter. Indonesia's Grasberg mine and West Virginia's mining history (see Boxes 1 and 2) both provide examples of instances where resource exploitation generated more than enough revenue to compensate local people, yet the local people were left without their local resources or compensation. Lack of adequate governance explains much of the failure to provide adequate compensation.

Most governments and international aid agencies have regulations that require appropriate environmental impact assessments and compensation of displaced and otherwise-affected people for resource-extraction projects they support. This is commendable, but covers only a small share of projects that exploit natural resources. A number of developing country governments also have such regulations, but they are much less effectively enforced. Many developers avoid seeking the support of international financing agencies because of their environmental assessment requirements. Interestingly, most official Export Credit Agencies[41] do not have such requirements and have been involved in financing a number of projects with severe negative impacts on the environment and local people.[42] These loopholes pose a severe problem for both poverty alleviation and the environment.

Ensuring appropriate legislation is in place to prevent unchecked exploitation should be a high priority for aid agencies as well as international and national NGOs. The next priority should be to ensure that such legislation is enforced. Since the exploiter often is a multinational corporation, pressure should also be placed on the corporation's home government and financial agents to assure proper respect for the local environment and society. In the case of the Antamina Mining Company, a

copper and zinc mine operating in Peru, for example, pressure from national and international sources averted the construction of a road through a national park and World Heritage Site.[43] The road right-of-way that was eventually agreed upon not only avoided environmentally sensitive areas, but also proved to be more economically viable to the company in the long run. Simply bringing public attention to the problem can encourage action not only on the part of the public in the affected country, but also occasionally among consumers of the product abroad. Such was the case when the demand for ivory decreased when the international community discovered the connection between the ivory trade and rapid decline in elephant populations.

It should be noted that there is controversy over extending environmental impact assessment requirements and programs for compensation of affected persons to all investment in developing countries. Many assert that the requirements of the World Bank and other aid agencies are "gold-plated" standards derived from developed country rules. Such standards, they argue, are not readily transferable to developing countries, nor can most of those countries afford to apply them to all projects. While protecting the rights of local people, compensating citizens for environmental losses, and stemming environmental degradation are equally important in all countries, developing countries do lack the resources to do this as extensively as developed countries. To address this problem, aid agencies and NGOs should work with interested governments to design locally adapted environmental impact procedures that the government can apply to all projects in the country. Aid agencies and NGOs might also provide additional funding to get the programs started. Once in place, the programs can be strengthened and improved over time. Even one of the world's poorest countries, Eritrea, has been able to implement this type of program.[44]

ESTABLISHING FUNDS TO PAY FOR STEWARDSHIP

The public-good nature of environmental services means that markets will not always generate the optimum level of these services. Quasi-markets can be established to achieve desirable levels of production of public goods; but if the benefits are too diffuse or difficult to quantify, additional funds will be needed to supplement the funds that can be raised from quasi-market arrangements. In Costa Rica, for example, government funds supplemented those provided by the electricity company derived from its market transactions. The more general the benefit, the more likely it is that a common fund will be needed to remunerate the providers of stewardship. Such funds can be raised from taxes or from private contributions. For example, in the United States, Defenders of Wildlife uses private contributions for wolf conservation to pay ranchers who have lost livestock to wolves.

In the public domain, national funds have been raised to fund environmental improvements. Many are from general tax revenues, others from special-purpose taxes or user fees, such as in Kigali, Rwanda, where visitors pay to see mountain gorillas in their natural habitat. The funds, however, must be appropriately allocated to the maintenance of the environmental services in question, or to remediation for their loss. In too many cases, funds are not used to improve environmental sustainability or to compensate adequately those who could provide stewardship. In developing countries, governments and NGOs must direct more attention toward creating and managing such funds.

International funds along these lines should also be established, both because of the global nature of many of the environmental public goods and because of the impact of large income disparities on the relative demand for natural resources. The Global Environmental Facility (GEF) is an important step in this direction. This fund is supported by a variety of countries and compensates countries for the additional expense of addressing global environmental issues in a defined set of projects. It is not aimed at reducing poverty at the same time, though to their credit, staffs of the institutions that administer the facility (World Bank, United Nations Development Program, and United Nations Environment Program) often strive to address poverty issues in their projects in the poorer countries. Given the growing concern over both the environment and poverty, environmental compensation funds could become a powerful tool in providing compensation to the poor who contribute to environmental stewardship. Such funds would encourage more efforts to develop stewardship arrangements that link environmental sustainability and poverty alleviation. ➡

VIII

CONCLUSIONS

The analysis and examples offered in this document demonstrate that market principles can be modified to promote environmental sustainability and reduce rural poverty. But it is not easy. The limitations of market functions must be accepted. Environmental goods and services must be valued. And appropriate interventions to make markets function must be designed. This requires concerted action by different stakeholders, including the rural poor, governments, civil society (including NGOs and international agencies), and the commercial interests involved. Success depends on both the cooperation of stakeholders and the existence of adequate institutional and enforcement capacity.

We have used case studies to show what is possible, and to give guidance to those trying to replicate the outcomes. There are also cases when attempts to introduce market functions have not succeeded, and others where attempts are not likely to be fruitful, either because market conditions cannot be created, or because the institutional and governance framework is not adequate. In the latter case, institution-building is needed before these approaches can be attempted.

The role for market practices in promoting sustainability can be enhanced with a proper understanding of how markets function and what their limitations are. This understanding should be an important part of any overall strategy to increase sustainability and reduce poverty, bringing together different stakeholders to address common-pool property and public goods aspects of achieving environmental sustainability.

The analysis and examples offered in this document demonstrate that market principles can be modified to promote environmental sustainability and reduce rural poverty. But it is not easy.

Living in the modern world, it is easy to forget that we are entirely dependent upon the extraction, transformation, and delivery of natural resources. The challenge we face is not to stop using environmental resources. We couldn't survive without them. Nor is the challenge to set arbitrary limits on their use, which would prevent others from attaining acceptable standards of living. The challenge is to manage our environmental assets and resources so that they can contribute to improved standards of living in ways that promote the preservation of environmental amenities for all people. The vast variety of goods and services available in modern economies is highly desirable; indeed, it is the aspiration of the three billion people living in poverty. And as incomes rise, people come to value preserving unspoiled nature wherever possible. The proposals outlined above constitute a critical step is realizing those aspirations. ➡

ENDNOTES

[1] Some environmental services have been viewed as scarce and valuable once extracted and converted to marketable commodities. Although a number of conflicts have arisen over access to water, rarely have these conflicts led to a valuation of the resource that assured its sustainable use.

[2] Chambers et al, 2000 and WWF, 2000

[3] Costanza et al, 1996

[4] Conservation International (Indonesia), 1999

[5] The term "equity" here refers to the treatment of individuals and cultures, not shares of companies.

[6] This set of data from World Bank, 2000

[7] World Bank, 2000. The two exceptions are Georgia (9.9% of rural are poor compared to 12.1% urban in 1997) and Mongolia (33.1% vs 38.5% in 1995)

[8] World Bank 2002

[9] Relatively more rural poor do have title to land in countries that have undertaken land reforms and titling (such as South Korea and Thailand), and most of the titles are for individual use in agriculture.

[10] The concept of open access was evoked by Hardin in 1968 in the "Tragedy of the Commons," and can be a problem anywhere where controls over use of a resource falter. High-seas fisheries are a current example.

[11] Chambers et al, 2000 and WWF, 2000 for discussions of the footprint concept and estimates.

[12] For example, many fisheries once harvested far below their replacement levels are now overexploited and dwindling, as in the case of the North Atlantic cod fisheries.

[13] Malnutrition is a result of institutional and market failures that prevent the distribution of available food to those in need. Current United Nations Food and Agriculture Organization projections of continued growth in food production capacity indicate that most of the increase in food production capacity will occur in the temperate zones and affluent areas, while nearly all the increase in the world's population, and demand for more food, will occur among the poor in the tropics, exacerbating the distributional challenge.

[14] By environmental goods, we mean those goods extracted from the environment for economic use, such as timber and other plant life, minerals of all kinds, hydropower, wild animals, and fish. Environmental services include purification of air and water by natural means, siltation control, and amenity services such as beautiful landscapes existence values of wildlife, etc. that are naturally available but which depend on the integral functioning of the environmental system. Roughly, goods are taken from the environment and converted to a commodity; services are benefits provided from the normal functioning of the environment in place.

[15] In economic terms, there was no scarcity of environmental resources, hence no need to establish markets and prices for environmental goods and services.

[16] For example, building roads through a forest, clear-cutting large areas to extract timber, digging a mine, or converting land to agriculture can have significant negative impacts on the provision of environmental services, such as supporting biodiversity or moderating water flows downstream.

[17] Costanza et al, 1996

[18] The World Bank has estimated, for example, that in China, the costs of environmental abuse, such as the costs of air pollution on health and the costs soil erosion on agricultural productivity, exceed 6% of GDP annually. Similar estimates have been made for a number of other developing countries.

[19] Governments often grant rights to extract minerals and timber for low fees to large firms. Adequate environmental protection is rarely required, and the bulk of the benefits accrue to the firm and the government. Little of the income reaches the people affected. This is as true in developed countries as in developing countries.

[20] For example, in the U.S., publicly claimed lands were transferred to the private ownership of railroads to encourage the building of a transport system. Under the Homestead Act, public lands were transferred to farmers to encourage settlement and farming, and public lands have been transferred to miners staking claims. In addition, access to public lands for logging, tourism, and other

uses can be granted on certain terms. In another example in Central America, land title schemes required potential land owners to convert mountain forest lands to commercial pasture or other agricultural use in order to secure title.

[21] De Soto, 2000

[22] Ostrom, 1999

[23] Perrot-Maitre and Davis, 2001

[24] Tognetti, 2001

[25] Unfortunately, not all public interventions in the market are motivated by a desire to increase the common good, and may instead protect certain interest groups or political agendas.

[26] Bazanson and Sagasti, 2001

[27] Litigation in the US in such areas as the damages from second-hand tobacco smoke and asbestos are beginning to expand the liability and responsibility of polluters.

[28] Our primary focus will be on finding ways to pay for environmental stewardship provided by the rural poor. There are, however, rural areas of little or no environmental value where this approach may not be relevant to poverty alleviation, and other approaches where poverty alleviation is called for.

[29] The way the permits are issued has important distributional effects. The permits may be given equally to all emitters, distributed based on past levels of emission, or auctioned. Only the third method transfers to the public the value of the good auctioned, and this transfer is only accomplished if the proceeds of the auction are used to some public benefit. In the trading permit schemes to date, licenses have been issued to existing polluters, so the only benefit accruing to the public has been a reduction in pollution levels as emissions have been reduced.

[30] Scherr et al, 2001

[31] The Mountain Institute, 1997

[32] Perrot-Maitre and Davis, 2001

[33] Tognetti, 2001

[34] Minimum wage laws, bankruptcy policies, conventional use laws are examples of such interventions.

[35] In effect, the values of the extracted resources are priced in international markets based on prices determined in the developed countries, which are high. The value of the competing local service is priced in local markets where lower incomes result in lower relative prices for the service than would be the case in international or developedcountry markets. It is well-known that market prices overstate the actual differences in prices of local services, and thus of comparative incomes. There is a large body of research on Purchasing Power Parity (PPP) that has demonstrated this effect. Properly recalculated income comparisons show much lower differences in relative incomes, with the incomes of the poor countries rising substantially, implying that local pricing of services underrepresents their value compared to international prices. Market-based pricing in these international comparisons accentuates inequity.

[36] See polls from Environics International

[37] Simply making information about degrees of pollution and possible remediation generally available can have positive effects, such as the World Bank-sponsored PROSPER program in Indonesia. The program posted a grading of pollution emissions of a number of industrial plants, informing local people of the extent of pollution each plant generated. It also provided information to the firms on how to reduce pollution economically. Local populations applied pressure and firms responded.

[38] These changes in legislation also can help in combating corruption, which often involves the misallocation of natural resources.

[39] There are even emerging cases of conventional businesses completely redesigning their models to be able to sell to and employ those at the "bottom of the pyramid," or the 4 billion people with incomes below $1500 per year on a purchasing power parity basis. For more information, see Prahalad and Hart, 2001.

[40] World Bank, 1997

[41] Export Credit Agencies are institutions established by governments to provide credit, usually on favorable terms, to help promote national exports.

[42] Rich, 2000

[43] Pratt, 2001

[44] The government of Eritrea was committed to protecting the environment and developed an environmental impact assessment program with the assistance of several aid agencies. The World Bank helped implement the program and agreed to allow the government to use its own assessment system in place of the World Bank's, subject to periodic review.

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