

ISSUES PAPER



Payments for Environmental Services and Poverty Reduction

Risks and Opportunities

Erica Lee and Sango Mahanty

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Issues Paper

Payments for Environmental Services and Poverty Reduction:

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Executive Summary

Payments for environmental services (PES) involve schemes where payments or rewards are given by those who benefit from environmental services like clean and sufficient water, biodiversity, stable climate, or aesthetic beauty, to those who play a central role in providing or maintaining these services. Scholars and policy-makers are in the midst of a debate on whether PES creates opportunities or risks for the rural poor—a debate which is also critical to current discussions on reducing greenhouse gas emissions from deforestation and forest degradation (REDD). This issues paper synthesizes recent practice and research that point to significant areas for further research and attention in future PES initiatives.

The paper starts by analyzing the linkages between PES, forests, and poverty, where poverty is understood to be multidimensional in nature, involving deprivation across a range of assets and livelihood flows—as well as political and social marginalization and vulnerability to social and environmental risk. Given the spatial linkage between poverty and forests and the importance of such resources as ‘safety nets’ for the poorest households, PES interventions in forests are inextricably linked to the interests of the rural poor. A fuller understanding of the relationship between PES and poverty and the opportunities and risks that PES presents from the perspective of the poor is therefore needed.

The study has used an adapted Sustainable Livelihoods framework to examine the opportunities and risks. This approach suggests that livelihoods are not just about securing financial assets, but also human (e.g. education, health), social (e.g. institutions to facilitate coordination and cooperation), natural (e.g. access to natural resources), and physical (e.g. infrastructure) assets. Understanding the livelihood impacts of PES on the rural poor therefore requires us to look broadly at how schemes may interact with this wider range of livelihood assets.

In applying this framework, it becomes clear that PES schemes can and are impacting rural communities in important ways. Although conclusive answers on the impacts of PES are not possible given the early stage of implementation in many developing countries, and the diversity of schemes and communities with which they interact, some critical issues can be synthesized from recent experiences:

- The development opportunities that PES brings can elude the rural poor if they have weak or unrecognized rights to resources. Furthermore, this group is least able to meet with the high transaction costs associated with participation, unless there are existing institutions for local coordination as well as support from intermediary organizations.
- Many schemes are creating additional income for rural households, but the net benefits of this income need to be considered in light of the costs of participating in the scheme and income lost from agriculture or other resource-use options. The potential financial benefits for the rural poor are limited or nonexistent where they are unable to participate in schemes or where better-off households are able to garner more of the benefits (as has occurred with community-based resource management initiatives in the past).

- Improving the status of natural assets is a central objective of PES; however this may bring restrictions in access to common lands for grazing, resource collection, and shifting agriculture. The welfare impacts of such restrictions may be particularly significant for the landless and others with a high dependence on common property resources. Increases in the value of land under PES schemes may further contribute to this loss of resource rights.
- Where local institutions for coordination and cooperation are strong, they can provide a strong basis for participation in PES and to manage the flow of benefits from PES schemes. PES initiatives could usefully 'piggyback' on existing community-based initiatives where institutional development has been a strong focus. Organizations working in a support role with local community-based initiatives could help to sensitize local actors to the opportunities and risks that PES brings. On this point, conflict management capacities need particular attention as PES can change the stakes that local institutions are used to dealing with.
- Infrastructure development, such as water supply or other communal facilities, has been one way in which some PES schemes have delivered community-level benefits. Such opportunities need to be further explored, while recognizing that community-level investments may be more workable where existing community-level coordination institutions are strong.

Some people argue that market efficiencies rather than social objectives should drive the design of PES schemes. This issues paper, however, challenges this view given the emerging evidence on how PES can impact on the livelihoods of the rural poor. Blindness to social welfare could not only fuel the very real risk of adverse social outcomes, it could also mean foregoing the opportunity to improve the circumstances and opportunities of the rural poor.

1. INTRODUCTION

The continued degradation of the environment and the world's resources, despite ongoing conservation attempts, has motivated calls for innovative conservation approaches. Payments or rewards for environmental services (PES) involve payments or other incentives from the beneficiaries of such services to those that facilitate the service. This has been hailed as a more direct conservation approach than most other recent approaches (Wunder 2005). While PES schemes exist in some developed countries and have been piloted in various locations in developing countries, PES remains a fairly new practice with limited experience. It has recently been attracting increasing interest in Asia—particularly with developments in carbon markets and Reduced Emissions from Deforestation and forest Degradation (REDD)—but many questions remain regarding its design and implementation.

A central question is the effect of PES on livelihoods and the poor. Many proponents of PES say that the approach may help reduce poverty and improve livelihoods, especially within poor communities selling their services (Pagiola et al. 2004; Wunder 2005). Much of the interest in PES in Asia has been driven by hopes that PES can effectively achieve both of these goals (Subedi et al. 2007). At the same time, there is skepticism about the poverty reduction potential of PES. Critics contend that, since markets pursue cost-efficiency, a market-based tool like PES does not allow for bias in the distribution of benefits towards landless individuals and the poorest of the poor. Others fear that PES will actually harm the poor.

We argue that the potential for PES to support poverty reduction depends largely upon the design of particular payment and reward schemes and surrounding governance and social conditions. To support systematic consideration of the range of factors that determine the impacts of PES, in this paper, we propose a framework that sets out the factors potentially shaping the relationships between PES and poverty. The framework has been adapted from existing analyses of PES, livelihoods, and poverty. We also analyze how PES schemes might potentially respond to different elements of the framework by drawing on examples from existing PES schemes.

This paper is divided into five sections. Section 1 provides an overview of PES and potential poverty reduction. Section 2 discusses relationships between PES, poverty, and forests, including key concepts and definitions. Section 3 explains the framework. Here, we detail our approach in arriving at the framework and outline key issues and questions raised by the framework. In Section 4, we explore the constraints, risks, and opportunities that PES schemes might present, based on a desktop review of the literature on existing PES schemes. Finally, we conclude by briefly highlighting potential areas for attention by practitioners and intermediary organizations.

Importance of Assessing the Poverty Implications of PES

Why is it so important to assess the impacts PES may have on poverty? Experience has shown that resource management interventions of this kind, particularly where common property resources are involved, have the potential to affect livelihoods in significant ways. Indeed, a number of risks and opportunities for the poor have already emerged from PES projects. Taking these into consideration, it is plausible that ignoring the effects of PES on the poor can be at best, a lost opportunity to reduce poverty, or at worst, a significant liability to the poor and a setback in the pursuit of poverty alleviation. Given the limited evidence on this point, we cannot reach a definite conclusion on how much of an impact PES can have on the poor, either positively or negatively. But our analysis of the opportunities and risks in the multiple areas in which PES plays a role indicates that the impact of PES may be significant.

We can come to a fuller understanding of the opportunities and constraints PES faces by analyzing the concept of poverty, its connection with resources, particularly forests and the relevant ways in which PES interacts with them. As Pagiola et al. (2004) noted, “the specific characteristics of both the PES programs and the areas they are implemented in are likely to play critical roles in how the relationship between PES and poverty plays out.” We believe it is important to analyze this relationship to maximize its potential and inform decision making.

Key Concepts

Before considering the linkages, we turn our attention to clarifying what we mean by three key concepts— poverty, PES, and forests.

Poverty

It is important to distinguish between factors that *cause* poverty and how we *measure* poverty (RECOFTC 2008). Although poverty is often measured in monetary terms, such as the World Bank’s poverty benchmark of US\$1 per capita per day, adjusted for purchasing power parity (PPP), to identify the poorest of the poor, it is now widely accepted that the causes of poverty are multi-dimensional.

Poverty can be characterized not just as a lack of material income or financial assets, but also the lack of basic capabilities that enable a person to live a life and make choices that he or she value (Sen 1992). As such, poverty may involve deprivation across critical social, political, and personal assets that go well beyond financial resources, including:

- Human Assets, including access to basic services like education and health and emergency assistance that enable people to adapt to change and decrease vulnerability to financial, political, or environmental shocks.
- Natural Assets, encompassing access to natural resources needed to sustain life (e.g. food and water) and livelihoods.
- Social and Political Assets, such as access to social capital, ability to participate in decision-making processes, and ability to trust in political institutions. These comprise critical social resources for people to function equitably as members of society.
- Physical Assets, including basic infrastructure such as adequate housing, energy, transport systems, and communications facilities. (Bebbington 1999; World Bank 2002)

In addition, a range of dynamic flows and processes enable livelihoods to function or to be impoverished where they are absent, including: energy, food, water, information, motivation, social transaction, and income (FAO 2006).

In terms of the drivers for poverty, power differentials, processes of social marginalization, vulnerability, and social and environmental risk have been identified as key areas to be addressed (Brocklesby and Hinshelwood 2001; Hobley 2007). Related to this is the recognition that ‘the poor’ is a diverse category of people and might include the ‘improving’ poor, the ‘coping’ poor, and the ‘declining’ poor¹. These groups respectively have a decreasing ability to access and effectively use the four asset types to improve their situation, as well as facing higher levels of risk, vulnerability, and powerlessness (Hobley 2007). Effective poverty reduction strategies need to recognize this diversity and work with an understanding of the local population’s access to the different assets and livelihood flows, their level and causes of poverty, and how this impacts their resilience and vulnerability. Such targeted approaches to working with the most vulnerable groups are often referred to as ‘pro-poor.’

Payments (and Rewards) for Environmental Services

What exactly do we mean when we speak of PES programs? Quite literally, these are programs where payments are exchanged for the delivery of environmental services. More specifically, beneficiaries of environmental services make payments or provide other nonfinancial rewards to individuals or groups whose actions contribute to the provision of such services. Environmental services can be understood to be nonmaterial, nonextractive benefits from natural resources, such as watershed protection and carbon sequestration.

According to Wunder (2005), PES is:

1. a *voluntary* transaction where
2. a *well-defined* Environmental Service (or a land-use likely to secure that service)
3. is being “bought” by a (minimum one) ES buyer
4. from a (minimum one) ES *provider*
5. if and only if the ES provider secures ES provision (conditionality)

PES schemes fulfilling all of the five criteria are very difficult to find in practice. In particular, the last criterion of conditionality is difficult for many schemes to fulfill, as this requires payments to be conditional on evidence of environmental goals being achieved through effective monitoring. This definition is useful for a theoretical understanding of PES, but the examples and cases we draw on in the paper fall under a more flexible definition in terms of conditionality and the types of payments.

The use of terms such as ‘payments’ and ‘buyers’ invoke ideas of monetary transactions. Indeed, PES is often understood to consist of *financial payments*, such as user fees that the beneficiaries of environmental services pay to the providers of such services. However, when we refer to PES in this paper, we are more broadly speaking of *compensation or rewards* for environmental services (which some people refer to as CES). PES in this sense can include compensation mechanisms that “reward people for managing ecosystems and providing environmental services, and are based on the premise that positive incentives can lead to changes in land-use practices” (Frost and Bond 2006). Such schemes may include *payment in kind*, such as infrastructure development, access to training, and access to resources or markets, such as land-use rights or access to new markets through certification (Wymann von Dach et al. 2004). Some challenge the use of compensatory language such as ‘rewards’ on the basis that it raises undue expectations on the part of environmental service (ES) providers (Wunder 2005), but the appropriateness of a broader definition will become clear when we discuss the nonfinancial dimensions of poverty in the following section.

Forests

FAO (2006) defines forests as “land spanning more than 0.5 hectares with trees higher than 5 metres and a canopy cover of more than 10 percent,” which effectively excludes tree stands in agricultural production systems. In this paper, however, we use the term forests more broadly to refer to forested landscapes that potentially encompass agriculture and other land uses. This broadening of scope is important because PES schemes might target different types of forested landscapes, including *frontier forests* at the diffuse edge of agriculture, *forests beyond the agricultural frontier*, and areas of *forest-agriculture mosaic* (Chomitz et al. 2007).

1 For more on the conditions defining each of the three categories of the poor, see Hobley (2007).

2. POVERTY, FORESTS, AND PES: WHAT ARE THE LINKS?

The most common environmental services marketed in PES schemes —watershed services, carbon sequestration, biodiversity conservation, and landscape preservation—are associated with forested and agroforestry landscapes (WRI 2005). The schemes often involve a change in resource governance and management, including altered arrangements for decision making, changes to established rights (both formal and informal), and resource management and use. This, combined with RECOFTC’s continuing interest in equitable and collaborative forest management, brings us to focus the discussion primarily on forests rather than other ecosystems that have also been targeted in PES schemes.

There is considerable debate on the role that forests might play in reducing poverty, given the strong spatial overlap that has been observed between forested landscapes and the incidence of poverty in Asia (Sunderlin et al. 2007). We do not delve into the forests-poverty debate here, given our focus on PES, but note below some key threads in this discussion that are of interest from a PES perspective.

The spectrum of relationships that is possible between poor people and forests is as diverse as the social and environmental contexts in which they occur. These have been broadly grouped into two categories. On the one hand, forests can provide an important safety net and welfare function for the poor, providing food, energy, and other resources for direct use by households, as well as a safety net in times of environmental and social crisis. This has been referred to as the poverty avoidance/mitigation relationship (Sunderlin et al. 2005). Where forests currently play this role for poor households, changes in governance and management regimes through PES schemes could affect their welfare function. Key potential problems include the exclusion of the poor from forest areas that come under PES schemes with associated loss of income and subsistence that forests provide and loss of land control as land becomes more valuable and appealing to powerful actors.

On the other hand, there are situations where revenue from timber and non-timber forest products and forest services might potentially help lift a poor household out of poverty by strengthening its assets and livelihood flows—referred to as “poverty elimination” (Sunderlin et al. 2005). In this case, a PES scheme alone might not be expected to offer the solution to poverty, but the associated payments and rewards could contribute to asset building for poor land users and communities, through revenue, improving access to education and training, encouraging cooperation within communities, and promoting infrastructure development.

We go further into the specifics of how these constraints and opportunities might be configured and influenced later in the paper. At this stage we make the general point that the implications of PES for the poor need to be considered both in terms of the welfare impacts for vulnerable groups and the potential PES might create for assisting these groups to move out of poverty.

Is Poverty Alleviation a Priority in PES?

Related to this, a fundamental question arises of how much priority poverty alleviation should be given in PES design and implementation. Wunder (2008) argues that we must be careful to keep conservation as the primary objective of PES. The reasoning here is that PES was originally developed as a more direct and conditional conservation mechanism than other existing approaches such as integrated conservation and development programs.

Unlike the approaches PES replaced, which aimed to achieve a win-win situation between livelihoods and conservation, PES theorists suggest that there may be a trade-off between efficiency and poverty reduction. Even if poverty alleviation is an important secondary objective, focusing too much on it may cause PES to not properly deliver expected environmental services. As a result buyer support would decline and both environmental conservation and poverty reduction objectives would not be achieved (discussed further by Wunder 2005; Pagiola et al. 2004; Kerr 2007). Additionally, with an altered focus, it is feared that PES will be “subsumed into the generic family of altruistic development projects to which they were actually meant to be an alternative” (Wunder 2005).

However, there are those whose interest in PES is largely due to hopes that it could effectively function as a mechanism to reduce poverty as well as conserve the environment. They view poverty alleviation as a central objective of PES (see, for instance, RUPES 2008). There is also a fear that PES schemes that do not fully integrate the social objective of directly benefiting communities with the environmental objective could become instruments of exclusion (Rosa et al. 2003).

Our position is that, regardless of the relative focus on poverty reduction of each PES program, poverty issues are intimately connected to PES in societies where rural populations have limited alternatives to agriculture and forestry. Furthermore, we suggest that a fuller understanding of the relationship between PES and poverty may better inform the debate by providing a clearer picture of the costs and benefits involved in PES. This, in turn, can better inform decisions about whether PES schemes should be implemented in certain areas or if alternative or supplementary initiatives for livelihood support, service, and infrastructure provision should be considered. Without this understanding, especially given the widespread interest in PES in Asia, a widely-adopted tool blind to poverty could unintentionally deliver adverse poverty and social outcomes.

A systematic approach to understanding the opportunities and constraints posed by particular PES schemes is thus crucial, and the framework which follows aims to support such analysis.

3. AN ASSETS AND EQUITY FRAMEWORK TO EXAMINE POVERTY AND PES

Considering the multi-dimensional nature of poverty discussed earlier and drawing on previous PES-related research, we propose that the poverty reduction potential of any scheme largely depends on how it interacts with: the asset bases available to the poor, their livelihood flows, and the drivers contributing to their impoverishment, including processes of political and social marginalization and vulnerability to social and environmental risk. Although most of these issues relate to environmental service sellers, they also relate to poor environmental service buyers and the poor who are not participating in the scheme. In fact, in certain cases, the greatest risks for the poor are with poor nonparticipants, particularly those who do not own land (Wunder 2008). Key questions to help in assessing this relationship are detailed in Table 1 and have been compiled from a number of poverty- and livelihood-related studies on PES.

Table 1: Key questions in examining the poverty reduction potential of PES

The poverty impacts of PES schemes depend on whether they:	Key questions
Enable poor households/groups to access schemes and obtain tangible benefits	<ul style="list-style-type: none"> • How are poor households defined and identified? • What constraints might they face in engaging in a PES scheme, and how may these constraints be addressed? • Are impacts on and potential benefits for poor households factored into the design of the PES mechanism? • Are trade-offs involved in delivering benefits to the poor and maintaining a viable scheme? • How are rewards/compensation transferred and do they actually reach and benefit the poor?
Strengthen financial assets and flows	<ul style="list-style-type: none"> • Does a PES scheme increase the overall income in participating households (direct payments, employment, disparities in income)? • How is the income managed at the household level (household decision making and control of funds)? • Is a diversity of income sources sustained for PES participants? • Are there impacts on the income of nonparticipants? • Is the PES scheme contributing to increases in the cost of living?

Improve human assets and well-being	<ul style="list-style-type: none"> • Does a PES scheme contribute to improvements in capacity, skills, and knowledge, and for whom? • Does a PES scheme contribute to improvements in health (health indicators)? • Is PES income used to improve education and health?
Secure natural assets and flows	<ul style="list-style-type: none"> • Is there a change in the nature and security of access to resources (i.e. property rights)? • To what extent does the status/value of natural resources improve? • How does a PES scheme impact on flows of food, water, energy?
Strengthen social and political assets and processes	<ul style="list-style-type: none"> • Does a PES initiative strengthen social capital and institutions within communities? • Does engagement in PES increase coordination and influence with wider institutions and decision-making processes e.g. government services and infrastructure, policy, land use? • How does PES interact with existing local practices/values?
Improve physical assets and access to them	<ul style="list-style-type: none"> • Does PES stimulate investment in local infrastructure (e.g. safe housing, adequate water supply, energy infrastructure, transportation, and communications facilities)? • How is access to these facilities distributed?

Adapted from Ritchie et al. 2000; Chambers and Conway 1992; Grieg-Gran et al. 2005; Miranda et al. 2003; Landell-Mills and Porras 2002; Wymann von Dach et al. 2004; Iftikhar et al 2007; Scherr et al 2004; van Noordwijk et al. 2007.

In answering these questions, this paper summarizes the outcomes for each asset type in terms of:

- The opportunities provided by PES schemes to strengthen assets.
- The constraints that may apply for poor households to realize these opportunities as well as specific risks to poor households.

There are a number of points to be understood regarding this framework. Firstly, as indicated in the first row of the table, the identification of poor households, their access and distribution of benefits under the scheme is a key issue in designing a ‘pro-poor’ PES scheme. This is relevant not just at the outset, but at different phases in the design and implementation of the scheme (Iftikhar et al. 2007). The rest of the table highlights potentially important interactions between PES schemes and livelihood assets and flows that could also be factored in during the conception of PES schemes, as well as in monitoring and evaluating their impacts.

A second important point about this table relates to the ideas on poverty mitigation/avoidance and poverty elimination discussed earlier. One factor in the table—natural assets and flows—relates strongly to the welfare role that forests might have for poor households. The other assets are more relevant to the poverty reduction potential of PES schemes, and their potential for improving physical and financial assets, human capacity, and securing livelihood flows.

Thirdly, we recognize that it would be unrealistic for any one initiative to address all of the factors identified. After all, PES might be one of a range of livelihood options available to poor people; it would rarely exist as a sole source of income. However, we feel it is important for practitioners and participants working with PES to be aware of the range of potential linkages in order to clearly determine where they may or may not make a difference. This framework does not address which factors are necessary, or what factors would be sufficient in at least making a positive impact on poverty. Such issues will most likely depend on the details of individual PES schemes and the particular processes reproducing poverty in the populations with which they engage.

Another important issue is the scale of analysis and whether we examine impacts at a community or household level. Often the tracking of benefit flow ends at the household level, with the assumption that funds reaching a household equate with asset-building. To know whether funds actually translate to investment in human and physical capital, however, further analysis is needed within the household, factoring in issues such as gender. On the other hand, certain assets such as infrastructure, and education and health services require a wider than household-level scale of analysis, looking at a community or even subregional level.

The framework focuses broadly on PES schemes but another important issue that has been raised is whether different types of environmental service markets bring different opportunities and impacts, given the types of buyers, institutional arrangements, and payment mechanisms involved (Scherr et al. 2004). We are still at a very early stage of understanding what these differences might be and therefore it is important to carefully document institutional arrangements and ES types in analyzing PES schemes as well as considering how these factors might have influenced poverty outcomes.

Another issue is the potential for trade-offs and synergies to occur at various levels and possibly even between asset types: For instance, between ecosystem services and human well-being; between stakeholders; between households; within households; and between spatial scales (Iftikhar et al. 2007). There may also be trade-offs between environmental goals, for instance simultaneously maintaining or increasing water quantity and sequestering carbon. Such trade-offs have important implications for the viability of PES schemes and therefore need to be considered at various points in the design process.

Finally, we reiterate that this is a working framework, and the questions presented here should be refined as more evidence on the relationships between PES and poverty emerges. Our purpose is for these questions to provide an initial basis for informing design, and in evaluating existing PES schemes for their impacts on poverty. As such, a number of additional questions can be asked, including: Are some factors more important than others? Do community level rewards (such as infrastructure and services) benefit the poor more than household-level payments? What trade-offs and synergies might be required for a viable and equitable scheme? What are the best methods to track PES impacts? These are some of the questions that should be considered and hopefully answered as more PES experiences are accumulated. We recognize that as more experience is documented, some of the issues flagged in the framework may be seen as less significant, while new ones may arise.

Applying the Framework: Some Examples

In this section, we explore a number of issues and examples related to the poverty reduction potential of PES, drawing on illustrative examples from Asia and Latin America. We relate these examples to each section of the framework—addressing interests of the poor in PES design and the five key asset bases. We do not contend that this is an exhaustive review of PES schemes. Our focus has been on summarizing key cases that were information-rich on livelihood and poverty issues.

Factoring the Interests of the Poor into PES Design

The framework starts with the fundamental issue of whether poor people are able to engage with PES and how their interests are addressed at various phases: scoping schemes, brokering agreements, negotiation of rewards, and implementation of the scheme. Given the relative newness of PES in the Asian context, our focus here is on entry into PES schemes at the scoping and negotiation stage, although we also touch on implementation issues.

Is there a Market for the Environmental Services Being Delivered by the Poor?

One of the key factors in determining whether the poor will be able to access environmental service markets is their location in relation to environmental service buyers. Are poor people located in areas where they can benefit from PES schemes? We previously stated that many of the poor are found in rural areas, including forested landscapes that are closely associated with marketable environmental services. This is particularly true in marginal areas, such as hydrologically sensitive watersheds. For example, in countries like Guatemala and Honduras, the most sensitive watersheds coincide with areas of high poverty (Pagiola et al. 2004).

However, such findings are not conclusive and make up only part of the picture. Even if land users are practicing good land

management and securing environmental services, there is no guarantee that the environmental services they provide have (fairly direct) beneficiaries. So for instance, hydrologically sensitive areas, though perhaps populated by many poor people, may have few downstream users and therefore low potential to be included in PES schemes (Pagiola et al. 2004). Additionally, if PES programs target sellers in only a small part of a larger area of ES provision (for example, a section of a watershed), as is occurring in the Costa Rican Pago por Servicios Ambientales (PSA) program, the poor may not be picked up by these programs (Pagiola et al. 2004).

In other cases, the value of certain environmental services may not be fully recognized, with beneficiaries unwilling to pay for them. This often seems to be the case with biodiversity, where the benefits are more intangible and difficult to quantify than watershed services. Even in Malinau District of Kalimantan, Indonesia, where forests are recognized as having global conservation value, the Centre for International Forestry Research (CIFOR) was unable to find buyers for an offer by the village of Setulang to forego logging in exchange for payment (Boedhihartono et al. 2007). Potential buyers may also be unwilling to pay if the environmental services are not seen to be threatened in any way.

Perhaps the most critical element in making PES viable while engaging the poor is identifying and mobilizing users of environmental services who would be willing and able to pay the communities to provide services, with assurance that the service is actually being provided. Although both supply of and demand for environmental services are needed for a market to work, research from the World Agroforestry Centre (ICRAF) indicates that demand for environmental services is a more important condition for operational PES at local and national levels (Swallow et al. 2007). The role of donor organizations, government officials, and policy-makers to further promote and support this agenda has been seen as crucial (Subedi et al. 2007).

Still, considering how much of the world's poor rely on and use natural resources, it does seem that many areas where the poor are located should be further explored for market potential. Many PES pilot programs are taking place in poor villages, where tangible environmental services can be identified. Also, increasing interest in carbon sequestration raises the possibility of markets in forested areas populated by poor people or in degraded areas that can be reforested or protected, as is already occurring through voluntary carbon markets and may expand through the United Nations Framework Convention on Climate Change's (UNFCCC) foreshadowed REDD activities. The global nature of carbon sequestration services may also allow ES sellers to not be limited by local markets. Problems may arise for the poor, however, who typically have insecure or no tenure in such areas. This point is further discussed below.

Who Participates?

This is often the principal question addressed in studies on PES and the poor. Even if markets for environmental services exist, various barriers may exclude the poor from participating. Some obstacles include tenure, size of landholding, high transaction costs to participate in PES schemes (e.g. title papers, complex procedures), high investment costs to adopt PES-related land-use practices, lack of awareness, education, or access to technical knowledge which is required for measuring and monitoring the impact of activities.

4. CONSTRAINTS, RISKS, AND OPPORTUNITIES THAT PES SCHEMES MIGHT PRESENT

Based on the asset categories outlined in the livelihoods framework, this section examines the constraints, risks, and opportunities in a range of PES schemes.

Access and Equity in PES Schemes

A number of factors affect access to PES schemes, who benefits, and how they benefit. While the potential impacts and risks for specific assets are analyzed in later sections, we begin here with key factors that can influence access to PES by poor households and the distribution of benefits from such schemes.

Insecure Tenure

Insecure tenure is a problem facing many of the world's poor, with millions of people in developing countries not owning the land they live on or use. This is highly problematic in PES because markets involve the exchange of services, which typically require enforceable property rights (Kerr et al. 2006). Even if requirements for entering PES schemes are flexible enough to allow participation by those with insecure tenure, the fact that such people have low control over their land may reduce the marketability of their services. Buyers may be less willing to engage with those who are unable, for instance, to prevent encroachment, and thus disruption of ES delivery by outsiders (Wunder 2008).

Communities in the PES-like Communal Areas Management Programme for Indigenous Resources (CAMPFIRE)—where communities using communal lands in Zimbabwe market the wildlife on their area to safari operators—have sometimes been unable to prevent settlement and land clearance by migrants (Frost and Bond 2006). Even worse is the possibility that such lack of control over land may lead to more powerful people forcing people with insecure tenure off these lands as PES increases the land value, as has occurred in some out-grower schemes.

Pagiola et al. (2004) added that tenants on rented land would face the need to negotiate an agreement with their landlord on payment distribution, with the risk that landlords may discontinue previous rental agreements. They noted that such land rental arrangements are common in the Nicaragua part of the Regional Integrated Silvopastoral Ecosystem Management Project (RISEMP) project, which will hopefully provide empirical evidence on this issue in the future.

We return to these land tenure issues in the section covering natural assets, but note here that PES schemes may respond to this barrier by making participation requirements more flexible and/or strengthening property rights of the poor, possibly as a reward itself. Costa Rica's PSA program, where land users receive payments for various specified land uses, originally required land titles in order for landholders to participate, which prevented many poor farmers from participating. This requirement, however, was later eliminated (WRI 2005). Formalized land tenure has also been used in a number of PES schemes to reward providers. An example is the Rewarding Upland Poor for Environmental Services (RUPES) project in Sumberjaya, Indonesia, where coffee farmers obtained conditional land tenure as part of their 'benefits' (discussed further in the Natural Assets section).

Small Landholdings

For the poor who do own land, their generally small landholdings are another factor that excludes them from participation in PES projects. Smaller farms often provide households with their basic income and subsistence, which may give them less flexibility to adopt resource management changes associated with a PES program (Pagiola et al. 2004); this presents a substantial opportunity cost for these households (Kerr et al. 2006). In addition to high opportunity costs, the cost of operating most PES schemes is usually higher on small plots. For example, the monitoring compliance with delivery of biodiversity management has higher rates for small plots than for larger landholdings (Landell-Mills and Porras 2002).

High Transaction Costs

Transaction costs, including costs in searching for and obtaining information, contracting, and monitoring, can prevent poor households from participating in PES schemes. As discussed earlier, small landholdings translate into proportionally higher transaction costs for both seller and buyer. These higher costs often discourage potential buyers of environmental services from negotiating with many dispersed smallholders rather than a smaller number of large landholders, thus reducing participation by the poor in PES schemes (Pagiola et al. 2004). Meanwhile the costs to enter into contracts are also higher relative to expected returns for smallholders than they are for large landholders. Such costs may include titling papers and the need to follow complex procedures, which are the same regardless of the size of the land area held. For example, in Costa Rica's PSA program, applicants were previously required to fulfill 11 separate requirements, including the submission of a management plan prepared by a certified forest engineer (Pagiola et al. 2004).

PES programs can try to minimize transaction costs by taking measures such as creating systems for collective bargaining and contracting. With regard to minimizing transaction costs, many of the 11 requirements under Costa Rica's PSA program had little or nothing to do with their ability to provide environmental services, such as providing proof that farmers did not have debts towards the health system. Removing some of these requirements would lower costs without sacrificing program effectiveness. In order to keep transaction costs from hindering the poor, a system of collective bargaining and contracting could help, as seen in the Costa Rican PSA case. Here, a system of collective bargaining has enabled groups of small farmers to join the program collectively, so that transaction costs are spread over a large group (Pagiola et al. 2004). 'Bubble projects'² for carbon sequestration also deal with larger groups, forming commitments with entire countries or regions, rather than with individuals (Wunder 2005).

Community-oriented NGOs, rural people's organizations, and sometimes local government can play an important role in reducing setup costs by serving as representatives and intermediaries for numerous individuals (Kerr et al. 2006). The existence of effective local institutions, such as local forest governance bodies, can help poor service providers to access PES schemes as a mechanism to negotiate and implement the schemes. These bodies have been shown to have a critical role in facilitating a degree of equity in benefit sharing in local forest governance (Mahanty et al. 2007; RECOFTC 2007), and could have a similar role in PES schemes. There can still be problems with organizational management and agreement, however. For example, in Mount Apo National Park on Mindanao, Philippines, the Protected Area Management Board of 250 stakeholder representatives can take years to reach a major decision because of the difficulty in gathering sufficient representatives for a meeting (Winrock 2004). Large groups may find it difficult to reach a consensus, with associated time and administrative costs.

These local institutions can also help with reducing information costs. Setting up a PES scheme requires service providers, beneficiaries, and intermediaries to agree on the problems and threats that are reducing environmental services, as well as potential actions to manage problems and reduce threats. Capturing the local knowledge and perspectives of the community members and policy-makers can reduce transaction costs. This is particularly so where potential solutions to environmental problems are familiar and well-established in communities (Leimona and Lee 2007).

2 Schemes where an imaginary 'bubble' enables an emission target to be met across multiple localities. This allows a company at one location to continue or increase its emissions in one location by reducing or sequestering emissions at another location.

Transaction costs also extend to the monitoring and verification of PES schemes. Monitoring and verification of environmental service provision are essential in ensuring the confidence of buyers. They are often required to secure payments. However, monitoring may involve expensive technical equipment and processes, or require skills that poor households do not have (discussed later). Introducing simple technologies that are relatively inexpensive, easy to use, and provide relatively rigorous data in monitoring could help in conducting simple environmental outcome monitoring. For example, in The International Small Group and Tree Planting Program (TIST)-led carbon sequestration project in India, monitoring is done with hand-held GPS that are relatively inexpensive to the project, easy to use, and can help in more rigorous tracking of carbon plantations. TIST has trained village-based volunteers to take field measurements through GPS. A carbon expert in the central office subsequently uses these field measurements to calculate sequestration credits for each site (Jindal and Kerr 2007). Ultimately these approaches need to satisfy environmental service buyers who may also require independent verification.

High Investment Costs

Some PES programs involve high investment costs in land-use practices required by the PES agreement, which poor households cannot afford. For example, farmers in Nicaragua wanting to undertake silvipastoral practices to receive payments under the RISEMP program might have to sacrifice part of their normal income and additionally invest US\$500 in the first year, which amounts to about 70% of current net income (Pagiola et al. 2004). Such a high investment cost is a heavy burden for the poor. This could also apply to participants in certain PES-like ecotourism projects too. For example, if a community has to set up various facilities for tourists, costs occur before benefits can be realized (Landell-Mills and Porras 2002).

Theoretically, access to credit should allow poor households to overcome high investment costs. However, due to the weakness of state-owned financial institutions in developing countries, credit is effectively unavailable in many rural areas. An alternative way to address high investment costs is to have PES schemes adapt the payment schedule to take such high up-front costs into account. Costa Rica's PSA program, for example, front-loads payments for reforestation so that the bulk of payments are provided in the early years. In Nicaragua's RISEMP program, land users are initially compensated for environmental services they are already providing. This enables them to invest in other necessary changes (Pagiola et al. 2004).

Low Awareness, Education, and Technical Capacity

Finally, even if there are good market opportunities for the poor, there may be low awareness, education, or access to technical knowledge among poor sellers and low capacity to take advantage of them (Landell-Mills and Porras 2002). Before awareness-raising activities in Kulekhani Watershed, Nepal, for example, the local people did not understand the concept of 'environmental services' and were unaware that their conservation activities benefited groups elsewhere (Upadhyaya 2007). Technical capacity and resources may also be required to deliver the desired environmental services and especially (as discussed above) carry out monitoring activities. The Clean Development Mechanism (CDM), for example, involves detailed methodology and many skills are needed to manage data, make calculations, and meet mapping requirements (Doets 2007); the outcome is only one forestry CDM project being implemented in Asia.

Capacity building of local people may be necessary, though training can itself be a reward (discussed further under Human Assets below). The experiences of a few Himalayan villages indicate that local people can learn to measure tree diameter changes (required to estimate changes in biomass over a time period), and draw forest boundaries and locations using GPS (Subedi et al. 2007). These monitoring efforts can also be conducted by trained village-based volunteers, such as the River Care group in the Sumberjaya case in Indonesia (Suyanto 2007).

Who Receives Benefits?

Finally, as we noted previously, the 'poor' are not a unitary group and the distribution of local benefits determines who gains and in what way from PES schemes. Experience from community-based natural resource management (CBNRM) highlights that women and certain social classes are easily marginalized from community-level initiatives, with the potential for elite capture (RECOFTC 2007). Local benefit distribution needs to be considered in the design of payment and reward mechanisms. The PES program at the Kulekhani Watershed, Nepal, took this issue into account at the design stage; it was agreed that hydropower plant royalties would be deposited into a fund to support community projects, with the condition that project proposals demonstrate how the project would help improve the livelihoods of poor and marginalized people (Upadhyaya 2007). Experiences from CBNRM may be instructive regarding approaches to improving the equity of benefit sharing.

A summary of constraints, risks, and opportunities related to access and equity in PES schemes is provided in Table 2.

Table 2: Constraints, risks, and opportunities related to access and equity in PES schemes

Constraints/Risks	Opportunities
<ul style="list-style-type: none"> • Poor households may be unable to access PES schemes if they are too remote from ES markets • The poor often lack rights to resources subject to ES agreements • High transaction costs in negotiating agreements for small landholders or dispersed local resource users/managers • Lack of capital for investing in actions required for ES agreements • Costs associated with monitoring to ensure sustainability of environmental service agreements may be beyond the reach of the poor • Elite capture of PES-related benefits at the local level 	<ul style="list-style-type: none"> • Development of agreements based on rights and responsibilities other than ownership; providing more secure rights as a “benefit” • Emergent or existing local resource governance bodies can have lead roles in negotiations and help to reduce transaction costs for smallholders in establishing agreements • Civil society organizations taking a lead role in strengthening local governance bodies, capacity building, and participatory monitoring processes

Financial Assets

The most obvious way in which PES may assist the poor lies in the effect PES programs have on their financial assets. This applies to environmental service buyers and sellers, as well as nonparticipants.

Does the PES Scheme Increase the Overall Income in Participating Households (Direct Payments, Employment)?

The most direct way in which poor providers would gain in terms of financial assets is an increase in income. Additional income, however, cannot just be calculated as an increase in income relative to the past, but should be considered as the net payment against the opportunity cost of adopting the PES-promoted land use (Wunder 2005). For example, a payment of US\$100 for someone to maintain a piece of forestland should not be simply seen as a US\$100 monetary benefit, but should be compared to the opportunity cost of, say, the person passing up a payment of US\$90 that was offered by a logging company.

However our understanding of opportunity costs are quite limited and evidence on income is more often presented as a gross figure or as a proportion of household income. Preliminary evidence indicates that income from PES schemes can be a substantial portion of participants’ household income (Wunder 2008). Watershed-protection payments in Pimampiro, Ecuador, composed 30% of recipient households’ spending on food, medicine, and schooling (Wunder 2008). In some forest protection contracts in Viet Nam, PES payments composed more than one-third of the contracted households’ income, while in other cases payments were as little as 1–2% of household income (Wunder et al. 2005).

There are cases, particularly with poor people living in remote areas, where PES markedly improved the participants’ financial situation. In Costa Rica’s Osa Peninsula, half of the ES sellers climbed above the poverty line via PES cash (Wunder 2008). The TIST project in India has also shown that project carbon sales were not only the primary source of income for many farmers, but also significantly improved their economic status. The farmers were additionally able to reinvest the income in agriculture or cover important household expenses (Jindal and Kerr 2007). Increasing interest in carbon markets—both markets under Kyoto and other voluntary markets—indicates potential for even higher financial rewards for providing carbon sequestration services.

However, there are many PES schemes that function at the community level, in which the financial payments are not high enough to have a significant impact at the household level. Community-level payments may still provide capital for investment in community infrastructure and services. For example, in the Kulekhani Watershed, cash payments to individual sellers were not an attractive option given the relatively small size of the reward compared to the many sellers; instead, the sellers opted for payments to be made to a fund for conservation and development projects (Upadhyaya 2007). Programs that focus on such nonfinancial rewards are further discussed in the following sections.

A better understanding of opportunity cost, particularly by the ES sellers, is an important requirement for developing an equitable package of benefits. In theory, the voluntary nature of PES programs means that sellers can refuse the offer of a payment, and therefore are only engaged if they are better off, or at least not being made worse off (Wunder 2005). However, in practice, various factors intervene. Sellers may have limited information and may not have an accurate understanding of the costs and benefits involved in joining PES programs. Also, the wealthier groups in communities, or specific individuals expecting to profit more from the programs, might influence larger groups or communities to enter programs that fail to benefit poorer households. In the aforementioned CAMPFIRE program, landowners and land users directly bordering wildlife-priority areas often lost out but could not individually reject the program (Wunder 2008). This issue relates to elite capture, which was discussed earlier.

The outcome of an inevitably imperfect market is that the benefits gained by sellers are not optimal because of their lack of information and bargaining power. Payments tend to be set near the minimum of the amount they are willing to sell the service for, and are potentially below the maximum the buyers are willing to pay.

For poor households, PES income has the advantage of generally being more stable than income from other sources. For example, income from selling forest products may be subject to fluctuating prices, or changes in annual harvests due to weather or land degradation. A stable income can have important welfare benefits for many poor households, especially considering that they generally do not have funds to draw on during times of low or no income. However, PES income is obviously only a stable source if the PES scheme is ongoing, which depends on factors such as financial sustainability and the satisfaction of buyers with the provision of environmental services (Pagiola et al. 2004; Landell-Mills and Porras 2002; Wunder 2005).

Employment Opportunities

Apart from direct payments, PES programs may increase income by providing poor households with employment opportunities. Building natural assets, through initiatives like planting trees in degraded areas, can expand rural jobs and benefit unskilled laborers (Wunder 2005). For example, in the Sukhomjiri case, the landless have worked in watershed development programs, the income from which has been a significant contribution to their household income. PES programs may also indirectly increase labor demand, as also seen in the Madhya Pradesh Watershed case, where the watershed development program positively impacted agricultural productivity in the village which, in turn, created more demand for labor and increased local wage rates (Sengupta et al. 2003).

In other cases, the employment opportunities might be a payment-in-kind. In the case of Makiling Forest Reserve (MFR), where the University of the Philippines at Los Baños offered various rewards in return for the cooperation of upland communities, resort operators in the Los Baños–Calamba area employed community members as an in-kind payment for watershed-protection services (Rosales 2003). In Sukhomajiri village, where there was a PES scheme for watershed management, a water users' association was formed, which made a point to employ landless people in order to gain their support (Sengupta et al. 2003).

On the other hand, the poor may lose employment opportunities if the practices required by the PES programs have a lower labor demand than current land-use practices. For example, if a PES scheme requires forest protection, laborers who previously farmed or logged the land will lose work opportunities. Also, if the local economy is stimulated, which PES might do in various ways, migrants may be attracted to the area and compete with the poor for employment opportunities (Kerr 2007).

Even in cases where the employment opportunities have improved for the poor, there may be a number of other factors that partially neutralize this advantage. We will further discuss these factors in the section below concerning effects on the income of nonparticipants.

Is Income Diversity Sustained for PES Participants?

Income diversity increases resilience for poor households. If one source of income is lost, the household has other options to fall back on. On the one hand, the payments from PES programs may supplement the income of the poor and thus expand their income base. Community members interviewed in Costa Rica and Ecuador carbon projects indicated that carbon payments were important in diversifying and stabilizing their income (Grieg-Gran et al. 2005).

On the other hand, restrictions on agricultural expansion and resource use may reduce income from other sources. There is a fear that long-term inflexible PES contracts will limit poor communities to single land-use practices, and thus make them vulnerable to changing conditions. PES schemes can address this concern by including flexible types of land uses and by offering insurance for lost revenues (Mayrand and Paquin 2004).

Are there Impacts on the Income of Nonparticipants?

PES schemes can have impacts on the income of poor nonparticipants. These nonparticipants do not receive direct payments themselves, but their livelihood activities may be affected by the changes generated by PES projects, particularly with common lands upon which many of them rely. Some groups of poor people are also involved in very environmentally harmful activities, such as logging (Wunder 2008). Where the PES scheme is restricting uses, such as limiting or prohibiting access to lands where poor people gather forest products or grow crops, nonparticipants involved in these activities can lose their source of income (Smith and Scherr 2000). For example, it is estimated that of the estimated 3.1 million hectares of tropical land technically suitable for large-scale CDM projects, only 30% or less may be used without impairing the local people's access to resources (Bass et al. 2000).

Yet, as noted above with regard to participants, nonparticipants may also benefit from a potential growth in employment opportunities. As seen in the Madhya Pradesh Watershed case, however, such opportunities may have limitations. In this case, employment was the most direct benefit for the landless. A more indirect benefit was the increase in labor demand and wage rates due to the positive impacts watershed development had on agricultural productivity in the villages. However, a few constraints to these indirect benefits were observed. First, the increase in employment opportunities was often not significant enough to make up for the increase in the workforce through in-migration that usually accompanied the watershed development projects. More than three-quarters of the landless reported no significant increase in employment opportunities, and for most of them, such opportunities have been short term.

Second, the sustainability of employment opportunities beyond the lifetime of the Government project is highly uncertain. Third, though the use of machinery for watershed development activities was discouraged, it was still used, reducing employment opportunities. Fourth, most of the self-help groups that were established with the intention of providing credit/loan facilities to the landless to help them set up their own enterprises have been unsuccessful, offering limited assistance. Finally, as previously described, the landless have lost access to village common lands without gaining significant compensation in return (Sengupta et al. 2003).

Is the PES Scheme Contributing to Increases in the Cost of Living?

Even if a PES scheme is contributing to increases in financial income of the poor, such positive effects could be partially negated if costs of living are also rising. A change of land use under PES programs may bring changes in production and prices. A fall in agricultural production due to protected forestland, for example, can lead to higher food prices (Pagiola et al. 2004). The landless poor in particular depend on purchased food. Local supply effects could strongly influence local market prices, which could heavily impact rural food purchasers (Zilberman et al. 2008). As such, food insecurity was a concern in carbon sequestration projects in India. TIST responded by promoting carbon sequestration primarily on marginal and low-productivity lands that were of low suitability for agriculture (Jindal and Kerr 2007).

PES schemes can also increase the costs of living for poor buyers of environmental services. One way that this can occur is if they have to pay for services they were previously enjoying for free, for instance water supply. Another way is through an increase in commodity prices, which can impact both the rural and urban poor. However, in the long run, the poor may be bearing less financial cost by paying a fee for an environmental service than by not paying and thereby losing the service. For example, water vendors often charge prices at least 10 times more than those charged by water utilities; thus, paying a fee to maintain water quality could be relatively less expensive than having to purchase water from vendors when water provided by utilities degrades (Wunder 2005), although poor households might prefer deferred rather than up-front costs. Additional costs may be managed through pricing systems, such as the Fonda para la Proteccion del Agua (FONAG) water fund in Quito that allocates part of the current revenue rather than levying additional fees on consumers (Pagiola et al. 2004).

Poor groups who benefit from but do not pay for the improved environmental service, such as water supply (viewed in economic terms as free-riders) might actually experience a decrease in the cost of living (Wunder 2005). On a broader level, poor tropical farmers, who are unable to adapt their farming systems to climate change, may benefit from climate mitigation efforts that they are not paying for (Wunder 2008). However, such benefits need to be considered in the wider context of disadvantage that these groups might experience.

A summary of opportunities, constraints, and risks related to financial assets is provided in Table 3.

Table 3: Summary of opportunities, constraints, and risks related to financial assets

Opportunities	Constraints/Risks
<ul style="list-style-type: none"> • Additional income for participating households • PES income is relatively stable (provided the scheme continues) 	<ul style="list-style-type: none"> • Income may be concentrated amongst the wealthy because they are more able to participate • Community-level investments (e.g. infrastructure, services) may counter income disparities but only if access is equitable • Restrictions on agricultural expansion and resource use may reduce income from other sources • Potential for lost income from agricultural expansion and restrictions on resource use for nonparticipants • Potential for increases in cost of living

Human Assets

Assessing potential impacts on human assets explores whether the capability, skills, and knowledge of ES providers are strengthened through PES schemes. This may happen through the investment of revenues in services and activities that support human assets, or from direct activities under PES schemes to build capacity.

Does the PES Scheme Contribute to Improvements in Capacity, Skills, and Knowledge, if so, for Whom?

As noted above, PES programs may directly provide access to education and training through activities connected with brokering and implementing the PES initiative. An example is where PES initiatives provide training related to enterprise development, project management, marketing, and negotiation (Landell-Mills and Porras 2002). They may also develop various skills in the activities required to meet agreed PES obligations, such as sustainable forestry, forest-based industries, ecotourism, carbon monitoring, certification, climate change mitigation, and project management (Landell-Mills and Porras 2002). Capacity building could also reduce the costs of project entry for poor households as well as project costs—for instance, empowering forest guards could reduce transaction costs for monitoring (Arifin 2005).

Investments in education and training were made in the Maasin Watershed project, Philippines, where the Government worked with communities as partners to rehabilitate the watershed. In order to accomplish this, technical assistance was provided through the Department of Environment and Natural Resources (DENR) for activities such as reforestation, assisted natural regeneration, timber-stand improvement, agroforestry, and rattan and bamboo enhancement. Upland communities also received training in various aspects of forest management, both technical and organizational (Rosales 2003).

As with many other livelihood assets, PES schemes can contribute to education improvements by offering improved access to education and training as a nonfinancial benefit. Improving access to education and training was an incentive in the case of the Makiling Forest Reserve, Philippines. The university sponsored a number of training days on sustainable land uses and practices, as well as on livelihood development. It also provided scholarships to high school students. In addition, the university upgraded the skills of community members who wished to work in local resorts (Rosales 2003).

On the other hand, there is a concern that there will be limited opportunities for the poor to access capacity development opportunities (Landell-Mills and Porras 2002). Training could be oriented towards PES participants only, which may not include the poor. This could feed a cycle of exclusion, where lack of education or access to technical assistance hinders participation in PES programs by the poor. Moreover, most PES programs in Latin America, for example, offer limited or no technical assistance (Pagiola et al. 2004). Experiences suggest that capacity development has been more emphasized where civil society organizations have adopted a brokering role.

Does the PES Scheme Contribute to Improvements in Health?

Some PES schemes are offering improved access to healthcare as a benefit. In the Makiling Forest Reserve, one reward for upland farmers was medical discounts for the use of the university infirmary (Rosales 2003).

Besides providing better access to healthcare and sanitation facilities, PES, like any other effective conservation program, can improve health by securing water supply and air quality (Landell-Mills and Porras 2002). This applies not only to poor sellers, but to poor buyers and nonparticipants as well. For example, watershed protection could bring health benefits, such as reduction of water-borne diseases, to both upstream and downstream users, including the poor who are not participating in the PES scheme. Development projects that have been used as the reward in PES schemes may be associated with health benefits. In Cauca Valley, Colombia, the downstream water user associations implemented “infrastructure programs” for the upland communities, including better sanitation facilities (further discussed under Physical Assets, WRI 2005). Considering that physical vulnerability and poor health are often characteristics of poverty, such benefits may have a real impact on improving welfare.

On the other hand, there could be adverse indirect health effects on communities if their access to forestland is restricted. Not only can the resulting loss of income have a negative impact on healthcare, but the poor may also be unable to consume forest-based foods that provide nutritional variety in local diets and medicinal benefits (Landell-Mills and Porras 2002).

Is PES Income Invested in Education and Health Improvements?

More information needs to be gathered on what PES income is invested in to address this question, both at the community and household level. At the community level, the answer depends largely on the needs and organizational capabilities of communities. In theory, PES income received at the community level could be invested in education and health improvements from which all can benefit. A number of PES projects also deliver rewards in the form of community development projects. The sellers in the Kulekhani Watershed project opted for conservation and development projects rather than cash payments to individual sellers (Upadhyaya 2007).

At the household level, as with other rural development and natural resource management activities, income may not equate with asset building; for instance, if short-term spending on immediate needs or consumption of alcohol and luxury goods dominate over long-term investments. The role of gender in terms of how payments are received and managed at the household level quite likely influences the outcome, but has so far not been an important focus in PES initiatives.

A summary of opportunities, constraints, and risks related to human assets is presented in Table 4.

Table 4: Summary of opportunities, constraints, and risks related to human assets

Opportunities	Constraints/Risks
<ul style="list-style-type: none"> • Many examples of education and training associated with PES initiatives • Improved health through improvements to water supply and air quality 	<ul style="list-style-type: none"> • Limited opportunities for the poor to capture capacity development opportunities • More limited impact if income is invested in short-term consumption rather than human capacity, particularly if gender is not factored into payment schemes • Reduced health if access to nontimber forest products for direct use and income is lost

Natural Assets

Considering the importance of natural resources and forests as a 'safety net' for the poorest and most vulnerable families, it is very important that PES impacts on the natural assets of the poor are examined. Even if payments from PES programs financially improve the situation of the poor, there is little expectation that such income would completely eliminate the poor's need to access natural resources for direct use and income.

Is there a Change in the Security of Access to Resources?

PES can impact on resource access in a range of ways. As land under PES projects is no longer considered 'idle', PES can provide some protection against encroachment by external actors, as occurred in Costa Rica's PSA program (Pagiola et al. 2004). Landowners in Los Negros, Bolivia, involved in a conservation program, reported that their land was better protected from encroachment because they held maps with demarcated boundaries and could demonstrate income-generating activities (Wunder 2008).

Additionally, tenure security itself may be used as the compensation/reward for communities providing environmental services. In the RUPES project in Sumberjaya, Indonesia, for example, coffee farmers obtained conditional land tenure from the Government in exchange for protecting natural forests and managing the land to provide watershed protection services (Suyanto 2007). The community forestry permits were very well-received by the farmers, who are no longer at risk of eviction. Similarly, in the Maasin Watershed project, Philippines, tenure security embodied in the community-based forest management agreement allows 25 years of stewardship renewable for another 25 years. Although we previously said that landownership is often required in order to enter PES programs, the possibility of providing tenure security as a nonfinancial benefit suggests that the lack of formal tenure does not necessarily have to restrict participation in certain PES schemes (Kerr et al. 2006).

In some cases, programs that require land rights can prompt their issuance. In the reforestation project in A Luoi, Viet Nam, the process of developing an application for the CDM led to clearer land allocation to the local people (Doets 2007).

Unfortunately, PES also has the potential to lead to the loss of natural assets for the poor by weakening their tenure security and control of land. As currently marginal land becomes attractive for PES agreements, the associated increase in value may in turn increase the incentive for powerful groups to take control of it (Pagiola et al. 2004) and fuel competition for land (Wunder 2005). Poor households with limited or unclear tenure rights are especially vulnerable. Currently, there is anecdotal evidence of politically powerful groups pushing aside poorer land users with a lack of tenure security due to PES schemes in Colombia's Cauca Valley (Pagiola et al. 2004). To address this potential threat, cooperatives similar to the ones in a pastureland development project in India led by the Foundation for Ecological Security (FES) can play a role. These cooperatives obtained long-term leases from local governments to regenerate pastures and share benefits among their members (Jindal and Kerr 2007).

Another critical concern relates to common lands that poor people may be using for various livelihood activities. In order to provide environmental services, PES schemes may restrict access to common lands and prevent marginal groups from grazing, resource collection, and swidden agriculture. In the early stages of the Sukhomajiri project in India, the construction of an irrigation reservoir restricted the poor's forest product collection and grazing on common lands (Landell-Mills and Porras 2002). Such areas are particularly critical in terms of their safety net function.

To What Extent does the Value of Natural Resources Improve?

Since the driving objective for PES is environmental, this review has focused on gaining an understanding of its social and livelihood impacts. However, we note that, besides achieving the main goal of conserving environmental resources, programs that actively involve stakeholders can also raise their general environmental awareness. The CDM application developed in A Luoi, Viet Nam, increased awareness by introducing more long-term thinking in selection of tree species for reforestation (Doets 2007). In Kuhan, India, an ecowalk and a catchment-level camp were organized for local students. This helped in announcing the PES mechanism agreement across the villages (Agarwal 2007). On the buyer side, beneficiaries may also gain increased environmental awareness and an understanding of how certain actions can sustain and/or enhance environmental services.

PES schemes that can effectively enhance the value of natural resources can ultimately benefit the poor who depend upon these resources. The degradation of resources is a major challenge to sustaining the welfare function they provide. It is therefore important to consider net overall benefits in the context of the short-term livelihood costs that poor families might face.

A summary of opportunities, constraints, and risks related to natural capital is provided in Table 5.

Table 5: Summary of opportunities, constraints, and risks related to natural capital

Opportunities	Constraints/Risks
<ul style="list-style-type: none"> Strengthened tenure security in some cases: <ul style="list-style-type: none"> Land under the PES agreement is not 'idle' and therefore encroachment is prevented Tenure security used as a reward for environmental service provision Improvement in the status/value of natural resources 	<ul style="list-style-type: none"> Access to common lands by marginal groups may be restricted for grazing, collection of products, swidden agriculture Increase in value of currently marginal land may increase incentives for powerful groups to take control of it

Social and Political Assets

An improvement in the social and political assets of the poor, both within communities and in wider society, is not only important in itself, but helps in securing other assets as well. Organization and cooperation are fundamental in building up communal goods and ensuring equity in benefits, as recent experiences in collaborative forest management highlight (Mahanty et al. 2007).

Can a PES Initiative Strengthen Social Capital?

PES schemes can promote social capital by strengthening or creating institutions to negotiate agreements, thereby enhancing participants' ability to cooperate and network. This is seen in the village of Balian, Philippines, where watershed management activities led the residents to form an umbrella group called Lingap Kalikasan. Here, organizational meetings on the watershed serve as a venue for comprehensive planning and management of the area. Through these watershed-related meetings, residents are able to address other downstream issues, such as soil erosion, sedimentation, flooding, irrigation, and solid waste, and connect these issues to watershed management and protection (Rosales 2003).

RUPES has also facilitated increased cooperation among villages through its Kulekhani Program in Nepal. Before the implementation of the PES mechanism, people from the different Village Development Committees (VDCs) were distrustful of one another due to a history of some VDCs securing more of a development budget than others, at times through unfair means. The VDCs were able to set aside their distrust to form a watershed-level local organization to mobilize collective action with the PES project. Representatives from various VDCs formed the Kulekhani Watershed Conservation and Development Forum (Upadhyaya 2007).

However, our preceding discussion of local 'winners and losers' hints at a possible problem. If divisions increase between these two groups, or between participants and nonparticipants, social cooperation may erode (Landell-Mills and Porras 2002; Wunder 2005). Social tension over unequal losses and gains under PES schemes raises the issue of how compensation payments might be fine-tuned to accommodate different opportunity costs faced by individuals or communities (Wunder 2008).

Where the poor are already marginalized by local political processes, this could feed a cycle of exclusion from PES schemes and the opportunity to build their other assets. This is particularly relevant where PES deals with common property resources requiring management based on collective decision making and implementation. If collective decision-making processes and bodies are weak, lacking transparency and accountability, costs and benefits may be distributed inequitably at the local level (Pagiola et al. 2004). One problem with working with recognized pressure groups in some Philippine communities was that membership often represented only a small segment of the upland population. These few families, often the more vocal and influential members of the community, largely appropriated the benefits of participation in watershed-protection activities (Rosales 2003).

Collaborative forest management experiences highlight that the existence of local governance bodies does not in itself guarantee high levels of engagement by poor and marginalized groups. This often needs targeted attention through capacity building and positive discrimination to ensure their representation in decision-making bodies (Carter and Gronow 2005; RECOFTC 2007). Lessons and approaches from this field could usefully inform efforts to work with local bodies in PES schemes.

Can PES Increase Coordination and Influence?

Since social exclusion is a defining facet of poverty, the poor typically have very limited political standing and influence in decision-making processes. By requiring negotiation with external agents, PES enables poor households or communities to actually interact more directly with ES users or outsiders. Such interactions can bring recognition and pave the way for future opportunities to engage with external agents. Also, the cooperative organizations that may rise out of PES (discussed in the preceding section) may enhance political standing for poor households and communities. Such bodies will often have power and influence that individual households lack and allow for greater networking and empowerment in decision making.

At the WWF and KONSEPSI (a local NGO) site in Lombok, Indonesia, an intermediary organization of community-level and other actors, including two parliamentarians, has been set up. The multi-stakeholder body, called BESTARI, has facilitated negotiation of a payment scheme through draft regulations, allowing the communities to have a voice in the political arena and support legislation (field visit, January 2007). In A Luoi, pursuing CDM prompted discussions on how smallholders can be represented in carbon negotiations and sales, thereby increasing the smallholders' knowledge and empowerment (Doets 2007). The CAMPFIRE project in Zimbabwe also enhanced the communities' sense of ownership of their natural resources. Dialogue around the project contributed to higher confidence and skills in negotiating and managing conflicts (Frost and Bond 2006).

On a wider scale, recognizing the role environmental services play can provide a basis for supporting their rights. PES creates the opportunity for upland resource managers to be seen as part of the solution instead of just being the source of the problem. As noted earlier, this may happen where PES initiatives foster a shift in perspective from criticizing land users for deforestation or watershed degradation, to recognizing land managers for proper management of the land (John Kerr, personal communication, 14 December 2006).

Increasing the voice of the poor can also contribute to advances in other assets. Communities gaining greater visibility, for instance, may find it easier to attract funds for other activities. For example, villages that were involved in PES ecotourism initiatives found it easier to attract funds for health clinics from donors, and also in strengthening tenure claims with municipalities (Wunder 2005).

How does PES Interact with Existing Local Practices and Values?

Certain local practices or values are important to a community's social assets as they can promote community cohesion and cooperation. Support for natural and cultural heritage in PES schemes can in turn support such practices (Landell-Mills and Porras 2002). For example, local practices or values may be recognized by certifying traditional forms of production. This occurred in Latin America, with various programs involving organic farming, shade-grown coffee, ecotourism, and forest management certification (Rosa et al. 2003). Traditional institutions can also take on a role in facilitating and coordinating access to PES markets, as occurred in the Lingap Kalikasan case in Indonesia (Rosales 2003).

In other cases, social practices, such as caste, may contribute to social marginalization and need to be carefully negotiated as in any other rural development intervention (European Union et al. 2007). Concerns have also been raised by some researchers about the potential cultural impact of monetizing environmental services when, traditionally, nonfinancial values are placed on such assets (Landell-Mills and Porras 2002).

A summary of opportunities, constraints, and risks related to social and political assets is provided in Table 6.

Table 6: Summary of opportunities, constraints, and risks related to social and political assets

Opportunities	Constraints/Risks
<ul style="list-style-type: none"> • Strengthening/creating institutions to negotiate agreements can contribute to social capital in communities • Greater visibility and ability to attract funds for some activities • Protection of natural and cultural heritage improves recreation and cultural opportunities • Potential to incorporate and "certify" traditional (sustainable) forms of production 	<ul style="list-style-type: none"> • If collective decision-making processes are weak (lack of transparency, accountability), PES costs and benefits may be distributed inequitably • Erosion of social cooperation if there is conflict among participants or between participants and nonparticipants • Cultural impact of monetizing environmental services

Physical Assets

We now come to the last of our key asset bases—physical assets. It is important to look at these assets in the assessment of poverty outcomes because they enable the poor to gain access to other assets and services that may not be directly available within the local setting. These may be necessary to ensure better quality of life. For instance, roads allow remote communities to gain access to better health and education while water (e.g. irrigation), power, and communication infrastructure can improve livelihoods in a range of ways.

Does PES Stimulate Investment in Local Infrastructure?

PES schemes seem to present the potential to stimulate local infrastructure development (Landell-Mills and Porras 2002). Becoming involved in such programs might require improved infrastructure, such as transportation and relevant market infrastructure. In the Maasin Watershed project, Philippines, various infrastructures were put into place, including trails, fire lines, nursery units, lookout towers, and concrete dams. Additionally, as with tenure security and other benefits, infrastructure development may serve as the compensation or reward in itself. In the Makiling Forest Reserve, Philippines, upland farmers worked to protect the area's water sources in exchange for a pump donated by an NGO (Rosales 2003). In Cauca Valley, Colombia, the downstream water user associations implemented 'infrastructure programs' for the upland communities, where 72% of the poor farmers lacked sanitary facilities and 83% had no electricity. The programs improved sanitary and drinking water facilities, built roads, and constructed erosion control structures (WRI 2005).

Yet, some PES agreements may also require dismantling or discouraging local infrastructure in order to secure environmental services. This might occur if a community has to do away with roads that disrupt the provision of environmental services (Landell-Mills and Porras 2002).

A summary of opportunities, constraints, and risks associated with physical assets is provided in Table 7.

Table 7: Summary of opportunities, constraints, and risks associated with physical assets

Opportunities	Constraints/Risks
<ul style="list-style-type: none">Infrastructure development with community-level payments/rewards—transport, market infrastructure, research, health care, housing water supply, communications	<ul style="list-style-type: none">Inequality in infrastructure development so that only market participants benefitDismantling of local infrastructure, e.g. roads, to secure environmental services

5. CONCLUSIONS

While there is debate on the level of priority that should be given to poverty reduction within PES programs, it is imperative that proponents are aware of potential impacts in order to avoid adverse social outcomes. Further, PES schemes could usefully take up the identified opportunities to improve the accessibility of PES initiatives and to build the assets available to the poor. There are numerous examples of PES schemes contributing to the building of the financial, human, social/political, natural, and physical assets available to the poor. Awareness of these opportunities can assist us to design interventions that benefit the poor, the environment, and buyers of environmental services alike.

Our analysis of experiences relating to PES and poverty reduction shows that PES brings a number of opportunities, constraints, and even risks for the poor. PES is not alone in this regard. Many CBNRM and rural development activities more generally have experienced issues of elite capture and lost opportunities for the poor. How these factors ultimately play out will depend upon the design of specific PES mechanisms. It is therefore important to draw on the growing base of PES experience and lessons on benefit sharing and the design of pro-poor initiatives more widely in the design of future PES mechanisms.

The rural poor are not a homogeneous entity but diverse groups whose interests and assets differ according to their specific circumstances. The impacts of PES on the poor depend upon the interaction of PES schemes with the specific interests and assets of the heterogeneous groups that comprise the rural poor. The specific sources of social differentiation (e.g. caste, gender etc.) need to be understood within specific socio-political contexts, and at the household as well as community level. For the poorest people, who rely on common pool resources as a safety net, maintaining access to these resources is a critical concern in avoiding poverty. Those with a higher level of resource security may be able to work towards strengthening other assets to improve their circumstances over time.

A critical starting point is creating opportunities for the poor to access PES schemes. Clarifying and improving the security of property rights is an important part of this process. Experiences in Latin America and Asia suggest that even if such rights are limited (e.g. the land cannot be sold) opportunities to be involved in PES schemes might be expanded for the landless through PES agreements that focus on the commons rather than private lands. Furthermore, there is the opportunity to build on existing local natural resource management or community development bodies, as a way of reducing the transaction costs in reaching poor households and opening up opportunities for greater access to PES schemes by the poor.

Intermediary organizations have a critical role to play, particularly in facilitating access and benefit sharing. They can identify and mobilize users of environmental services who might be willing and able to pay for services; this is critical in setting up a PES mechanism, but is difficult for those with limited resources to accomplish. They can further help to improve the accessibility of PES schemes to the poor by sharing information on environmental service marketing opportunities, facilitating innovative ways to strengthen resource rights for the poor, and reducing the transaction costs of their participation. They can also strengthen the assets of the poor in various areas, particularly through training and knowledge management and strengthening and developing local institutions. Lessons from CBNRM might provide guidance on useful approaches to asset building as well as approaches and mechanisms that can guarantee equitable benefit sharing. Practical and inexpensive monitoring methods are another key area for development and capacity building. In order for intermediary organizations to play this local capacity-building role effectively, they need to strengthen their understanding of the linkages between PES and livelihoods, and their capacity to work with them.

We recognize that the assets and equity framework and the examples discussed here are a starting point based on limited case experience. Further evolution of the framework and its key questions could usefully occur as new cases come to light. There is a need for further research on whether particular assets have greater significance or potential in relation to PES, and whether different mechanisms and different environmental services provide particular constraints or opportunities in relation to the assets discussed in the framework.

Finally, we stress that PES schemes, at the very minimum, should ‘do no harm’ to the poor—the basic welfare and safety net functions provided by common resources must be secured. Beyond this, the role of PES in poverty reduction will depend not only upon how such schemes contribute to assets in the range of areas discussed here, but will also ultimately need a range of complementary strategies, not just PES. Such strategies might include regulation, enterprise development, and CBNRM. The poverty reduction potential of PES is perhaps best considered on a site-specific basis in the context of the other options available, to enable the most effective options for sustainable livelihoods and resource management to be supported in an integrated way.

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