

**Payments for Environmental Services:
A Survey and Assessment of Current Schemes**

By **Unisféra International Centre**

Karel Mayrand
Marc Paquin

For the **Commission for Environmental Cooperation of North America**

Montreal, September 2004

Preface

As part of its Environment, Economy, and Trade program, the CEC has explored in recent years new avenues for trade in environmental goods and services with the objective of informing the North American public on opportunities to green trade in North America. In 2003, it published a document, entitled *Market-based Mechanisms for Carbon Sequestration, Energy Efficiency and Renewable Energy in North America: What are the Options*, that examines the different market-based mechanisms that could be used to encourage the sequestration of carbon, increase energy efficiency, and support the development and use of renewable energy sources. In 2004, the CEC published *Greening Trade in North America: Shade-grown Coffee/Sustainable Palm/Renewable Energy*, a report reviewing existing schemes of payments for the provision of environmental services. The present report aims to complement this work by surveying payments for environmental services (PES) schemes in the Western Hemisphere.

Chantal Line Carpentier
Head, Environment, Economy and Trade Program
Commission for Environmental Cooperation

Table of Contents

LIST OF ACRONYMS	I
EXECUTIVE SUMMARY	II
INTRODUCTION	1
I. DEFINING THE PES CONCEPT	2
AN OVERVIEW OF ENVIRONMENTAL SERVICES	2
PAYMENTS FOR ENVIRONMENTAL SERVICES: DEFINITION AND RATIONALE	4
THE STRUCTURE OF PES MECHANISMS	5
MARKETS FOR ENVIRONMENTAL SERVICES	9
<i>Markets for Watershed Services</i>	10
<i>Markets for Carbon Sequestration</i>	12
<i>Markets for Biodiversity Services</i>	13
<i>Markets for Landscape Beauty</i>	14
<i>Markets for Bundled Services</i>	14
II. ASSESSING THE EFFECTIVENESS AND EFFICIENCY OF PES SCHEMES	15
IDENTIFYING BENEFICIARIES AND GENERATING DEMAND	16
GENERATING REVENUES FOR SERVICES PROVIDERS	18
ESTABLISHING SCIENTIFIC KNOWLEDGE AND VALUING ECOSYSTEMS SERVICES	21
UNDERSTANDING THE LEGAL AND POLICY ENVIRONMENT	22
<i>Regulatory and Fiscal Environment</i>	22
<i>Property Rights</i>	23
ESTABLISHING AN INSTITUTIONAL STRUCTURE	24
FINANCING THE PES SYSTEM	26
<i>International Sources</i>	27
<i>Government Subsidies</i>	27
<i>Charges and User Fees</i>	28
<i>Earmarked Taxes</i>	29
<i>Voluntary Payments and other Transactions</i>	29
MANAGING TRANSACTION COSTS	30
III. CONDITIONS FOR SUCCESS AND EMERGING BEST PRACTICES	32
THE STRENGTHS AND LIMITATIONS OF PES SCHEMES	33
DIVERSIFYING REVENUES FOR SUSTAINABLE LIVELIHOODS	34
GENERATING BENEFITS TO POOR COMMUNITIES	36
BUILDING CAPACITIES IN COMMUNITIES	38
CONCLUSION	39
APPENDIX I: LIST OF PES SCHEMES SURVEYED	41
BIBLIOGRAPHY	ERROR! BOOKMARK NOT DEFINED.

List of Acronyms

CBD	Convention on Biological Diversity
CRP	Conservation Reserves Program
EMAAP-Q	<i>Empresa Metropolitana de Alcantarillado y Agua Potable de Quito</i>
EPA	US Environmental Protection Agency
EQ	<i>Empresa Eléctrica de Quito</i>
ESPH	<i>Empresa de Servicios Públicos de Heredia</i>
Fonafifo	<i>Fondo Nacional de Financiamiento Forestal de Costa Rica</i>
Fonag	<i>Fondo Nacional del Agua de Ecuador</i>
GEF	Global Environmental Facility
ICMS-E	<i>Imposto sobre Circulação de Mercadorias e Serviços</i>
IPCC	Intergovernmental Panel on Climate Change
Minae	<i>Ministério del Ambiente y Energía de Costa Rica</i>
NGOs	Nongovernmental organizations
OCIC	<i>Oficina Costarricense de Implantación Conjunta</i>
PES	Payments for Environmental Services
Procafe	<i>Fundación Salvadoreña para Investigaciones del Café</i>
RISEMP	Regional Integral Silvopastoral Ecosystem Management Project
Semarnat	<i>Secretaría de Medio Ambiente y Recursos Naturales de México</i>
Sinac	<i>Sistema Nacional de Áreas de Conservación</i>

Executive Summary

Payments for environmental services (PES) are relatively new schemes seeking to support positive environmental externalities through the transfer of financial resources from beneficiaries of certain environmental services to those who provide these services or are fiduciaries of environmental resources. This report surveys PES schemes in the Western Hemisphere and analyzes the main differences and similarities between PES models as well as their strengths and limitations. In addition, the report identifies conditions for the success of PES schemes and highlights experiences that could emerge as best practices allowing PES to maximize their positive impacts both in terms of environmental and socioeconomic outcomes.¹

The basic principle behind PES is that resources users and communities that are in a position to provide environmental services should be compensated for the costs of their provision, and that those who benefit from these services should pay for them, thereby internalizing these benefits. There is no commonly agreed definition of PES schemes, but a series of classifications based on the type of environmental services, the geographical scope, the structure of markets, or the types of payments involved. This lack of common definition/classification reflects the great diversity of existing models. However, it also generates some confusion and lack of clarity in the literature as to which schemes should be considered payments for environmental services.

More than 300 PES schemes have been inventoried in the world. Most of them are recent or have been running for a few years only, and several PES schemes remain experimental in scope or are still in their pilot phase. Consequently, there are few empirical studies that document best practices and lessons learned. However, some initial lessons and emerging best practices have been documented. The survey of PES schemes conducted for this report shows that a multiplicity of models coexists and that no single one has so far emerged as a standard. Moreover, PES schemes are usually adapted to the very specific conditions under which they are established and to the specific characteristics of markets for different environmental services (watersheds, biodiversity, carbon sequestration, landscape beauty).

One finding of this report is that PES schemes may not constitute a cost-optimal instrument in all circumstances. Indeed, their success depends in great part from pre-existing conditions. PES systems work best when services are visible and beneficiaries are well organized, and when land user communities are well structured, have clear and secure property rights, strong legal frameworks, and are relatively wealthy or have access to resources.

PES schemes focus on those environmental services for which there is an existing market demand, or for which such demand can emerge under appropriate conditions. Over the

¹ The findings presented in this report are based on a survey of published and grey literature, as well as on selected interviews with PES specialists and practitioners. Twenty-five PES schemes in 15 countries were surveyed for this report.

last decade, the use of PES schemes for watersheds, biodiversity, carbon sequestration and landscape beauty has gained popularity. PES systems tend to work best when the value of environmental services is high for beneficiaries and the costs of providing services is low. Markets for environmental services differ in geographic scope, strength and structure of demand, the competitiveness, nature and price of commodities sold, and the number of transactions. Generally speaking, it appears from the review of markets for environmental services that local markets are often better defined than global ones, allowing a more precise definition and valuation of services. This can lead to more cost-optimal payments schemes that attribute value to services close to their marginal benefits.

Another finding of this report is that there is a built-in tension in PES schemes between the concurrent goals of effectiveness, efficiency and equity. The cost-efficiency of PES schemes is closely related to the transaction costs of the system. PES schemes therefore seek to minimize those costs. On the other hand, payments delivered under PES schemes are more effective when they are targeted and involve detailed management requirements. However, such an approach increases the transaction costs of the system. Furthermore, equity in PES schemes is better served by untargeted payments to small land users. This approach raises transaction costs by multiplying participants in the system and decreases the effectiveness of payments. There are, therefore, difficult trade-offs between cost-efficiency, effectiveness and equity involved in developing PES schemes.

The design of PES schemes plays a central role in guaranteeing their success. PES schemes tend to work best when they have the following characteristics:

- They are based on clear and consensual scientific evidence linking land uses to the provision of services;
- They clearly define environmental services to be provided;
- Their contracts and payments are flexible, ongoing and open-ended;
- Their transaction costs do not exceed potential benefits;
- They rely on multiple sources of revenues delivering money flows that are sufficient and sustainable in time;
- Compliance, land use changes, and the provision of services are closely monitored; and
- They are flexible enough to allow adjustments to improve their effectiveness and efficiency and to adapt to changing conditions.

Clearly, different PES schemes vary tremendously in these characteristics, as demonstrated by the multiplicity of experiments underway in the hemisphere. These PES schemes also face various difficulties and limitations, including the following:

- They are often based on scientific generalizations not supported by empirical studies;
- They are sometimes implemented in a context where they are not the most cost-effective method to attain the goals established;

- Service providers, users and the service itself are sometimes not properly identified;
- They are executed without a proper monitoring or control mechanism;
- The cost of environmental services are set arbitrarily and do not correspond to studies on demand and economic valuation of the resource;
- Their design is not based on previous socioeconomic or biophysical studies;
- They may offer perverse incentives to land users, or they may displace environmental problems or unsustainable land uses to surrounding areas;
- They depend largely on external financial resources; and
- Programs and activities are disseminated poorly among the local population.

Among the emerging best practices that can be identified, the diversification of revenues for communities involved in PES schemes through the creation of new markets for environmental goods and services (non-timber forest products, organic food, ecotourism) appears to be one of the most promising. PES schemes can play a significant role in supporting such diversification of revenues by including specific support measures for market development and revenue diversification in their compensation packages.

Another finding of this report is that PES schemes may not work effectively if poor communities, which are most dependent on the land for their livelihoods, are excluded from the system. Efforts must therefore be made to integrate these populations and extend the benefits of PES schemes to them. Several strategies can be put forward to maximize benefits to poor communities and minimize the chance that PES schemes further marginalize them:

- Clarify and strengthen land tenure;
- Create or strengthen cooperative institutions to reduce transaction costs;
- Define cost-effective and flexible payments mechanisms;
- Provide flexibility in eligible land uses;
- Facilitate access to start-up financing; and
- Invest in community capacity-building

Community capacity building is a key accompanying strategy to support revenue diversification and the generation of benefits for marginalized communities. However, capacity-building strategies are often lacking in existing PES schemes.

PES schemes have the potential to become very valuable transfer mechanisms to internalize positive environmental externalities, and to generate new revenues for sustainable development. This potential will be gradually fulfilled as markets for environmental services mature over time and as PES schemes become more financially sustainable. In addition, their positive effects on sustainable development will be maximized if their distributional impacts are considered and if concrete efforts are made to build capacities in poor and indigenous communities.

Introduction

Economic and market-based instruments have been used for pollution prevention and ecosystem conservation for several decades. Most of them try to prevent negative environmental externalities (for example, pollution or habitat destruction) through eco-taxes, charges or other tools based on the polluter-pays principle. In the last decade, new approaches have focused on the creation of positive environmental externalities through appropriate economic incentives, often in the form of subsidies or other environmental programs e.g., agro-environmental programs, for example.

Payments for environmental services (PES) are one of these new approaches seeking to support positive environmental externalities through the transfer of financial resources from beneficiaries of certain environmental services to those who provide these services or are fiduciaries of environmental resources. Over the last decade, the use of PES schemes for watersheds, biodiversity, carbon sequestration and landscape beauty has gained popularity.

Most PES schemes are relatively recent, with only a few being over five years old, and several PES schemes remain experimental in scope or are still in their pilot phase. Consequently, it is early to confirm the existence of best practices in this field. However, the accumulation of experience and the multiplication of schemes (more than 300 PES schemes were inventoried in 2002²) allow a preliminary assessment of the strengths and weaknesses of different markets for environmental services, of various PES models and of specific schemes that have been undertaken thus far.

The objective of this report is to survey PES schemes in the Western Hemisphere and analyze the main differences and similarities between models for them, as well as their strengths and limitations. In addition, the report suggests criteria to assess the effectiveness and efficiency of the PES approach, identifies critical conditions for the success of PES schemes and highlights experiences that could emerge as best practices allowing PES to maximize their positive impacts both in terms of environmental and socioeconomic outcomes.

The findings presented in this report are based on a survey of published and grey literature, as well as on selected interviews with PES specialists and practitioners. Twenty-five PES schemes in 15 countries were surveyed for this report. Table 1 shows their distribution in terms of environmental services involved and scope of market.³

² Pagiola, S. and G. Platais. 2002a. Market-based Mechanisms for Conservation and Development: The Simple Logic of Payments for Environmental Services. In *Environmental Matters—Annual Review*, July 2001–June 2002 (FY 2002). Washington, DC: World Bank’s Environment Department. p. 26.

³ A complete list of PES schemes surveyed is available in Appendix I.

Table 1: Distribution and scope of PES schemes surveyed by environmental services

Services		Scope	
Water	15	Local	21
Carbon	6	National	3
Biodiversity	9	International	4
Landscape beauty	2		
Bundled	1		

The report is divided into three sections. Section 1 provides a summary description of environmental services, and an analysis of the PES concept. Section 2 deconstructs PES schemes into their main components in order to assess conditions and elements that can influence their effectiveness and efficiency. Section 3 identifies conditions for the success of PES schemes. The study concludes with an assessment of the current state of development of PES schemes and of the conditions in which they are likely to perform best as policy instruments for reaching environmental and socioeconomic objectives.

I. Defining the PES Concept

Since 1961, tropical countries have lost over 500 million hectares of forest cover⁴ and the consumption of forest products has risen by 50 percent worldwide.⁵ This situation is leading to the loss of environmental services that play an important role in the livelihoods, economic development and health of populations all around the world. These services are generally unknown, poorly understood or simply taken for granted by policymakers, private firms or local communities. Consequently, they are seldom taken into consideration by markets, due to lack of consumer information or awareness, or to the absence of appropriate economic incentives that would influence the behavior of land users towards sustainable practices or conservation. PES schemes try to correct this market failure by internalizing benefits, thereby creating these missing incentives for the provision of environmental services. The first step in this perspective is to define what is meant by environmental services and which services can actually be internalized into market transactions.

An Overview of Environmental Services

The literature on environmental services and the way they influence human societies has been growing both in number and complexity in recent years. Several definitions have been put forward to describe and understand the interactions between the natural environment and human societies. PES schemes focus on those environmental services for which there is an existing market demand, or for which such demand can emerge

⁴ FAO. 2000a. *Global Forest Products Outlook Study*. Rome: Food and Agriculture Organization.

⁵ Gardner-Outlaw, T. and R. Engelman. 1999. *Forest Futures: Population, Consumption and Wood Resources*. Washington, DC: Population Action International.

under appropriate conditions. Existing services fall within four categories: water services, carbon sequestration, biodiversity conservation and landscape beauty. The Costa Rican forest law provides a definition of environmental services along the following lines:

*Those provided by forests and forestry plantations that have an impact on environmental protection and improvement. They are the following: mitigation of greenhouse gas emissions (fixing, reduction, sequestration, warehousing and absorption); protection of water for urban, rural or hydroelectric use; biodiversity protection to conserve it and for sustainable, scientific and pharmaceutical use; genetic research and improvement; protection of ecosystems, life forms and natural scenic beauty for tourism and scientific ends.*⁶

PES schemes focus on the environmental services provided by forests conservation, reforestation, and sustainable forest exploitation, as well as certain agroforestry or silvopastoral practices.

Water services are targeted under numerous PES schemes. The list of water services provided by forest ecosystems that are considered under existing PES schemes include:

- Water flow regulation: maintenance of dry season flows and flood control;
- Water quality maintenance: sediment load control, nutrient load control (e.g. phosphorous and nitrogen), chemical load control, and salinity control;
- Erosion and sedimentation control;
- Land salinization reduction/water table regulation; and
- Maintenance of aquatic habitats (e.g., maintaining water temperature, shading rivers/streams, ensuring adequate woody debris in water).⁷

Water services provided by forests are complex and often only partially understood. Forest services to watersheds depend on several site-specific factors, such as terrain, soil composition, tree species, vegetation mix, climate and existing management regimes. In addition, watersheds may experience seasonal, annual or multi-year fluctuations that make it virtually impossible to project and quantify the provision of specific levels of water services at any given time.⁸

⁶ Costa Rican Forest Law (Law 7575, Art.3, Clause k), as cited in Rosa, H. *et al.* 2003. Compensation for Environmental Services and Rural Communities. Lessons from the Americas and Key Issues for Strengthening Community Strategies. Fundación PRISMA. p. 19.

⁷ Landell-Mills, N. and L. Porras. 2002a. *Silver Bullet or Fools' Gold? A Global Review of Markets for Forest Environmental Services and their Impact on the Poor*. London: International Institute for Environment and Development (IIED). p. 112.

⁸ For a more detailed analysis of the linkages between land use and water, see: FAO. 2000b *Land-Water Linkages in Rural Watersheds Electronic Workshop–Synthesis Report*, Rome, FAO, 18 September–27 October. < <http://www.fao.org/ag/agl/watershed/watershed/papers/paperewk/pewrken/synthesis.pdf>>, consulted on 22 June 2004.

Biodiversity services are also frequently involved in PES schemes.⁹ Biodiversity can therefore be measured in terms of ecosystems, species and genetic diversity. The list of biological services that can be provided under PES schemes include the protection of ecosystems of particular value, natural habitats, species, genetic resources or others.

Carbon sequestration services are also involved in numerous market transactions in the world and are the focus of several PES schemes. Carbon sequestration occurs when trees or other vegetation absorb carbon contained in the atmosphere during their growth. Conversely, forest destruction releases carbon into the atmosphere. As a consequence, carbon sequestration may involve two types of services: active absorption through reforestation or avoided emissions through conservation of forest cover.¹⁰

Lastly, landscape beauty services are mostly associated with the aesthetic or cultural value given to specific sites. Landscape beauty services may involve the protection of natural heritage sites, coral reefs, cultural sanctuaries, or even traditional livelihoods as part of a combined cultural/environmental landscape protection approach. Few PES schemes involve the provision of such services, which are difficult to quantify and evaluate due to their cultural foundations. However, these services are increasingly introduced in PES schemes as cultural consciousness and the global tourist industry are growing.

Payments for Environmental Services: Definition and Rationale

By definition, environmental externalities—negative and positive—are not incorporated into the price of products or services that are sold in the market. Consequently, certain markets do not favor conservation or pollution prevention through appropriate price signals or other economic incentives. This situation generally leads to the growing destruction of natural capital or to unacceptable levels of pollution. The traditional response to this situation has been to introduce command and control measures in the form of laws and regulations on environmental protection, polluting emissions, human health or land use, among others.

Over the last twenty years, environmental regimes have evolved towards economic and market-based instruments that seek to internalize environmental externalities through appropriate price signals and incentive systems that may involve subsidies, fiscal policies, the creation of markets for polluting emissions and many other tools (Commission for Environmental Cooperation, 2003). At the other end of the spectrum, those who contribute to the provision of positive environmental externalities in the form of environmental services rarely receive compensation for the benefits they provide. The

⁹ The Convention on Biological Diversity (article 2) defines biodiversity as: "...the variability among living organisms from all sources including, *inter alia*, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems."

¹⁰ For more detailed analysis of forest services on watersheds, biodiversity and carbon fixation, see: Bishop, J. and N. Landell-Mills. 2002. "Forests Environmental Services: An Overview" in Pagiola, S. *et al.* 2002.

basic principle behind PES is that resource users and communities that are in a position to provide environmental services should be compensated for the costs of their provision, and that those who benefit from these services should pay for them, thereby internalizing these benefits.¹¹ From this perspective, the PES approach mirrors the polluter-pays principle by creating positive incentives to environmental protection and conservation.

In comparison to command and control strategies, PES schemes hold the potential to be more effective and cost-efficient. Indeed, enforcement of environmental command and control regimes rely on the existence of proper institutional and financial resources, which are often lacking in developing countries. In this context, regulatory approaches to conservation often miss environmental objectives due to the weakness of the environmental enforcement system and generalized noncompliance. PES schemes can work where regulatory approaches fail by creating an incentive system for conservation instead of a set of legal obligations that faces widespread noncompliance due to economic counterincentives and a lack of resources for legal enforcement.

In addition, it can be difficult, and sometimes impossible, to enforce conservation measures, land use regulations or specific agricultural or forest management practices upon poor communities who depend on resource exploitation for their livelihood. Regulatory approaches will sometimes hurt these populations by banning activities that are essential for their livelihoods and pushing them toward illegal survival patterns.

In comparison to state subsidies, PES can lead to more sustainable outcomes by generating a continuous flow of payments.¹² Moreover, PES schemes are likely to be more cost-efficient than the combination of regulatory approaches and subsidies, which require significant state resources to manage. By contrast, PES schemes usually rely on a lighter, flexible structure that can be self-supporting in the long run.

PES schemes are also potentially more effective, flexible and cost-efficient than the creation of traditional protected areas. They can be implemented where the creation of protected areas would be impossible due to socioeconomic or political considerations. They can also be easier to administer and allow for a more flexible range of land uses and extractive activities that will benefit both socioeconomic development and environmental protection.

The Structure of PES Mechanisms

There is no commonly agreed definition of PES schemes, but rather a series of classifications based on environmental services, structure, types of payments or others. This lack of common definition/classification reflects the great diversity of models, but also generates some confusion and lack of clarity in the literature as to which

¹¹ Pagiola, S. and G. Platais. 2002b. *Payments for Environmental Services*. Washington, DC: The World Bank Environment Department, Environment Strategy Notes (3). p. 2.

¹² Pagiola, S. 2002. "Paying for Water Services in Central America: Learning from Costa Rica" in Pagiola, S. *et al.* 2002c. *op. cit.* p. 38.

mechanisms should be considered payments for environmental services. PES schemes are commonly classified by type of services provided, but they can also be classified according to the type of payments/transactions they involve.¹³

However, all PES schemes share the objective of providing environmental services that are undersupplied due to the lack of compensatory mechanism, and to provide a mechanism by which services can be provided in a cost efficient manner over the long run. PES schemes seek to attribute a certain value to environmental services and establish appropriate pricing, institutional and redistribution systems that will lead to behavioral changes and sustainable and socially optimal land use practices.

PES schemes will tend to work best when the value of environmental services is high for beneficiaries and the costs of providing the services is low. However, they can also work when the value of services and the cost of their provision are both high, as long as the payments exceed the cost of providing the services.¹⁴ However, if the value of services and the cost of their provision are low, the transaction costs associated with a PES scheme might be higher than its value-added in terms of environmental benefits. In that case other solutions may be more cost-effective.

Rosa *et al.* describe the conventional approach to PES in the following way:

- It focuses on the use of economic instruments seeking the lowest possible costs for achieving environmental goals;
- It singles out environmental services (carbon sequestration, water regulation or filtration, or single species biodiversity);
- It shows a preference for simplified and large-scale ecosystems, preferably owned by few people, to reduce transaction and monitoring costs; and
- It seeks to secure private property rights and to reward landowners.¹⁵

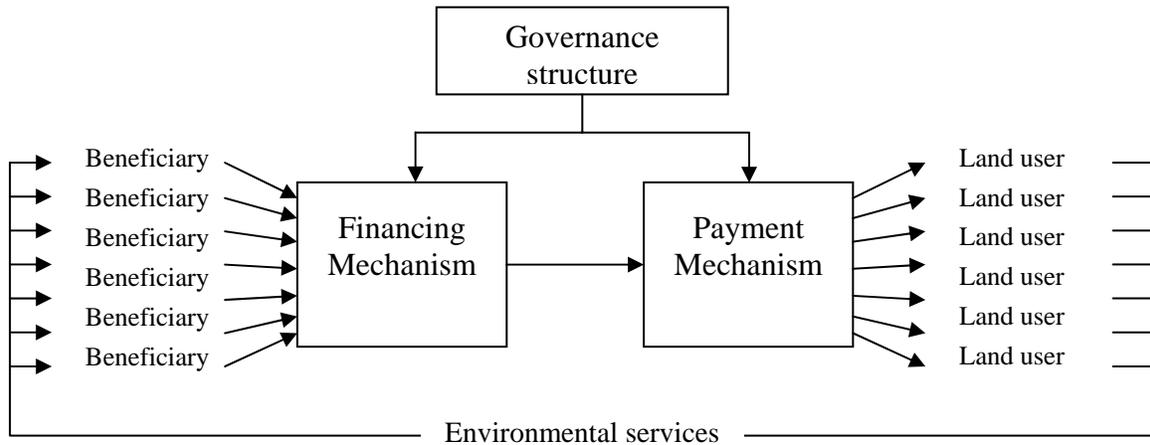
While each PES scheme is unique, most have a common basic structural design, as shown in Figure 1. This model is conceptually appealing for both its simplicity and its flexibility in various socioeconomic and environmental conditions. However, its application in real-world situations raises several challenges that are brought to light by a closer analysis of existing PES schemes.

¹³ Forest Trends developed a typology of four types of PES: public payments, private deals, cap and trade schemes, and ecolabeling of products or companies.

¹⁴ Alix J. *et al.* 2003. *Payment for Environmental Service: To whom, where and how much?* Guadalajara, Mexico: INE/CONAFOR/World Bank. p. 14.

¹⁵ Rosa, H. *et al.* 2002b. *Payment for Environmental Services and Rural Communities: Lessons from the Americas.* Tagaytay City, The Philippines: International Conference on Natural Assets, Political Economy Research Institute and Centre for Science and the Environment. p. 2.

Figure 1: Structure of PES Mechanisms



Source: Pagiola, World Bank, 2003.¹⁶

The first challenge in developing a PES scheme is to define, measure and quantify the environmental services (carbon sequestration, watersheds, biodiversity conservation or landscape beauty) that are to be generated under the system. This requires significant scientific knowledge as well as consultation with stakeholders in order to identify services that can attract participation from beneficiaries. The key is to identify which services are needed, by which beneficiaries and at which level.¹⁷

Beneficiaries can be local (for example, water users in the lower watershed), national (for example, state, NGOs or business associations) or international (international organizations, multinationals or international NGOs). There can also be a mix of local, national and international beneficiaries. The nature, number and origin of beneficiaries are directly related to the nature of environmental services generated under the PES scheme. Transaction costs are reduced if beneficiaries are few and well organized.

The establishment of a PES scheme also requires the creation of a financing mechanism that will gather and manage funds from beneficiaries. In theory, beneficiaries should not have to pay more than the value of the services to them. Assigning a proper value for environmental services therefore constitutes one of the main challenges in the establishment of PES schemes. This valuation process involves economic analysis as well as extensive consultations with beneficiaries in order to set up contributions that are both acceptable to them and sufficient to fund the PES system and the provision of needed environmental services. One key objective of PES schemes is to generate a stable and continuous flow of revenues that will ensure the long-term sustainability of the system. Revenues can originate from taxes, user fees, state subsidies, direct contributions, grants or loans by international institutions or donations by international NGOs or foundations.

¹⁶ Pagiola, S. and G. Platais. 2002b. *op. cit.* p. 3.

¹⁷ Bishop, J. and N. Landell-Mills. 2002. "Forests Environmental Services: An Overview," in Pagiola, S. *et al.* 2002. *op. cit.* p. 20.

A payment mechanism must also be designed to deliver funds to land users. In theory, payments given to land users should be enough to compensate for the cost of conservation and the opportunity cost of foregone land uses. Therefore, a balance is needed between the maximal payment that beneficiaries are willing to provide and the minimal payments that will ensure the provision of services by land users.

PES schemes allow for great flexibility in the design of payments: they can be based on the number of hectares that will be subject to land use changes or to specific land use practices; they can also be targeted to specific areas or practices or attributed according to very general criteria. More sophisticated, targeted payments will tend to be more effective, but less cost-efficient as they tend to increase transaction costs. In addition to direct payments, PES schemes can also provide non-monetary benefits to land users in the form of training, infrastructure or support for revenue diversification or market development.

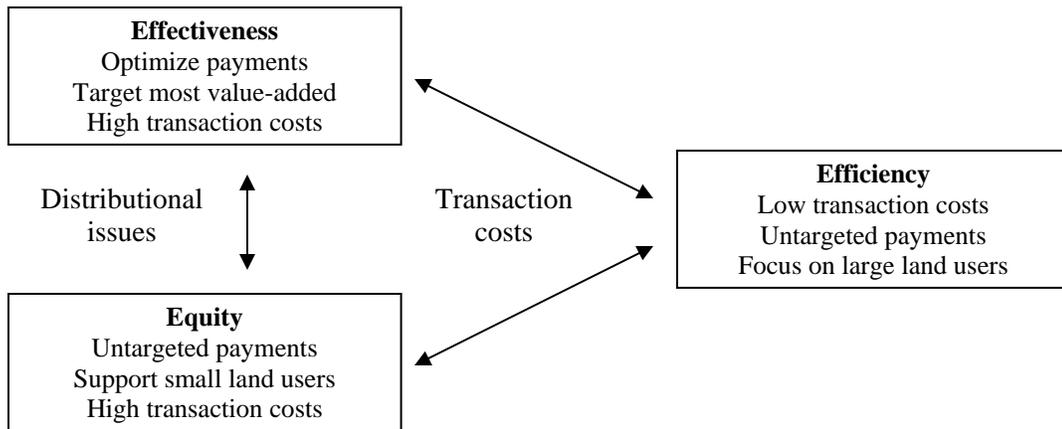
Transactions with land users are generally managed by a payment mechanism entity that signs contracts with land users establishing specific obligations in terms of land use, production of management plan, reporting, and so on. Contracts have a specific duration and may be renewable. In order to reduce transaction costs, land users may be permitted to negotiate collective contracts. PES schemes tend to favor collective negotiations with land user associations or cooperatives when land users are numerous. Given the significant transaction costs involved in meeting contractual obligations, PES schemes usually favor larger land users who benefit from economies of scale (unless smaller farmers are well organized in cooperatives and associations, as in some Mexican states).

One key challenge in establishing a PES scheme is to keep transaction costs low in order to optimize the use of resources collected from beneficiaries. The costs of establishing a PES system and managing its first transactions may be high. These costs may involve scientific research, consultations with land users and beneficiaries, assessments of current land uses and practices, contract design, implementation of a pilot phase, and so on. In addition to these initial costs, there are transaction costs associated with the maintenance of the system, such as monitoring, contracting, and managing payments. Some of these transaction costs can be transferred to land users, but the administrative costs falling upon users have to be low to ensure that they derive enough benefits to remain involved in the system.

As shown in Figure 2, there is a built-in tension in PES schemes between the concurrent goals of effectiveness, efficiency and equity. In order to be effective, payments need to be optimized and targeted to higher value land, this involves higher transaction costs and the risk of creating inequities since targeted payments are more costly to manage, and higher value land tend to belong to wealthy land owners. On the other hand, in order to be efficient, PES schemes need to reduce transaction costs. This can be done through untargeted payments focusing on large land users. This may be done at the expense of smaller, often poor land users, and of decreasing the effectiveness of PES schemes. Lastly, PES schemes will be more equitable (but less effective) if untargeted payments are used. Equity also involves supporting numerous, small land users and consequently

raising transaction costs. Figure 2 therefore shows the difficult trade-offs involved in developing PES schemes. These trade-offs will be addressed in more detail in the next section of this report.

Figure 2: Trade-offs in PES schemes



Monitoring is also important under PES schemes to ensure that services are generated and adjust payments or provide technical assistance when needed. Monitoring is important at three levels: implementation/compliance, impact on the generation of services and impacts on local users. Effective monitoring is essential to prove beneficiaries that their investments are generating land use changes. In addition, initial payments are usually established based on *ex ante* assessments of the costs associated with land use changes and of benefits generated. Good monitoring practices allow adjustments to payments and contributions to optimize the system.

Lastly, PES schemes have a governance structure that oversees their functioning, specifies eligible activities and payments levels, monitors impacts of land use changes and the provision of services, and adjusts eligible activities and payments, as appropriate.

Markets for Environmental Services

Markets for environmental services differ in geographic scope, strength and structure of demand, the competitiveness, nature and price of commodities sold, and the number of transactions. PES schemes have been established for the four types of environmental services identified at the beginning of this section. PES scheme are likely to be successful only if the nature of markets for the environmental services they are targeting is well understood.

One of the challenges in establishing PES schemes is to translate environmental services into commodities that can be sold to beneficiaries. This requires accurate information on the nature of the market, demand structure and value of services to beneficiaries.

Generally speaking, the more defined a commodity (and the more complex the service contract), the higher the transaction cost of the system, yet also the higher the potential price obtained on the market. Less defined commodities will be cheaper to manage but will obtain a lower payment. Therefore, the key is to find an optimal situation, balancing commodity precision and transaction costs. In any case, the success of the PES scheme requires a solid understanding of the markets for the environmental services to be sold.

Markets for Watershed Services

Markets for watershed services are usually local in scope with most transactions occurring at the watershed level. Markets for watershed protection usually do not involve trading commodities such as water quantity or quality, but rather financing land uses that are generating watershed benefits.¹⁸ Demand for water services mostly originates from downstream water users, including farmers, hydroelectric producers, and domestic water users in urban areas.¹⁹ Given the local nature of demand and the presence of a limited number of well-organized beneficiaries (e.g., water or hydroelectric utilities, irrigation commissions), it is relatively easy to mobilize downstream beneficiaries and involve them in PES schemes.

Watershed-based services are usually funded through user fees to finance improved management of the protected area upstream.²⁰ It is therefore essential to develop sophisticated hydrological models to link conservation practices with the generation of water quality and quantity services in order to make sure that the PES system is providing the services for which beneficiaries are paying.

A survey of 61 watershed-based payment schemes conducted by Landell-Mills and Porras (2002) found that these markets are more institutionalized and rely on a cooperative relationship between demand and supply rather than on competition among service providers and beneficiaries. This survey also found an increased willingness on the part of beneficiaries to pay for services, as awareness is growing on the importance of conservation in upper watersheds for the maintenance of water services.

The improved management of the upper watershed for the maintenance of water services is a strategy implemented in several countries in Latin America and the Caribbean, including Brazil, Colombia, Costa Rica, the Dominican Republic, Ecuador, Honduras and

¹⁸ Pagiola, S. *et al.* 2002. "Making Market-based Mechanisms Work for Forests and People," in Pagiola, S *et al.* 2002. *op. cit.* p. 264.

¹⁹ FAO. 2000b. *Land-Water Linkages in Rural Watersheds Electronic Workshop- Synthesis Report.* p. 16 <<http://www.fao.org/ag/agl/watershed/watershed/papers/paperewk/pewrken/synthesis.pdf>> consulted on 22 June 2004>.

²⁰ Pagiola, S. *et al.* 2003b. *Paying for the Environmental Services of Protected Areas: Involving the Private Sector.* Durban, South Africa, 8–17 September 2003: Fifth World Parks Congress: Sustainable Finance Stream. p. 2.

Panama.²¹ In most cases, the approach favored is the establishment of protected areas rather than the creation of PES systems to improve management practices among land users. However, watershed-based PES schemes are increasingly used and have been put in place in several countries, including the United States, Mexico, Colombia, Ecuador, Costa Rica, Honduras and Brazil.

One of the most famous examples is the system established by the city of New York to protect its drinking water sources. In the late 1990s, the city of New York increased water fees by nine percent to invest in the protection of the Catskill/Delaware and Croton Watersheds. This was done primarily through a land acquisition program and conservation easements that expanded the protected area within the watershed to 121,500 ha. In addition, farmers and forest producers received compensation under new programs to remove environmentally sensitive lands from production or to improve forest and land management practices.²²

Another well-known example is the *Fondo Nacional del Agua* (Fonag) in Ecuador. Fonag collects contributions from water users, including the water utility of the city of Quito and a hydroelectric power utility, to fund conservation practices in the upper watershed that provides drinking water for the city of Quito.²³ Also in Ecuador, the municipality of San Pedro de Pimampiro, in the province of Imbabura, is developing a pilot project aiming to protect drinking water sources by paying land users in the upper basin to improve forest management in the watershed.²⁴

In the Cauca Valley in Colombia, farmer associations initiated a PES system to address concerns regarding the sustainable supply of water for irrigation.²⁵ Since its inception, this scheme has led to the adoption of conservation measures in over one million hectares of land. The system annually raises US\$600,000 in revenues from water user fees.²⁶ Similarly, farmers in the Guabas River watershed in Colombia have negotiated an agreement with upstream land users to improve land use practices in order to maintain

²¹ World Bank and World Wildlife Fund Alliance for Forest Conservation and Sustainable Use. 2003. *Running Pure: The Importance of Forest Protected Areas to Drinking Water*. Washington, DC: World Bank and WWF. pp. 20–21.

²² For a detailed description of the New York City case, see *ibid.* p. 86–9. See also: Landell-Mills, N., and L. Porras. 2002b. *Silver Bullet or Fools' Gold? A Global Review of Markets for Forest Environmental Services and Their Impact on the Poor*. London: International Institute for Environment and Development. pp. 134–35.

²³ See Echevarría, M. 2002. “Financing Watershed Conservation: The Fonag Water Fund in Quito, Ecuador” in Pagiola, S. *et al.* 2002. *op. cit.* pp. 91–101.

²⁴ See World Wildlife Fund and Danida. 2003. *From Good-will to Payment for Environmental Services. A Survey of Financing Alternatives for Sustainable Natural Resource Management in Developing Countries*. pp. 107–9.

²⁵ Tsen, W. *et al.* 2002. *Payments for Environmental Services in Mexico*. Berkeley, University of California at Berkeley – Goldman School of Public Policy. p. 26.

²⁶ Landell-Mills, N. 2002c. *Marketing Forest Environmental Services—Who benefits?* London: Gatekeeper Series no.104, International Institute for Environmental and Development (IIED). p. 9.

dry-season water flows. The system is financed through additional charges for water use.²⁷

In the states of Paraná and Minas Gerais in Brazil, municipalities receive five percent of the state sales tax to finance upper watershed conservation programs to protect drinking water sources. This program has led to the conservation of one million hectares of land in the state of Paraná and over one million hectares in Minas Gerais.²⁸ Also in Brazil, São Paulo's water utility has agreed to contribute one percent of its revenues to fund conservation and forest restoration activities in the Corumbatai watershed.²⁹

In Mexico, Semarnat (*Secretaría de Medio Ambiente y Recursos Naturales*) has initiated PES pilot projects in six watersheds.³⁰ The first pilot project in Mexico was initiated in the Lerma Chapala Basin in 1995.³¹ Another pilot PES scheme for watershed protection is currently being developed in the Triunfo Biosphere Reserve in Chiapas. In Honduras, a PES scheme has been established in the El Escondido watershed to protect the drinking water source for the city of Santa Barbara, the second-largest in the country.³²

Markets for Carbon Sequestration

Carbon markets are essentially global in scope and most transactions involve international buyers. Markets for carbon sequestration services are well developed and highly competitive. This competition leads service providers to reduce transaction costs and to minimize the risk associated with the reliability of carbon credits.

The full deployment of a global carbon market is affected by uncertainty regarding the ratification of the Kyoto Protocol and the specific rules that will guide its implementation. This is affecting both the definition of carbon credits and their market price. These uncertainties are likely to disappear when the Kyoto Protocol enters into force and its rules are further defined. North America faces a unique situation in that context given that each of the three NAFTA parties has a different status under the Kyoto protocol, with the United States as a non-Party, Canada as an Annex I Party with emission reduction obligations, and Mexico as a Party without emission reduction obligations.

²⁷ Bishop, J. 2002. *Pro-poor Markets for Environmental Services: A New Source of Finance for Sustainable Development?* Presentation made at the World Summit on Sustainable Development, Johannesburg, August 28.

²⁸ May, P. H. *et al.* 2002. "Using Fiscal Instruments to Encourage Conservation: Municipal Responses to the 'Ecological' Value-added Tax in Parana and Minas Gerais, Brazil," in Pagiola, S. *et al.* 2002. *op. cit.* p. 177.

²⁹ Bishop, J. 2002. *op. cit.*

³⁰ Tsen, W. *et al.* 2002. *op. cit.* p. 1.

³¹ *Ibid.* p. 8.

³² Cohen, S. 2002. *Pro-poor Markets for Environmental Services: Carbon Sequestration and Watershed Protection.* Presentation made at the World Summit on Sustainable Development, Johannesburg, August 28.

Two environmental risks are associated with the creation of carbon markets: the risks of seeing tree plantations replace native forests or of financing conservation where no deforestation is occurring in the first place (the baseline issue). In the first case, carbon markets would create perverse incentives to deforest and afforest with monocultures that sequester carbon the most quickly, while in the second case, they would have no real value-added in terms of forest conservation, since the forests were protected without payments. Carbon sequestration projects must therefore be carefully defined to avoid such perverse outcomes.

In their survey of PES schemes, Landell-Mills and Porras (2002) reviewed 75 examples of payments for carbon sequestration services and showed that the market was rapidly evolving on multiple trading platforms, with transactions occurring at various levels (regional, national, international) despite persistent uncertainty about the Kyoto Protocol entering into force. While PES schemes involving carbon trading are too numerous to summarize in this report, a few examples are provided to illustrate how such schemes are implemented.³³

In Chiapas, Mexico, the Bioclimatic Fund was established to manage funds collected under the Scolel Té project, a carbon sequestration scheme based on agroforestry practices. More than 300 coffee and corn farmers participated in the project by planting trees on 20 percent of their land parcels on average to absorb carbon.³⁴ In Bolivia, The Nature Conservancy, along with the Bolivian government, Amigos de la Naturaleza, and US-based energy companies, have developed the largest forest-based carbon project in the world (600,000 ha) to sequester 26 million tons of carbon over 15 years in the Noel Kempff Mercado National Park at a cost of US\$9.6 million.³⁵ In Argentina, the German Development Agency (GTZ) agreed to invest in a project to generate carbon offsets in La Plata/Fontana. Under this project, 120,000 ha of native forests will be protected to sequester 12.6 million tons of carbon.³⁶

Markets for Biodiversity Services

Markets for biodiversity services exist at a local, national and international scale. They can therefore resemble carbon or watershed markets, or a mix of both. The diversity of biodiversity services generates a multiplicity of demands that increase the complexity of creating payments systems. As is the case of watershed services, biodiversity services are not sold directly. Instead, specific land uses that are thought to protect species, ecosystems or genetic diversity are sold.³⁷

³³ Landell-Mills, N. 2002. *op. cit.*

³⁴ Rosa, H. *et al.* 2003. Compensation for Environmental Services and Rural Communities. Lessons from the Americas and Key Issues for Strengthening Community Strategies. PRISMA. p. 27.

³⁵ Cohen S. 2002. *op. cit.*

³⁶ Landell-Mills, N. 2002. *op. cit.* p. 7.

³⁷ Pagiola, S. *et al.* 2002. "Making Market-based Mechanisms Work for Forests and People," in Pagiola, S. *et al.* 2002. *op. cit.* p. 264.

Demand for biodiversity conservation is sometimes local but more often global. International organizations, foundations and conservation NGOs are major buyers of biodiversity conservation services. Pharmaceutical companies are also involved in markets for biodiversity services. The value of biodiversity conservation services is difficult to establish. For example, certain biodiversity services—such as those arising from bio-prospecting—are sometimes based on the option value of future discoveries. In this context it is difficult to value services and match demand with supply.³⁸

Landell-Mills and Porras (2002) surveyed 72 payments schemes for biodiversity services and showed that these markets are nascent and in many cases experimental. For example in Brazil, rubber tappers receive payments for forest conservation services they provide through their management of forest resources.³⁹ In Guyana, Conservation International signed an agreement with the government for a conservation concession in 200,000 acres of forest.⁴⁰ In the United States, the Conservation Reserves Program (CRP) consists of 10–15 years contracts with farmers to remove sensitive land from production and prevent land degradation, thereby preserving future biodiversity.

Markets for Landscape Beauty

Markets for landscape beauty are the least developed of all markets for environmental services. There is both a national and international demand for these services. The ecotourism industry is potentially one of the main beneficiaries, and thus demanders, of landscape beauty services. So far governments have been the main suppliers of landscape beauty services through the creation of protected areas or the protection of natural or cultural heritage sites.⁴¹ However, landscape beauty services are increasingly provided by local communities and indigenous people since the concept of landscape beauty can also include cultural practices, traditional land uses or architectural features.

Landell-Mills and Porras' (2002) survey of PES schemes included 51 experiences in payments for landscape beauty. They found that this market was immature and characterized by significant constraints, including a lack of willingness from the ecotourism industry to pay for the provision of those services, and an absence of sophisticated payments mechanisms.

Markets for Bundled Services

Bundled services are found where different services are sold from a single land area. Markets for bundled services share features with markets for environmental services that

³⁸ Bishop, J. and N. Landell-Mills. 2002. "Forests Environmental Services: An Overview" in Pagiola, S. *et al.* 2002. *op. cit.* p. 20.

³⁹ See Rosa, H., and S. Kandel. 2002c. *Payments for Environmental Services: Brazil*. Ford Foundation and Fundación PRISMA.

⁴⁰ Landell-Mills, N. 2002. *op. cit.* p. 5.

⁴¹ Landell-Mills, N. and L. Porras. 2002b. *op. cit.* p. 158.

are incorporated in the bundle. The services can be sold in merged bundles (in which case it is impossible to separate the services) or in shopping basket bundles (where specific services can be bought and land users sell different services to buyers).

Merged bundles are easier to manage and reduce transaction costs in the PES scheme. However, they are less effective since merging services makes it impossible to target payments to individual services. The shopping basket approach is therefore better designed to maximize returns, but also more complex to manage and more costly.

Landell-Mills and Porras (2002) surveyed 28 cases of PES schemes selling bundled services and found that they can bring added revenues to land users, but that such an approach is more complex to set up since it involves dealing with several services at the same time. For example, it may be difficult to establish new forest management approaches and techniques that will optimize the production of several services. The bundled services approach was used by The Nature Conservancy in Belize, Bolivia, Costa Rica and Paraguay to bring additional revenues for biodiversity protection by promoting the sale of carbon offsets in biodiversity-rich locations. It was also used by Costa Rica's national power and light company and Norwegian partners to purchase watershed protection and carbon sequestration services.⁴²

Generally speaking, it appears from the review of markets for environmental services that local markets are often better defined than global ones, allowing a more precise definition and valuation of services. This can lead to more cost-optimal payments schemes that attribute value to services close to their marginal benefits.⁴³ In addition, it may be easier to generate long-term recurrent payment streams in watershed-based markets which are local by nature, than for biodiversity conservation or carbon markets, which are mostly based on international, one-shot deals. Overall, each market is characterized by its own set of strengths and limitations and the way PES schemes adapt to these features is key to their success.

II. Assessing the Effectiveness and Efficiency of PES Schemes

Several features of PES schemes may affect their effectiveness (ability to reach the environmental goal) or efficiency (cost at which the goal is achieved). This section attempts to deconstruct PES schemes into their various components to see how each one can have an impact on their effectiveness and efficiency. Examples are provided to illustrate these positive or negative impacts. The analysis conducted in this section also aims to identify some of the main strengths and limitations of PES schemes based on the current experience.

⁴² Landell-Mills, N. and L. Porras. 2002b. *op. cit.* p. 185.

⁴³ FAO. 2003. *Payment Schemes for Environmental Services in Watersheds*. Arequipa, Peru, 9–12 July: Regional Forum. p. 1.

Identifying Beneficiaries and Generating Demand

The creation of PES schemes is only possible if there is a demand for an environmental service. Therefore, the first task in establishing PES schemes consists in identifying who are the beneficiaries of environmental services and which ones are willing to pay for the provision of services. This requires a clear definition of environmental services and a careful assessment of existing demand for those services. It is easier to convince beneficiaries to participate in a PES scheme when the costs and benefits of environmental services are visible and quantifiable. Generally speaking, beneficiaries will be more inclined to pay for very specific services, as opposed to general conservation services. In identifying beneficiaries, it is also important to identify potential free riders that could benefit from the provision of services without contributing in the PES system. This may affect contributors' support for the PES scheme and/or lead to their withdrawal from the scheme.

Watershed services are visible and relatively easy to quantify, and the demand is usually easy to identify given that the services are provided within a watershed. So far, payments in watershed PES schemes have been based on the area to be protected and on specific land use practices rather than on the generation of specific and quantifiable levels of water services.⁴⁴ In the long run, this may negatively affect the support of beneficiaries for the system, since the linkages between the services they are paying for and the benefits they receive are at best indirect. This problem can be avoided by establishing baselines and closely monitoring the effects of land use changes on the provision of environmental services.

In the case of biodiversity services, it may be more difficult to identify beneficiaries who are willing to pay for the protection of ecosystems, species, or genetic diversity. So far demand has mostly originated from international conservation organizations and the Global Environmental Facility (GEF). The most important limitation in that context is that financing may be provided in the form of one-shot deals that do not provide a continuous flow of payments over time. Therefore, there is a significant risk that land users revert to past practices once they cease receiving payments. In addition, payments by international organizations are not necessarily based on the value of environmental services. This may reduce the efficiency of the PES scheme by substituting bureaucratic resources allocation criteria to a comprehensive services valuation process.

Carbon sequestration services are relatively well-defined and global in scope, with most demand originating from private firms in Europe and Japan. However, the price and value of services is still subject to much uncertainty, given the current status of the Kyoto Protocol. This raises the risk associated with this market and contributes to limiting demand for carbon sequestration services. Nevertheless, international organizations, private firms, governments and conservation NGOs are all active in this market.

⁴⁴ Pagiola, S. 2002. "Paying for Water Services in Central America: Learning from Costa Rica," in Pagiola, S. *et al.* 2002. *op. cit.* p. 48.

Demand for environmental services can exist and yet no transactions take place due to a series of factors, including the following:

- Lack of scientific evidence;
- Existence of cheaper substitutes;
- Lack of regulatory framework;
- Co-ordination problems;
- Inadequate participation;
- Cultural resistance; and
- Lack of finance.⁴⁵

In all these situations, there can be beneficiaries of environmental services, but the benefits they receive may not translate into an explicit demand. In these situations, specific interventions by the state or other intermediaries may be needed to transform this implicit demand into an explicit willingness to pay for environmental services. These interventions may include stakeholder consultations, information sessions, institution creation, financial support or technical training.

Markets for environmental services can also arise from policy-related or regulatory drivers. New regulations, user fees or fiscal incentives may be introduced to create a new set of incentives that will drive the development of a market for environmental services. For example, a new regulation introduced by the US Environmental Protection Agency (EPA)—the Surface Water Treatment Rule—forced New York City to consider various options to comply with the regulation at the lowest cost possible. After analyzing the relative costs of building a new water treatment plant and other land management alternatives, the city eventually established a broad system of payments to improve the management of the Catskills watershed from which it is obtaining its drinking water. The creation of a PES system allowed the city to comply with the new EPA regulation at one-fifth of the cost of building a new treatment plant.

In that case, new drivers coexist with uncertainty about the ratification of the Kyoto Protocol and the creation of a global carbon-trading scheme. This creates a complex situation in which incentives and risks are pulling in different directions, thereby slowing the development of a full-scale carbon market.

International and regional conventions can also drive the creation of markets for environmental services. Markets for carbon sequestration services are also developing in close relation with regulatory drivers that are linked to national GHG emission reduction plans or to the implementation of the Kyoto Protocol. Another example comes from the Convention on Biological Diversity (CBD) and the *Convenio para la Conservación de la Biodiversidad y la Protección de Áreas Silvestres Prioritarias en América Central*, which led to the creation of the Mesoamérica Biological Corridor. This initiative attracted demand for biodiversity conservation from international organizations such as the Global

⁴⁵ Landell-Mills, N. and L. Porras. 2002b. *op. cit.* p. 215.

Environmental Facility (GEF) and led to the creation of a PES scheme supporting the conservation objectives of the biological corridor initiative.⁴⁶

Generating Revenues for Services Providers

PES schemes must generate a sufficient and sustainable flow of revenues to land users to make sure that they implement and maintain land use changes that will generate needed environmental services. Payments under PES schemes must therefore be ongoing—as opposed to one-time payments—and be open-ended to allow them to last over time.⁴⁷ Also, as mentioned before, the level of payments must be high enough to cover the costs of implementing new land use practices and the opportunity costs of foregone land uses.

While this seems simple in theory, it is far more complex to set an optimal payment in practice, especially when scientific knowledge and valuation methodologies are incomplete. In addition, payments are also established according to complex negotiation and consensus-building processes involving all stakeholders. The outcomes of these processes play a central role in determining the level of payments.⁴⁸

It can be especially difficult to compensate the opportunity costs of conservation when there are several competing land uses in a region where a PES scheme is implemented. For example, one study conducted in three regions of Costa Rica found that payments were not high enough to compensate land users for the costs of forgone alternative land uses such as dairy farming, export-oriented agriculture, or urbanization.⁴⁹ In such a situation, PES schemes may not obtain optimal results if they do not provide sufficient incentives to abandon alternative land uses. In that case, an important proportion of land users did not enroll in the PES scheme due to the higher revenues obtained from other productive land uses.

Different types of compensations can be offered to land users. In addition to monetary payments, PES schemes can also provide compensation packages that will include other benefits. Recent experience in PES schemes seems to show that it is preferable to support a mixed approach in the form of compensation packages combining monetary payments and other benefits ranging from access to credit, capacity building, information and other collective or individual services.⁵⁰ These non-monetary benefits seem to be highly valued by participants and are key in ensuring the sustainability of land use changes.

Payments must also be flexible in terms of eligible activities and allow various sustainable land use practices instead of restricting payments to forest conservation activities. An approach focusing only on conservation may be detrimental to poor

⁴⁶ Esquivel, M.R., and O. Segura Bonilla. 2002. *El Pago de Servicios Ambientales en Centro América*. Heredia : Centro Internacional de Política Económica para el Desarrollo Sostenible (CINPE). pp. 1-2.

⁴⁷ Pagiola, S. and G. Platais. 2002b. *op. cit.* p. 3.

⁴⁸ Rosa, H. *et al.* 2003. *op. cit.* p. 57.

⁴⁹ Miranda, M. *et al.* 2004. *The Socioeconomic Effects of Carbon Markets in Costa Rica. A Case Study of the Huertar Norte Region*. London: IIED. p. iii.

⁵⁰ Rosa, H. *et al.* 2003. *op. cit.* p. 52.

communities that need to maintain certain land uses to support their livelihoods. It may therefore be preferable to support sustainable agroforestry or silvopastoral practices that can maximize environmental benefits as well as economic benefits for poor communities.

For example, in a country such as El Salvador with high population density and high pressure on land and resources, conservation may not be a realistic option for land users. In that context, PES systems in Salvador focus on improvements in land use practices such as silvopastoral practices and agroforestry that generate environmental services while maintaining land under production.⁵¹ An illustration of this approach is the Regional Integrated Silvopastoral Ecosystem Management Project (RISEMP) in Costa Rica, Colombia and Nicaragua that pilots the use of PES to promote the adoption of silvopastoral practices in degraded pasture areas.⁵² On the opposite, Fonafifo's approach in Costa Rica has been criticized for focusing on forest conservation and not including other land uses.⁵³

The creation of perverse incentives must also be avoided when elaborating the payment structure. For example, payments compensating reforestation activities, but not the conservation of existing forest cover, may create an incentive to cut down or burn forests to undertake reforestation activities and obtain payments. The risk of creating this type of perverse incentives is always present and must be carefully considered in the design of payments.

In order to be as effective as possible, payments must be targeted to specific land uses and/or specific areas. This is necessary to make sure that PES schemes generate services where most needed. PES can target highest value lands and land uses according to their contribution to environmental services and establish rates accordingly. However, targeting payments to optimize their cost-effectiveness also means raising transaction costs associated with monitoring and overall management of the payment system.

So far it has proved easier in existing PES schemes to raise funds than to control the land use practices that are associated with payments for environmental services. This has created a tendency to develop simple conservation payments that are less costly to manage but also less cost-effective. For example, in Costa Rica, 70 percent of PES resources are allocated for "forest conservation" and all participants are paid on the same basis.⁵⁴ This approach is simple to manage but it fails to discriminate between different land use changes and agricultural practices. However, the Costa Rican system has been moving away from untargeted payments towards a criteria-based system of payments.

⁵¹ Pagiola, S. 2002. Paying for water services in Central America: Learning from Costa Rica," in Pagiola, S. *et al.* 2002. *op. cit.* p. 58.

⁵² See Pagiola, S. *et al.* 2004. *Paying for Biodiversity Conservation Services in Agricultural Landscapes.* Environment Department Paper No. 96. Environmental Economics Series. Washington, DC: World Bank, May.

⁵³ See Rojas, M., and B. Aylward. 2003a. *Initiatives Based on Payments and Markets for Environmental Services in Costa Rica.* London: International Institute for Environment and Development (IIED), Environmental Economics Program (EEP). Consulted at <<http://www.iied.org/eep/pubs/documents/MES2.pdf>>, on 21 January 2004.p. 97.

⁵⁴ Rosa, H. *et al.* 2003. *op. cit.* p. 60.

While all landowners used to be eligible to participate in the PES scheme, Costa Rica is now refining its approach by linking specific revenue sources to specific services. For example, hydroelectric power producers finance conservation in their own basin, and GEF funding is channeled to lands with high biodiversity interest.⁵⁵ This allows beneficiaries to invest in land use changes that directly impact upon them.

The RISEMP project in Costa Rica, Nicaragua and Colombia distinguishes between different land uses and adapts payments accordingly. However, the task of setting appropriate differentiated payments is complex, especially when selling bundled services. Under the RISEMP project, a list of land uses was prepared with a pointing system on which payments are based. Two indices were developed: one for carbon sequestration and one for biodiversity conservation. Payments are based on an aggregation of scores obtained under those two indices.⁵⁶ The RISEMP system allows for highly targeted payments but its transaction costs are higher than for schemes working with simple undifferentiated payments.

Payments offered to land users in the Pimampiro watershed in Ecuador are also differentiated. They distinguish between different categories of land in establishing payments per hectare, with at one end primary forests and unexploited land receiving the highest payments and at the other end degraded land or livestock/agricultural land not eligible for payments.⁵⁷

As mentioned earlier, targeted payments tend to create distributional inequities and benefit land users with higher land value, which tend to be the wealthiest ones. One simulation conducted in Mexico according to various payments scenarios came to the conclusion that there can be significant trade-offs between efficiency and equity in the setting up of PES systems. This report showed that a pure cost-benefit approach would reinforce inequities within Mexican *ejidos*.⁵⁸

One last observation about payments to land users is that they must be well distributed in time. First, land users may need substantial up-front payments to cover the costs associated with the elaboration of management plans and investment made to implement them. This may require higher up-front payments and lower periodic payments over the duration of contracts. Moreover, delays in payments can affect the credibility and effectiveness of PES system.⁵⁹ It is therefore essential to make sure that the payment mechanism is efficient and timely.

⁵⁵ Pagiola, S. 2002. "Paying for Water Services in Central America: Learning from Costa Rica" in Pagiola, S. *et al.* 2002. *op. cit.* p. 53.

⁵⁶ Pagiola, S. *et al.* 2004. *op. cit.* p. 14.

⁵⁷ Echevarría, M. *et al.* 2002. *Impact assessment of watershed environmental services: Emerging lessons from Pimampiro and Cuenca in Ecuador*. London: International Institute for Environment and Development (IIED). p. 27.

⁵⁸ Alix, J. *et al.* 2003. *op. cit.* p. 24.

⁵⁹ Miranda, M. *et al.* 2004. *op. cit.* p. iii.

Establishing Scientific Knowledge and Valuing Ecosystem Services

As mentioned in the first section of this report, environmental services are numerous. They may be poorly understood and difficult to measure or to link with specific land uses. In addition, various types of conservation approaches or productive land uses are compatible with the provision of the same environmental services.⁶⁰ In this context, the establishment of PES schemes requires a basic understanding of how environmental services are generated, either through natural or managed ecosystems. PES schemes, therefore, require reliable scientific knowledge of landscapes and of the relationship between land uses and the provision of environmental services.

However, if good science is a basic requirement for the establishment of PES schemes, it is also costly to collect accurate data and to develop a sufficient knowledge base to feed the elaboration of a PES scheme. The costs of acquiring this knowledge are among the most important startup costs for PES schemes. Moreover, the maintenance of a credible PES system requires constant updating of data, information and knowledge. There are, therefore, clear trade-offs between the extent of data collection and scientific analysis needed for the development of a PES scheme and its transaction costs.

The costs associated with scientific knowledge are often too high to absorb locally, and external organizations are frequently needed to finance or directly conduct preliminary scientific research. In the absence of such support, some PES schemes may be established based on an incomplete, imprecise and sometimes inaccurate understanding of the relationships between land uses and the provision of services. In that context it may be to set up an efficient PES scheme since there is no way of quantifying services provided to establish optimal payments, of measuring the differentiated impacts of various land uses or conservation practices or of measuring the provision of environmental services.

The complexity and reliability of scientific knowledge varies according to the specific environmental and biophysical characteristics of the targeted land area. It also varies from one environmental service to another. For example, one weakness of watershed-based PES schemes is the lack of clear, solid information linking specific land uses with the provision of water services.⁶¹ The land use-carbon relationship is generally considered easier to measure and quantify. It is also characterized by more stability and predictability since carbon sequestration is a well-understood, well-documented process. Lastly, the relationship between forests and biodiversity tend to be better documented than those between forests and water services. This facilitates the creation of biodiversity-related PES by reducing the costs associated with scientific research.

Developing appropriate frameworks to value environmental services can be a significant challenge, even in presence of accurate data and good scientific knowledge. This exercise needs to be done as precisely as possible to ensure the optimization of PES. It is also

⁶⁰ Scherr, S. *et al.* 2004. *A New Agenda for Forest Conservation and Poverty Reduction. Making markets Work for Low-income Producers.* Washington, DC: Forest Trends. p. 40.

⁶¹ Pagiola, S. *et al.* 2002. "Making Market-based Mechanisms Work for Forests and People," in Pagiola, S. *et al.* 2002. *op. cit.* p. 264.

essential to understand the limitations of economic valuation techniques and to develop alternative valuation approaches that incorporate non-market value in developing a services valuation framework. Despite highly sophisticated techniques, the value of some ecosystem services might be difficult to quantify in monetary term. This is especially true for such services, as landscape beauty or biodiversity, which are essentially cultural in nature. Economic valuation methodologies often fail to incorporate cultural, value-based, traditional or other variables in the valuation process. Most valuation models will lose the essence of these variables in translating them into the concepts of taste and preferences.

Another limitation of traditional economic valuation of environmental services is that it voluntarily tries to isolate elements of ecosystems to quantify their incremental value. Such an approach tends to undervalue the multifunctional aspect of complex socio-ecological landscapes.⁶² However, expanding valuation processes from traditional targeted valuation techniques to an integrated landscape approach may significantly increase the complexity of the process.

Understanding the Legal and Policy Environment

Regulatory and Fiscal Environment

In setting up PES schemes, it is essential to assess the existing regulatory and fiscal environment. This is important to make sure that the newly created system will not run into regulatory or fiscal hurdles that would affect its development and/or reduce its effectiveness or attenuate its positive impacts. Regulatory and fiscal reforms to remove existing policy distortions and counter-incentives to conservation or sustainable land uses may therefore be a prerequisite to the creation of a PES scheme.

For example, perverse subsidies in the form of free or unregulated access to resources or regressive pricing mechanisms must be identified and reformed prior to the creation of the PES system market. Otherwise, these counter-incentives distort market signals and may considerably reduce the effectiveness and efficiency of the PES system.

While it is not essential to adopt specific laws for the creation of PES schemes, it may be useful to modify the regulatory framework and/or fiscal policies to support the development of PES schemes. The forest law reforms undertaken by Costa Rica in the 1990s provide a good example of the central impact that regulatory and fiscal reforms can have on the development of a PES scheme. In 1997, the Costa Rican Forestry Law was amended to allow land users to receive payments for specified land uses, including new plantations, sustainable logging, and conservation of natural forests. In addition, the Costa Rican Forest Law specifically recognized four types of environmental services: carbon sequestration, biodiversity conservation services, hydrological services, scenic

⁶² Rosa, H. *et al.* 2003. *op. cit.* p. 64.

beauty and ecotourism.⁶³ The law also introduced a new fuel tax to finance forest conservation and established Fonafifo to raise funds and manage the PES scheme.

In a similar manner, a regulatory reform introduced in Ecuador in 1999 allowed public enterprises to allocate resources to privately constituted financial mechanisms. This regulatory change allowed the *Empresa Metropolitana de Alcantarillado y Agua Potable de Quito* (EMAAP-Q) and the *Empresa Eléctrica de Quito* (EEQ) to allocate resources to the newly constituted *Fondo Nacional del Agua* (Fonag), the financial mechanism created to manage the PES scheme in the watershed providing water to the city of Quito.⁶⁴

Policy reforms can also be instrumental in the development of PES schemes. The Ecuadorian National Biodiversity Policy considers markets for environmental services within Ecuador's ecosystems as a means of protecting these ecosystems and recommends the establishment of the following instruments:

- A payment system for the protection of mountainsides, provision of water from forests, and protection of coasts;
- Payment for environmental services on public and private lands (including in the National Protected Areas System), for the provision of water for hydroelectric plants, irrigation and human use; erosion control and global climate change services (for example, carbon sequestration);
- An adequate compensation system to landowners, whether individuals or communities, for the lands that generate the services;
- Investment in the protection and maintenance of lands in order to ensure the continuity and quality of the environmental service;
- Investment in the social development of the communities within or around the lands in question.⁶⁵

This new policy framework can support the development of multiple PES schemes in the country.

Property Rights

Property rights play a central role in the establishment of PES schemes. Deforestation and overexploitation of forest resources are often related to insecure tenure or unclear property rights. Land tenure reform may therefore be one of the best strategies to address the overexploitation of resources. In addition, the existence of strong and undisputed tenure is a prerequisite for the creation of a successful PES scheme. In absence of strong tenure, PES schemes may exacerbate conflict over resources or simply be ineffective in

⁶³ Pagiola, S. 2002. "Paying for Water Services in Central America: Learning from Costa Rica," in Pagiola, S. *et al.* 2002. *op. cit.* p. 40.

⁶⁴ Echevarría, M. 2002. "Financing Watershed Conservation: The Fonag Water Fund in Quito, Ecuador," in Pagiola, S. *et al.* 2002. *op. cit.* p. 95.

⁶⁵ Source: Ecuadorian *Ministerio del Ambiente* (2000) and Llaguno (2002) cited in Echevarría, M. *et al.* 2002. *Impact assessment of watershed environmental services: Emerging lessons from Pimampiro and Cuenca in Ecuador*. London: International Institute for Environment and Development (IIED). p. 13–14.

addressing the root causes of overexploitation. The distribution of payments to land users can also be problematic when property and access rights are not well defined.

There are several different constituting elements of property rights and their specific implementation may vary among countries. The conceptual scheme for common property rights regimes proposed by Schlager and Ostrom provides a valuable framework for exploring the relationships between property rights, ecosystem management and livelihoods. These authors break down property rights into a series of rights according to the authority they grant:

Access: The right to enter a defined physical property and enjoy non-extractive benefits, primarily recreational activities.

Withdrawal: The right to extract the resources or products of a system (e.g., catch fish, gather fuel wood and water for irrigation or human consumption).

Management: The right to regulate internal use patterns and transform the resource.

Exclusion: The right to determine who will have an access or withdrawal right, and how those rights may be transferred.

Alienation: The right to transfer the rights of management and exclusion.⁶⁶

This conception allows much flexibility in adapting property rights to the specific conditions of countries, regions or communities.

Land tenure issues are also central in determining whether PES schemes will benefit poor land users or not. If PES schemes are implemented in the context of secure and undisputed property rights over the landscape providing ecosystems services, poor communities are likely to benefit from the system. On the other hand, if poor communities' rights to the resource base are limited, it is likely that the PES system may contribute to their further marginalization by undermining their access to resources. For example, the Costa Rican model tends to focus payments on large and medium size private landowners and neglect small landowners, indigenous communities and land users without registered property titles.⁶⁷ This may undermine sustainable use and conservation efforts by further marginalizing the poorest communities, which may revert to unsustainable or illegal land uses to generate revenues.

In Latin America, the inequitable distribution of property rights or the persistence of unclear land tenure regimes is often deeply rooted in history and maintained by current socioeconomic power structures. Securing access to the resources base through land tenure reforms therefore remains a considerable challenge in the region

Establishing an Institutional Structure

⁶⁶ Schlager and Ostrom. 1992. cited in Rosa, H. *et al.* 2003. *op. cit.* p. 69.

⁶⁷ Rosa, H. *et al.* 2003. *op. cit.* p.15.

Supporting institutions assume key functions in PES schemes, including scientific research, capacity building, technical assistance, certification, fund management, marketing, and linkages with national and international actors.⁶⁸ It may be necessary to create new institutions to support new PES schemes. In these situations, the start-up costs can be significantly higher, but they are incurred at the beginning only and can be absorbed over time.

In theory, the institutional structure should minimize transaction costs and allow the maximum transfer efficiency from beneficiaries to resources users. In practice, such governance structures need to take root into existing local institutions and communities. New institutions may be caught in local conflicts over access to resources or land uses. The setting up of governance structures may therefore require strong external leadership as well as confidence-building strategies to make sure that land users and beneficiaries will buy into the new system. In order to build trust, institutions supporting PES schemes must be as participatory and transparent as possible. However, this may increase transaction costs. There are therefore trade-offs between transparency and participation requirements, and the objective to minimize transaction costs.

The Costa Rican national PES scheme is surely the most complex and institutionally sophisticated one in the world. Fonafifo is responsible for the collection of funds and for the overall management of the PES system. However, contracts with land users are processed regionally according to guidelines established by the Ministry of Environment and Energy (Minae). The *Sistema Nacional de Áreas de Conservación* (Sinac) or NGOs such as Fundecor act as contracting agencies: they handle applications, sign contracts and monitor implementation. In addition, the *Oficina Costarricense de Implantación Conjunta* (OCIC) was established to handle carbon transactions at the national level.⁶⁹

The creation of PES schemes also involves the creation of institutions, although at a smaller scale, in other countries of the hemisphere. In Mexico, the National Forest Commission is working on the design of a Mexican Forest Fund, which would support projects for the payment of environmental services and for the improvement of productive chains. However, this ambitious project has not developed into a full-scale PES system due to a lack of funding. Also in Mexico, under the Scolel Té PES system, a management system—*Plan Vivo*—provides operating procedures on administrative, planning, monitoring and transaction functions.⁷⁰ In Salvador, a national *Ecoservicios* project is being developed with support from the World Bank and the GEF. One of the main focuses of the project is to strengthen institutions to support the creation of local markets for environmental services in priority project areas involving 300 farmers on a 5,000 ha area.⁷¹

⁶⁸ Rosa, H., *et al.* 2002b. *op. cit.* p. 5.

⁶⁹ Pagiola, S. 2002. “Paying for Water Services in Central America: Learning from Costa Rica” in Pagiola, S. *et al.* 2002. *op. cit.* p. 41.

⁷⁰ Tipper, R. 2002. “Helping Indigenous Farmers to Participate in the International Carbon Services: The Case of Scolel Té” in Pagiola, S. *et al.* 2002. *op. cit.* p. 228.

⁷¹ Rosa, H. *et al.* 2003. *Compensation for Environmental Services and Rural Communities. Lessons from the Americas and Key Issues for Strengthening Community Strategies.* PRISMA. p. 43.

In watershed-based PES, the presence of watershed institutions can facilitate the setting-up of PES systems. For example, in the Cauca Valley in Colombia, water user associations act as private foundations to fund watershed conservation activities that are coordinated by the local water authority.⁷² This example shows that building on existing associations or institutions can greatly facilitate the setting up of PES schemes and reduce their transaction costs.

Financing the PES System

The development of an appropriate financing platform is key in the establishment of a successful PES system. The objective is to generate a continuous flow of financial resources into the system to fund payments over the long term. PES systems involve three types of financing needs:

- The cost of establishing the system (e.g., scientific research, creation of institutions, stakeholder consultations, training).
- Payments to land users.
- Ongoing management costs of the system (management, monitoring, and so on).⁷³

Several sources of financing are available to PES systems, including:

- Donations and grants from national and international organizations;
- Government payments and subsidies;
- Payments from beneficiaries;
- Market development for related goods and services at the national and international level.

Government payments can be funded through earmarked taxes, user fees or other fiscal instruments. The rationale for government intervention in financing PES schemes is that it may already be paying for the provision of environmental services through other means, or using different policy instruments to reach similar objectives. The allocation of government resources through PES schemes might be more effective and cost-efficient than these alternative approaches. Payments from beneficiaries can be collected in the form of voluntary payments, user fees, and charges or through negotiated arrangements between the financing mechanism and beneficiaries.

PES schemes are often initiated with external resources and incorporate payments from beneficiaries to ensure a constant flow of resources once they are established. At a later stage, market development for environmentally preferable goods and services may bring additional revenues to land users. This can also allow a diversification of revenues that

⁷² FAO. 2000b. Land-Water Linkages in Rural Watersheds Electronic Workshop—Synthesis Report. Rome: FAO, 18 September–27 October, p. 21.

⁷³ World Bank and World Wildlife Fund Alliance for Forest Conservation and Sustainable Use. 2003. *op. cit.* p. 65.

will increase the stability of land use in the long run. Issues related to market development and revenue diversification are discussed in the third part of this report.

International Sources

PES schemes often need external resources in the form of grants and donations from international organizations or environmental NGOs to cover their start up costs. Indeed, several PES schemes have been initiated by international organizations and conservation NGOs and still depend on external financial support for their survival. While external support can constitute a positive driver in the short run, it can make the PES system heavily dependent on continuing international support and put into question the sustainability of the scheme if support is withdrawn. For example, in the Pimampiro watershed in Ecuador, the termination of support from the Inter-American Foundation jeopardized the survival of the PES system.⁷⁴

Such difficulties have been avoided in Quito where Fonag was established as a non-declining endowment fund that can receive contributions from government and the private sector. The endowment, provided by The Nature Conservancy and EMAAP-Q, is not spent to ensure the long-term sustainability of the PES system. In addition to the endowment, Fonag receives contributions from water users, mainly EMAAP-Q and EEQ. The fund is open and participatory: each contributor is a member of the board of directors and receives a number of votes proportional to its contribution. This approach contributes to the long term sustainability of the PES scheme.⁷⁵ Similar mechanisms are being developed by The Nature Conservancy in Bogotá, Colombia and Tarija, Bolivia.⁷⁶

International financing has also played an important role in Costa Rica where the GEF invested US\$8 million in the Ecomarkets program, including US\$5 million for forest conservation payments in the Mesoamerican Biological Corridors.⁷⁷ In addition, the World Bank has provided a US\$32.8 million loan and the Costa Rican government US\$8.6 million in counterpart funding.⁷⁸

Government Subsidies

Governmental support in the form of direct subsidies for the creation of PES schemes can generate dependency issues similar to that from international sources. Indeed, state

⁷⁴ World Wildlife Fund and Danida. 2003. *op. cit.* p. 107.

⁷⁵ However, Fonag has had difficulties in expanding its funding base and remains highly dependent on continuous support from EEQ and EMAAP-Q. For a detailed discussion, see Echevarría, M. 2002. "Financing Watershed Conservation: The Fonag Water Fund in Quito, Ecuador," in Pagiola, S. *et al.* 2002. *op. cit.* pp. 91–101.

⁷⁶ *Ibid.* p. 100.

⁷⁷ Ortiz Malavasi, E. *et al.* 2002. *Impacto del programa de pago de servicios ambientales en Costa Rica como medio de reducción de la pobreza en los medios rurales*. San José, Costa Rica: Unidad Regional de Asistencia Técnica (RUTA). p. 6.

⁷⁸ Rojas, M., and B. Aylward. 2003a. *op. cit.* p. 19.

subsidies are subject to government changes or policy reforms and can be withdrawn at any time. PES schemes relying on governmental payments can therefore be vulnerable and potentially unsustainable in the long run. However, their status can be strengthened if enshrined in laws, decrees or constitutional documents.

Governments may also wish to provide temporary subsidies to support the development of a market for environmental services. However, such an approach may raise issues associated with the political economy of subsidies. For example, in a pilot project in six watersheds in Mexico, the Mexican government is itself compensating land users in the hope that beneficiaries will accept providing payments themselves once the pilot period is over.⁷⁹ However, such an approach may create expectations of permanent government payments and it is far from certain that beneficiaries will take responsibility instead of lobbying government for the maintenance of payments once the pilot period is over.

Charges and User Fees

Financial contributions from beneficiaries can take several forms, including charges and user fees. Charges and user fees are common in watershed-based PES schemes since water fees are usually in place for urban water utilities, hydroelectric producers or industries. They can be collected in the form of new user fees for water users or simply by using part of water utility revenues to fund the PES scheme.⁸⁰

Charges are used in the El Escondido watershed in Honduras where the PES system was financed by a 35 percent increase in residential consumer water bills.⁸¹ It is also used in Costa Rica where the Heredia water utility, the *Empresa de Servicios Públicos de Heredia* (ESPH), charges an “environmentally adjusted water rate.” The revenues generated by this additional charge are put into a trust fund that invests in PES in the mountainous region of Heredia with the objective of protecting the water sources for the city of Heredia.⁸²

User fees are employed in Ecuador, where Fonag is funded by one percent of water utility revenues.⁸³ Similarly, Colombia has introduced charges for forest watershed services as a means to provide earmarked revenues for watershed protection. These charges include payments from electricity companies and hydropower plants equivalent to three percent of their revenues allocated to the protection of local or regional watershed. In addition, promoters of water-related projects must also provide payments equivalent to one percent of their investment, to be allocated in watershed protection projects. Finally, between 1993 and 2002, municipalities and provinces had to allocate one percent of their budget to acquire land in order to protect watersheds.⁸⁴

⁷⁹ Tsen, W. *et al.* 2002. *op. cit.* p. 1.

⁸⁰ World Bank and World Wildlife Fund Alliance for Forest Conservation and Sustainable Use. 2003. *op. cit.* p. 65.

⁸¹ Cohen, S. 2002. *op. cit.*

⁸² Rosa, H. *et al.* 2003. *op. cit.* p. 22.

⁸³ *Ibid.*

⁸⁴ Landell-Mills, N. and L. Porrás. 2002b. *op. cit.* p. 130.

Earmarked Taxes

Earmarked taxes can bring a stable and continuous flow of revenues for PES schemes since their revenues are specifically allocated to fund conservation activities. In addition, they may be less vulnerable to government budget reallocations than non-earmarked taxes. However, they can also create problems of financial dependency in the PES system. For example, in Costa Rica only 10 percent of land area under PES receives payments from services buyers and the system is heavily dependent on a gas tax.⁸⁵

In the states of Paraná and Minas Gerais in Brazil, five percent of the value added sales tax (*Imposto sobre Circulação de Mercadorias e Serviços* (ICMS-E)) is allocated to municipalities that commit to forest conservation in watersheds providing drinking water.⁸⁶ This tax is generating US\$17.5 million annually in the state of Paraná and US\$5.2 million in Minas Gerais and has led to the protection of over a million hectares in each state.⁸⁷ However, some municipalities have adopted a broad interpretation of the earmarking criteria and used the revenues for activities that are not directly related to conservation. Criteria governing the allocation of earmarked taxes must therefore be carefully defined and enforced to make sure that they are consistent with the objectives of PES schemes.

Voluntary Payments and other Transactions

Voluntary payments and other transactions can also be negotiated with beneficiaries that are willing to pay for the provision of services. Such payments are often negotiated on a case-by-case basis, according to the specific conditions of the PES scheme and on the nature of the beneficiary. For example, under the Scolel Té project in Mexico, the International Automobile Federation agreed to buy 5,500 tons of carbon in 1997.⁸⁸ A carbon transaction worth US\$2 million was also concluded by OCIC in Costa Rica in 1997.⁸⁹

Other examples can be found in Latin America. In the Cauca Valley in Colombia, agricultural water users pay a voluntary fee to invest in upstream watershed protection

⁸⁵ Pagiola, S. *et al.* 2002. "Making Market-based Mechanisms Work for Forests and People," in Pagiola, S. *et al.* 2002. *op. cit.* p. 264.

⁸⁶ Echevarría, M. 2002. "Financing Watershed Conservation: The Fonag Water Fund in Quito, Ecuador," in Pagiola, S. *et al.* 2002c. *op. cit.* p. 94.

⁸⁷ May, P. H. *et al.* 2002. "Using Fiscal Instruments to Encourage Conservation: Municipal Responses to the 'Ecological' Value-added Tax in Parana and Minas Gerais, Brazil," in Pagiola, S. *et al.* 2002c. *op. cit.* pp. 173–199.

⁸⁸ Rosa, H. *et al.* 2003. *op. cit.* p. 27.

⁸⁹ Pagiola, S. 2002. "Paying for Water Services in Central America: Learning from Costa Rica," in Pagiola, S. *et al.* 2002. *op. cit.* p. 42.

and forest conservation.⁹⁰ In Mexico, the municipality of Coatepec in the state of Veracruz has proposed a voluntary extra payment of two pesos on consumer water bills to finance conservation in the upper watershed. In Costa Rica, the Matamoros Hydroelectric Company (*Empresa Hidroeléctrica Matamoros*) signed a voluntary agreement in 1999 in which it agreed to pay US\$15 per hectare annually to Fonafifo to finance conservation or reforestation activities within the basin over a five-year period.⁹¹ Since 1997, Fonafifo has also concluded agreements with the following companies: *Energía Global*, *Hidroeléctrica Platanar*, *Compañía Nacional de Fuerza y Luz*, *Florida Ice and Farm*.⁹²

Managing Transaction costs

The transaction costs involved in setting up and managing PES schemes are central to the cost-efficiency of PES schemes. Given that PES schemes involve the creation of new markets with legal, fiscal and institutional support, there is a risk of seeing transaction costs exceed the potential benefits of the system. Overall, if transaction costs are too high, PES schemes may not be a cost-optimal strategy to deliver environmental services. Managing transaction costs becomes a priority of PES schemes in that context.

As mentioned before, the start-up costs for PES schemes may be significant. The main transaction costs are related to contract management and monitoring. At first the operating costs may be high, but they are likely to decrease over time as markets mature and institutional support needed becomes less intensive. Operating costs are generally lower when land users are few. However, when land users are numerous, collective contracting can reduce transaction costs. Transaction costs will be reduced where land users are already organized and well structured enough to receive and redistribute payments. The operating costs are also closely linked to the type of contracts and payments that will be used in the system. The costs of contracting with land users are generally lower when contractual obligations are simple.

In Costa Rica, participants in the national PES schemes must submit detailed management plans. These management plans must include a description of proposed land use changes as well as information on land tenure, topography, soils, climate, drainage, current land use and related carrying capacity as well as forest fire, illegal hunting and harvesting prevention plans. Management plans must also include a monitoring schedule.⁹³ Fundecor acts as intermediary and supports farmers in drafting these management plans and obtaining contracts from Fonafifo.

⁹⁰ Echevarría, M. 2002. "Financing Watershed Conservation: The Fonag Water Fund in Quito, Ecuador," in Pagiola, S. *et al.* 2002. *op. cit.* p. 94.

⁹¹ Rosa, H. *et al.* 2003. *op. cit.* p. 22.

⁹² Sánchez Chaves, O. 2004. *Programa de Pago por Servicios Ambientales (PSA)*. In: *Mecanismos Financieros Para El Uso Sostenible y La Conservación de Bosques*. Havana, Cuba, 2004, p.6.

⁹³ Pagiola, S. 2002. "Paying for Water Services in Central America: Learning from Costa Rica," in Pagiola, S. *et al.* 2002. *op. cit.* p. 41.

In addition to raising transaction costs, sophisticated contracts can also act as barriers to entry for poor land users who lack resources to develop detailed management plans. This problem may be circumvented through collective contracting or by contracting through NGO intermediaries. According to a study conducted in Costa Rica, contracting through intermediaries is less cumbersome for land users but it increases transaction costs. The study observed that farmers often accessed the PES system through intermediaries who would charge 12–18 percent in administration costs. The same study concludes that resorting to intermediaries however reduces delays in obtaining a PES contract with the contracting authority.⁹⁴

The waiting time for contract approval may also constitute a significant transaction cost that prevents small landowners from entering the system. Some PES schemes may require that the land area subject to a new proposal be subject to strict conservation measures while the management plan and PES contract are pending approval. This may be impossible for small landowners who cannot afford to place a portion of their land out of production.⁹⁵

Some interesting schemes have been undertaken to reduce transaction costs associated with contracting for poor or indigenous communities. For example, under Plan Vivo in the Scolel Té project in Mexico, the *Fondo Bioclimático*, which is responsible for contracting with farmers, makes initial contacts with farmer associations and organizes meetings to build farmers' knowledge. Farmers, individually or collectively, then have to produce simple management plans explaining the type of forestry or agroforestry activity they want to develop, where it will be located, what vegetation and current practices will be modified, and the extent of labor and materials needed. This pilot project is now being reproduced in India and Mozambique.⁹⁶

Contract renewal procedures can also involve significant costs. One way to reduce transaction cost is to automatically renew contracts or at least to develop a lighter approval process for contract renewals when land users show that they have been consistently complying with their obligations throughout the duration of the contract. In Costa Rica, payments are made under five-year contracts that are renewable. Some contracts can extend 10–15 years, and the contractual obligations are transferable with property deeds.⁹⁷

An effective monitoring strategy is essential to making sure that land users are complying with their contractual obligations, implementing their management plans, and generating needed environmental services. Monitoring plays an important role in ensuring compliance and documenting the provision of services. However, monitoring can significantly raise transaction costs, especially when contracts involve detailed

⁹⁴ Miranda, M., *et al.* 2004. *op. cit.* pp. ii & 30.

⁹⁵ *Ibid.* p. iii.

⁹⁶ Tipper, R. 2002. "Helping Indigenous Farmers to Participate in the International Carbon Services: The Case of Scolel Té," in Pagiola, S. *et al.* 2002. *op. cit.* p. 228.

⁹⁷ Pagiola, S. 2002. "Paying for Water Services in Central America: Learning from Costa Rica," in Pagiola, S. *et al.* 2002. *op. cit.* p. 41.

obligations and when payments are targeted to very specific land uses. For example, the implementation of the RISEMP project is accompanied with intensive monitoring to allow a detailed analysis of its effectiveness. This considerably raises the transaction costs of the project.⁹⁸ There is, therefore, a need to establish an appropriate balance between the need for effective monitoring and the importance of controlling transaction costs.

III. Conditions for Success and Emerging Best Practices

The survey of PES schemes conducted for this report shows that a multiplicity of models coexists and that no single one has so far emerged as the standard approach to establishing PES schemes. Moreover, PES schemes are usually adapted to the very specific conditions under which they are established and to the specific characteristics of markets for different environmental services. This explains the great diversity of models observed.

The theory and practice of payments for environmental service is in its infancy. Most PES schemes are recent or have been running for a few years only. Consequently, there are few empirical studies that document best practices and lessons learned. However, initial lessons and emerging best practices are documented in the literature. This section presents a summary of these observations.

There are several ways to measure the success of PES schemes. Indicators of success may include:

- The number of participants (both beneficiaries and land users);
- The land area that is included under the PES scheme;
- The extent to which a PES scheme is generating land use changes;
- The net additional revenues that a PES scheme brings to land users;
- The distributional impacts of PES schemes, especially their impact on poor or traditional communities;
- The financial sustainability of the system in the long run;
- The extent to which the system is generating environmental services;
- The transfer efficiency of the system (the net percentage of revenues that end up as net income gains for land users); and
- The cost-effectiveness of PES schemes compared to alternatives.

The design of PES schemes plays a central role in guaranteeing their success. PES schemes tend to work best when they have the following characteristics:

- They are based on clear and consensual scientific evidence linking land uses to the provision of services;
- They clearly define environmental services to be provided;

⁹⁸ Pagiola, S. *et al.* 2004. *op. cit.* p. 23.

- Their contracts and payments are flexible, ongoing and open-ended;
- Their transaction costs do not exceed potential benefits;
- They rely on multiple sources of revenues delivering money flows that are sufficient and sustainable in time;
- Compliance, land use changes, and the provision of services are closely monitored; and
- They are flexible enough to allow adjustments to improve their effectiveness and efficiency and to adapt to changing conditions.

Landell-Mills and Porras (2002) propose the following key steps to develop successful markets for environmental services:

- 1) Identify benefits provided by a specific service and by determination of (forestry) activities that deliver this service;
- 2) Undertake a feasibility study;
- 3) Establish willingness to pay;
- 4) Formalize property rights;
- 5) Establish payment mechanisms and supporting institutions; and
- 6) Undertake pilot activities and feedback to market design.

In addition, pilot projects constitute an important element in the process of creating a successful PES.

The Strengths and Limitations of PES Schemes

So far, PES schemes have proved effective in application to watersheds, carbon sequestration, biodiversity conservation, landscape beauty and bundled services. PES schemes have also been effective at both small and large scales. Most PES schemes are created at a small scale, but the Costa Rican example shows that the approach is also applicable at a national scale. Despite criticisms regarding its lack of flexibility, the Costa Rican experience is undoubtedly a success: Fonafifo allocated more than US\$80 million and incorporated 314,472 ha into the PES system between 1997 and 2002.⁹⁹

In addition, PES schemes are highly flexible and adaptable to different contexts as demonstrated by the multiplicity of experimentations underway in the hemisphere. However, PES schemes as they are currently developing also face difficulties and limitations. These limitations of current PES schemes include the following:

- They are often based on scientific generalizations, that have not been proven by empirical studies;
- They are sometimes implemented in a context where they are not the most cost-effective method to attain the goals established;
- Service providers, users and the service itself are sometimes not properly identified;

⁹⁹ Rosa, H. *et al.* 2003. *op. cit.* p. 18.

- They are executed without a proper monitoring or control mechanism;
- The cost of environmental services are set arbitrarily and do not correspond to studies on demand and economic valuation of the resource;
- Their design is not based on previous socioeconomic or biophysical studies;
- They may offer perverse incentives to land users, or they may displace environmental problems or unsustainable land uses to surrounding areas;
- They depend largely on external financial resources; and
- Programs and activities are disseminated poorly among the local population.¹⁰⁰

PES schemes are in their very early stages of development and consequently their transaction costs remain very high—in many cases, overwhelmingly so. However, such a situation can be considered a normal phase in the development of new markets. PES markets should mature over time and take root where they are most cost-efficient. In those circumstances, they should become less dependent on external sources of financing over time.

Diversifying Revenues for Sustainable Livelihoods

Among the emerging best practices that can be identified, the diversification of revenues for communities involved in PES schemes through the creation of new markets for environmental goods and services appears to be one of the most promising. As discussed earlier in this report, revenue diversification through market creation is a good strategy to ensure the sustainability of PES schemes over time since it raises the level of revenues associated with sustainable land uses. For example, participants in the Scolel Té project in Chiapas, Mexico, consider the payments for carbon sequestration minimal in terms of revenue generation, but the possibility to access markets for certified timber provides an additional incentive to enter the system.¹⁰¹ Revenue diversification can also help communities reduce their dependence on a single commodity, thereby reducing their vulnerability to price fluctuations on world markets.

Markets for environmental goods and services have been growing rapidly over the last decade. For example, Barry *et al.* estimate the world market for non-timber forest products could be as high as US\$7 billion.¹⁰² In 1999, the world market for organic food was US\$14.5 billion, growing at a rate of 20–30 percent a year. The premium price for organic products ranges from 20 percent to 200 percent.¹⁰³ Mexico has been successful with its shade-grown, organic coffee and sustainably harvested palm.

¹⁰⁰ FAO, 2003. *op. cit.*

¹⁰¹ Rosa, H. *et al.* 2003. *op. cit.* p. 27.

¹⁰² Barry, D. *et al.* 2003. *Achieving Significant Impact at Scale: Reflections on the Challenge for Global Community Forestry.* Bonn: The International Conference on Rural Livelihoods, Forests and Biodiversity. p. 7.

¹⁰³ Source: International Market for Organic Foods, 2000, as cited in Landell-Mills, N. and L. Porras. 2002b. *op. cit.* p. 52.

However, even though the potential of these niche markets is strong, the capacity to enter them is lacking in poor communities of the hemisphere. Indeed, entering markets for certified forest products or organic agriculture requires significant technical capacities to obtain certifications and effectively market products. As a consequence, poor communities are often excluded from these markets. In addition, as observed by Barry (2003), forest products certification is often seen as too costly by local producers, given the lack of guarantee that they will obtain a premium price or increased market share to recover the costs of certification in the transition period.

In line with this observation, a study conducted by the Salvadorian Foundation for Coffee Studies (Procafe) concluded that markets for shade-grown coffee were not mature enough to ensure a stable premium price over time, and that certification would not be profitable for small Salvadorian farms of less than seven hectares, due to additional expenses linked to certified production.¹⁰⁴ This suggests that in order for smaller farms to join markets for certified products, they need insurance from market fluctuations and support to cover the extra production and administrative costs associated with certification.

PES schemes can play a significant role in that regard by including specific support for market development and revenue diversification in their compensation packages. Such support may include capacity building, the creation of local marketing institutions or insurance services. In addition, there are huge information gaps in the market between environmental goods and services suppliers and potential buyers that can be filled in part through the development of local marketing structures. The Commission for Environmental Cooperation has been instrumental in filling those gaps and contributing to the development of markets for shade grown coffee and other environmental goods and services in North America.

In addition to markets for organic agriculture and certified timber, other markets are also emerging with various levels of success. Ecotourism seems to be a promising market to support revenue diversification in communities involved in PES schemes. In 1998, the International Ecotourism Society estimated that 40–60 percent of the 528.4 million tourists focused on nature.¹⁰⁵ Economic benefits from ecotourism can involve direct payments from tourist agencies to land users, or other activities or services that can be offered by local communities to tourists. These revenue opportunities will only be maximized when adequate infrastructures are in place to deliver tourists services and channel revenues into productive activities. So far, however, most revenues have been captured by tour operators, with poor communities often restricted to wage labor.

In Belize, the Toledo Ecotourism Association represents 10 local Mopan, Kekchi, Maya and Garifuna rainforest communities totaling 6,000 people. The association aims to develop ecotourism services that are compatible with the traditional livelihoods of these communities. These include guided tours, stays in community guesthouses, handicrafts, musical performances, crafts lessons and forest canopy walks. Direct payments are made to services providers and 20 percent of revenues are allocated to a central fund that

¹⁰⁴ Rosa, H. *et al.* 2003. *op. cit.* p. 40.

¹⁰⁵ Landell-Mills, N. and L. Porras. 2002b. *op. cit.* p. 154.

provides management, marketing, community conservation and development services.¹⁰⁶ In Mexico, communities in Mazunte and Ventanilla, Oaxaca, and Selva del Marinero, Veracruz, have organized to generate revenues from ecotourism by securing access to the resources and developing value added services. A portion of the revenues generated is reinvested in conservation.¹⁰⁷

Bioprospecting activities can also be part of a revenue diversification strategy. Although markets for these activities have not met expectations in the last decade, and while they are unlikely to generate enough revenues at this stage to support long-term land use changes, they may be part of a revenue diversification strategy that is based on multiple land use. Revenues from bioprospecting activities can be obtained in the form of fees, milestones payments or royalties. Bioprospecting can also bring non-monetary benefits, such as capacity-building, support for biodiversity science, sustainable economic activities based on the supply of raw materials or direct financial contributions to conservation programs. In addition, it can also lead to the development of a biodiversity-based industry, for example to supply samples to industry for screening, raw processed materials for advanced research or manufacturing purposes.¹⁰⁸

Generating Benefits for Poor Communities

As mentioned in the previous section, the design and implementation of PES schemes raise distributional issues that need to be considered to make sure that they will not exacerbate existing inequities or create new ones. Although the primary objective of PES schemes is not the alleviation of poverty, they may not work effectively if poor communities, which are most dependent on the land for their livelihoods, are excluded from the system. Efforts must therefore be made to integrate these populations and extend the benefits of PES schemes to them.

Poor people, indigenous communities, women and minorities tend to have insecure land tenure, to be concentrated on marginal lands and to be under-represented within local representation institutions. In that context, there is a risk that PES schemes might further marginalize them within their own communities by establishing inequitable payment schemes or by excluding them. Under such conditions, PES schemes could be undermined by growing conflict over resources or by the spread of illegal activities resulting from the exclusion of important segments of the population.

Entering into PES schemes should not make poor communities more vulnerable to climate or market-driven revenue fluctuations. Poor communities may reduce the risk associated with market price fluctuations or climatic variations by diversifying their production and their sources of revenues. However, long-term, inflexible contracts under PES schemes can lock poor communities in single land-use practices, thereby decreasing

¹⁰⁶ Ibid. p. 163.

¹⁰⁷ Rosa, H. *et al.* 2003. *op. cit.* p. 28.

¹⁰⁸ Laird S. A. and K. T. Kate. 2002. "Linking Biodiversity Prospecting and Forest Conservation," in Pagiola, S. *et al.* 2002. *op. cit.* pp. 159–161.

their flexibility to adapt to changing climatic or market conditions. This may increase their vulnerability to price shocks or climatic variation. It is important that PES schemes overcome this hazard by introducing flexibility in the types of land uses that are allowed under the system and by offering insurance compensation in case of loss of revenues.

There is also a need to look at the redistributive effect of the setting up of PES schemes, notably on labor and land value. PES-induced changes in land use can increase or decrease the labor force employed locally in farming. For example, if a PES scheme results in a conversion of labor-intensive agricultural lands to conservation practices; it might decrease farm labor and affect landless peasants. On the other hand, new agro-pastoral practices, usually more labor-intensive, promoted under PES schemes may generate new employment opportunities. The silvopastoral practices promoted under the World Bank's RISEMP project, for example, are expected to increase farm labor use in the project areas by 8–13 percent in Colombia, 34 percent in Costa Rica, and as much as 100 percent in Nicaragua.¹⁰⁹

PES schemes can also increase the value of marginal lands and increase competition for access to land resources.¹¹⁰ The establishment of a market for environmental services may act as an incentive for wealthier groups to expand the land area under their control at the expense of poor land users. There is anecdotal evidence that this has happened in Colombia's Cauca Valley, for example.¹¹¹ Landell-Mills and Porras (2002) also fear that the growth of carbon markets will lead carbon providers to buy-out small farmers in order to expand the land area they dedicate to carbon sequestration, thereby capturing economies of scale. In that situation, poor farmers could be displaced from their land by increasing competition arising from expanding carbon markets.

In order to avoid such outcomes, the Scolel Té project in Mexico tries to integrate indigenous communities into small-scale carbon trading. The project benefits 400 individuals from 30 indigenous communities representing four different ethnic groups. The particularity of the *Plan Vivo* system in the Scolel Té project is its ability to initiate carbon trading at a very small scale and to function with minimal resources.¹¹² If this project generates positive results, it could provide a useful platform to integrate poor indigenous communities into the emerging global carbon market.

Based on the preceding observations on the potential impacts of PES schemes on poor and indigenous communities, the following strategies can be advanced to maximize the benefits and minimize the chance that the PES scheme further marginalizes the communities:

- Clarify and strengthen land tenure;

¹⁰⁹ World Bank. 2002. *op. cit.*

¹¹⁰ Landell-Mills, N. and L. Porras. 2002b. *op. cit.* p. 101.

¹¹¹ Pagiola *et al.* 2005 forthcoming.

¹¹² For a more detailed discussion of the Scolel Té Project, see Tipper, R. 2002. "Helping Indigenous Farmers to Participate in the International Carbon Services: The Case of Scolel Té," in Pagiola, S. *et al.* 2002. *op. cit.* pp. 223–233.

- Create or strengthen cooperative institutions to reduce transaction costs;
- Define cost-effective and flexible payments mechanisms;
- Provide flexibility in eligible land uses;
- Facilitate access to start-up financing; and
- Invest in community capacity-building.¹¹³

In addition, lessons learned so far in implementing PES schemes show improved chances of success in including poor communities when the incentive system created by the PES is directed towards the social structure as a whole (communities as opposed to individual farmers) and when it is flexible in its application (allowing for a broader set of options to obtain results).

Building Capacities in Communities

Community capacity building is a key accompanying strategy to support revenue diversification and the generation of benefits for marginalized communities. By supporting capacity building in smaller, poor communities, PES schemes can strengthen their social capital, thereby reducing their vulnerability to land use changes and increasing their capacity to seize market opportunities and to voice their interest in decision making.

For example, one result of the Scolel Té project in Mexico was to improve farmers' skills by teaching surveying, mapping, financial planning and silviculture. The project also resulted in community empowerment.¹¹⁴ In addition, a survey conducted in the Sarapiquí region in Costa Rica found that participants highly valued the information and training they received on forest management.¹¹⁵ This suggests that a significant portion of the benefits associated with participation in PES schemes is not linked to increased revenues, but to various information and training services provided that end up strengthening the capacities of participants.

However, capacity-building strategies are often lacking in PES schemes, despite the needs of participating communities. In their study of the Costa Rican PES system, Miranda *et al.* (2004) documented that farmers knew very little about the way the system functioned, since they entered it through intermediaries. Such an information gap can develop as a serious weakness of PES schemes over the longer term. Therefore, developing local capacities and knowledge should be one of their main priorities.

In their review of 287 PES schemes in the world, Landell-Mills and Porras (2002) identified three priorities for building capacities in the participating poor communities in order to facilitate their integration into new markets for environmental services:

¹¹³ Adapted from Landell-Mills, N. and L. Porras. 2002b. *op. cit.* pp. 218–219.

¹¹⁴ Tipper, R. 2002. "Helping Indigenous Farmers to Participate in the International Carbon Services: The Case of Scolel Té," in Pagiola, S. *et al.* 2002. *op. cit.* p. 231.

¹¹⁵ Rosa, H. *et al.* 2003. *op. cit.* p. 23.

- *Strengthen capacity for market participation.* Training in marketing, negotiation, management, financial accounting, contract formulation and conflict resolution are important. Technical skills relating to forest management for environmental services are also needed.
- *Market support center.* To improve poor people's ability to participate in emerging markets, a market support center may offer access to information on recent prices and transactions, a contact point for potential buyers, sellers and intermediaries, an advice bureau and practical research that draws together emerging best-practices.
- *Access to finance.* Availability of finance is vital to negotiating and concluding environmental service deals. Where the financial sector is underdeveloped, and the environmental service sector faces significant hurdles in accessing funds, the government may have a key role to play in promoting improved access.¹¹⁶

Such capacity building strategies may have long-term impacts that will not only support the sustainability of PES schemes, but also produce positive outcomes in terms of community development.

Conclusion

As revealed in this report, payments for environmental services are an innovative and relatively young market-based instrument for environmental protection. As a consequence, it is still early to assess the overall effectiveness and efficiency of PES schemes and to identify lessons and best practices. However, this report has tried to provide preliminary observations based on the current state of the literature on PES schemes.

PES schemes are highly adaptable and several different models currently coexist in different markets and locations. If one conclusion can be derived from this state of affairs, it is that there is no single, transferable model for PES systems and that each one must be tailored to the specific conditions of the market for a given environmental service in a given location.

Another observation of PES schemes is that they may not constitute a cost-optimal instrument in all circumstances. Indeed, their success depends in great part on pre-existing conditions. PES systems work best when services are visible and beneficiaries are well organized, and when land user communities are well structured, have clear and secure property rights, strong legal frameworks, and are relatively wealthy or have access to resources. These conditions minimize sources of interference with the newly created market and reduce transaction costs. This suggests that part of the success of PES

¹¹⁶ Landell-Mills, N. 2002. *op. cit.* p. 2.

schemes rests in the selection of regions/communities where they will be implemented or on work conducted in their preparatory phase.

Transaction costs in markets for environmental services are still high due to the immaturity of certain markets. This makes PES schemes highly dependent on external sources of funding, which may undermine their sustainability in the long run. However, it is likely that transaction costs will decrease over time as markets for environmental services mature. The development of new markets may support revenue diversification and ensure a more stable, long lasting flow of revenues in PES schemes. In that sense, the future of PES schemes may be tied to the development of niche markets for certified forest products, organic agriculture or ecotourism, which have the potential to bring significant revenues. In addition, the expansion of carbon markets can constitute a major sources or revenues for PES schemes if the persisting uncertainty about these markets is lifted by the entry into force of the Kyoto Protocol.

One last observation is that PES schemes must be designed and implemented with a view toward minimizing tensions between the concurrent objectives of effectiveness, efficiency and equity. As shown in this report, this involves significant trade-offs that may greatly affect the success or failure of PES schemes. It is likely that new approaches will be found to attenuate these tensions as the body of experience with PES schemes continues to grow.

In conclusion, PES schemes have the potential to become very valuable transfer mechanisms for internalizing positive environmental externalities and generating new revenues for sustainable development. This potential will be gradually fulfilled as markets for environmental services mature over time and as PES schemes become more financially sustainable. In addition, their positive effects on sustainable development will be greatest if their distributional impacts are considered and if concrete efforts are made to build capacities in poor and indigenous communities. Otherwise, there is a significant risk that they will perpetuate or exacerbate existing inequities in resource use and simply continue unsustainable survival patterns in poor communities.

Appendix I: List of PES schemes surveyed

Country	Name	Type of environmental services	Scope	Progress
ARGENTINA	La Plata/Fontana	Carbon sequestration services	Local	Development phase
BOLIVIA	Noel Kempff Mercado National Park	Carbon sequestration services	International	Single transaction
BRAZIL	Paraná	Water services	Local	In progress
	Minas Gerais	Water services	Local	In progress
	Corumbatai watershed	Water services	Local	In progress
COLOMBIA	Cauca Valley	Water services	Local	Ended
	Guabas River	Water services	Local	Ongoing
COSTA RICA	Fonafifo	Biodiversity conservation, Carbon Sequestration, and Water services	National/International	In progress since 1996
	Ecomarkets	Biodiversity conservation/carbon sequestration services	Local	In progress
	Heredia	Water services	Local	In progress

Country	Name	Type of environmental services	Scope	Progress
ECUADOR	Fonag water fund	Water services	Local	In progress
	San Pedro de Pimampiro	Water services	Local	Pilot
EL SALVADOR	Ecoservicios	Various services	Local/National	Development phase
GUYANA	Conservation International/Guyana	Biodiversity conservation services	International	In progress
HONDURAS	El Escondido Watershed	Water services	Local	In progress
MEXICO	Lerma Chapala Bassin	Water services	Local	Pilot
	Triunfo biosphere Reserve, Chiapas	Water services	Local	Pilot
	Scolec Té Project, Chiapas (Bioclimatic Fund)	Carbon sequestration/ Biodiversity conservation services	Local	Pilot
	Coatepec, Veracruz	Water services	Local	Proposed
	Mazunte & Ventanilla, Oaxaca	Biodiversity conservation/Scenic beauty services	Local	In progress
	Selva del Marinero, Veracruz	Biodiversity	Local	In progress

		conservation/Scenic beauty		
--	--	----------------------------	--	--

Country	Name	Type of environmental services	Scope	Progress
UNITED STATES	Catskills, Delaware and Croton Watersheds	Water services	Local	Done
	Conservation Reserves Program	Biodiversity conservation services	National	On-going 10-15 yrs contracts
MULTI-COUNTRY	Regional Integral Silvopastoral Ecosystem Management Project (RISEMP) (Columbia, Costa Rica, Nicaragua)	Biodiversity conservation services	Local/International	Pilot
	The Nature Conservancy (Belize, Bolivia, Costa Rica, Paraguay)	Bundled services (Carbon sequestration/Biodiversity conservation)	Local/International	Single transactions

References and Pertinent Resources

Aldana Vargas, C. 2003. *Las Externalidades Forestales*. Bogotá: Cooperación Nacional de Investigación y Fomento Forestal (Conif).

Alix, J. *et al.* 2003. *Payment for Environmental Service: To whom, where and how much?* Guadalajara, Mexico: INE/Conafor/World Bank.

Barry, D. *et al.* 2003. *Achieving Significant Impact at Scale: Reflections on the Challenge for Global Community Forestry*. Bonn: The International Conference on Rural Livelihoods, Forests and Biodiversity.

Barzev, R. 2000. *Estudio de valoración económica de la demanda hídrica del bosque en que nace la fuente del Río Chiquito (Finca El Cacao, Achuapa)—para determinar la factibilidad de mantener el bosque en vista de garantizar la calidad y cantidad del recurso hídrico*. Programa para la Agricultura Sostenible en Laderas de América Central (Pasolac). Achuapa, NI, pp. 3–42.

Bayon, R. 2004. *Making Environmental Markets Work: Lessons from Early Experience with Sulfur, Carbon, Wetlands and Other Related Markets*. Washington, DC: Forest Trends.

Borge, C. 2003. *Impacto del Programa de Pago de Servicios Ambientales en Costa Rica como Medio de Reducción de la Pobreza en los Medios Rurales*. San José, Costa Rica: Unidad Regional de Asistencia Técnica (RUTA).

CCICED Western China Forest Grasslands Task Force. 2002. *Workshop on Payment Schemes for Environmental Services*. Beijing. April 22–23.

Commission for Environmental Cooperation. 2003. *Background Paper: Market-Based Mechanisms for Carbon Sequestration, Energy Efficiency and Renewable Energy in North America—What Are the Options?* Montreal: CEC, December.

Chomitz, M.K., *et al.* 1998. *Financing Environmental Services: The Costa Rican Experience and its Implications*. Washington, DC: World Bank.

Cohen, S. 2002. *Pro-poor Markets for Environmental Services. Carbon Sequestration and Watershed Protection*. WSSD.

Comité Nacional de Bienes y Servicios Ambientales de Honduras (Conabisah). 2004. *Bienes y Servicios Ambientales en Honduras. Una Alternativa para el Desarrollo Sostenible*. Tegucigalpa, Honduras: Conabisah.

Echevarría, M. 2002. *Water User Association in the Cauca Valley: A Voluntary Mechanism to Promote Upstream-Downstream Cooperation in the Protection of Rural*

Watersheds. *Land-water Linkages in Rural Watersheds Case Study Series*. Rome: Food and Agriculture Organization (FAO).

Echevarría, M. *et al.* 2002. *Impact Assessment of Watershed Environmental Services: Emerging Lessons from Pimampiro and Cuenca in Ecuador*. London: International Institute for Environment and Development (IIED).

Ecociencia. (Forthcoming.) *Un Análisis de los Impactos Sociales y Económicos de los Proyectos de Fijación de Carbono en el Ecuador. El Caso de PROFAFOR-FACE*. London : International Institute for Environment and Development (IIED).

Espinoza N., *et al.* 1999. *El Pago de Servicios Ambientales y el Desarrollo Sostenible en el Medio Rural*. Publicaciones RUTA-IICA.

Esquivel M.R., and O. Segura Bonilla. 2002. *El Pago de Servicios Ambientales en Centro América*. Heredia: Centro Internacional de Política Económica para el Desarrollo Sostenible (Cinpe).

Evans, W. 2003. *Promoting Markets for Environmental Services*. European Investment Bank Forum, 24 October 2003. World Bank, Environmental Department.

FAO. 2003. *Payment Schemes for Environmental Services in Watersheds*. Arequipa, Peru, 9–12 July: Regional Forum.

FAO. 2000a. *Global Forest Products Outlook Study, Food and Agriculture Organization*. Rome: Food and Agriculture Organization (FAO).

FAO. 2000b. *Land-Water Linkages in Rural Watersheds Electronic Workshop–Synthesis Report*. Rome: FAO, 18 September–27 October 2000.
<<http://www.fao.org/ag/agl/watershed/watershed/papers/paperewk/pewrken/synthesis.pdf>>
> consulted on 22 June 2004.

Gardner-Outlaw, T. and R. Engelman. 1999. *Forest Futures: Population, Consumption and Wood Resources*. Washington, DC: Population Action International.

Herrador, D., *et al.* 2002. *Pago por Servicios Ambientales en El Salvador: Oportunidades y Riesgos para Pequeños Agricultores y Comunidades Rurales*. The FORD Foundation and Fundación PRISMA.

Herrador, D., and L. Dimas. 2000. *Aportes y Limitaciones de la Valoración Económica en la Implementación de Esquemas de Pago por Servicios Ambientales*. Boletín 41. Fundación PRISMA.

Isakson, R.S. 2002. *Payments for Environmental Services in the Catskills: A Socioeconomic Analysis of the Agricultural Strategy in New York City's Watershed Management Plan*. Ford Foundation and Fundación PRISMA.

- Jenkins, M. *et al.* 2004. Markets for Biodiversity Services: Potential Roles and Challenges. *Environment* 46 (6): 32–42. July–August.
- Jimenez, F., *et al.* *Experiencias de Pago para los Servicios Ambientales en Cuencas en Costa Rica*. CATIE, Departamento de Recursos Naturales y Ambiente.
- Johnson, N. *et al.* 2001. *Financial Incentives for Watershed Management: Issues and Lessons for Innovators*. Washington, DC: Forest Trends.
- Kerr, J. 2002. Watershed Development, Environmental Services, and Poverty Alleviation in India. *World Development* 30 (8): 1387–1400.
- Koskela, J., *et al.* 2000. *Tropical Forestry Reports 22: Implications of the Kyoto Protocol for Tropical Forest Management and Land Use: Prospects and Pitfalls*. Helsinki: University of Helsinki, Department of Forest Ecology.
- Landell-Mills, N. 2002. *Marketing Forest Environmental Services—Who Benefits?* Gatekeeper Series no.104, London: International Institute for Environmental and Development (IIED).
- Landell-Mills, N. and L. Porras. 2002a. *Silver Bullet or Fools’ Gold? A Global Review of Markets for Forest Environmental Services and Their Impact on the Poor*. London: International Institute for Environment and Development (IIED).
At: <http://www.iied.org/docs/flu/psf_silvbullet.pdf>, consulted on 21 January 2004.
- Landell-Mills, N. and L. Porras. 2002b. *How Can Markets for Environmental Services be Pro-poor?* London: Forestry and Land Use Program (FLU), IIED.
- Lloret Zamora, P. 2002. *The Watershed Council as a Mechanism for Upstream-Downstream Cooperation: The Case of the Río Machángara, Cuenca, Ecuador*. Land-water Linkages in Rural Watersheds Case Study Series. Rome: Food and Agriculture Organization (FAO).
- Miranda, M., *et al.* 2003. *The Social Impacts of Payments for Environmental Services in Costa Rica. A Quantitative Field Survey and Analysis of the Virilla Watershed*. London: International Institute for Environment and Development (IIED).
- Miranda, M. *et al.* 2004. *The Socioeconomic Effects of Carbon Markets in Costa Rica. A Case Study of the Huertar Norte Region*. London: International Institute for Environmental and Development (IIED).
- Ministerio del Ambiente y Energía de Costa Rica (Minae), Sistema de Áreas de Conservación (Sinac). n.d. *Sistema de Pago de Servicios Ambientales*. Roma: Convención de las Naciones Unidas de Lucha contra la Desertificación y la Sequía. Coordinación y Movilización de Recursos Nacionales e Internacionales. CRIC.

- Moura Costa, P. 1998. The Costa Rican System of Direct Payment for Environmental Services. In *Greenhouse Gas Mitigation: A Review of International Policies and Initiatives*, Stuart, M., and P. Moura Costa, eds. London: International Institute for Environment and Development (IIED).
- Orozco, B.J., and K. Ruiz. 2001. *Uso de Instrumentos Económicos para la Gestión Ambiental en Costa Rica*. Heredia: Centro Internacional de Política Económica para el Desarrollo Sostenible (CINPE).
- Pagiola, S. 2000. *Payments for Environmental Services. Annotated References: Identifying, Quantifying, and Valuing Watershed Services*. Washington, DC: World Bank, Environment Department.
- Pagiola, S. and G. Platais. 2002a. Market-based Mechanisms for Conservation and Development: The Simple Logic of Payments for Environmental Services. In: *Environmental Matters—Annual Review, July 2001–June 2002 (FY 2002)*. Washington, DC: World Bank’s Environment Department.
- Pagiola, S. and G. Platais. 2002b. *Payments for Environmental Services*. Washington, DC: The World Bank Environment Department, Environment Strategy Notes (3).
- Pagiola, S. et al. 2002. *Selling Forest Environmental Services. Market-based Mechanisms for Conservation and Development*. London: Earthscan Publications Ltd. 299 pp.
- Pagiola, S. et al. 2003a. *Can Payment for Environmental Services Help Reduce Poverty? An Exploration of the Issues and the Evidence to Date*. Washington, DC: World Bank.
- Pagiola, S. et al. 2003b. *Paying for the Environmental Services of Protected Areas: Involving the Private Sector*. Durban, South Africa, 8–17 September 2003. Fifth World Parks Congress, Sustainable Finance Stream.
- Pagiola, S. et al. 2004. Paying for Biodiversity Conservation Services in Agricultural Landscapes. May. Environment Department Paper (96). *Environmental Economics Series*. Washington, DC: World Bank.
- Pagiola, Stefano, Agustín Arcenas, and Gunars Platais. 2005, forthcoming. Can Payments for Environmental Services Help Reduce Poverty? An Exploration of the Issues and the Evidence to Date from Latin America. *World Development*.
- Pearce, D.W. 2001. *How Valuable are the Tropical Forests? Demonstrating and Capturing Economic Value as a Means of Addressing the Causes of Deforestation*. Paris: IDDRI.

Profor. 2004. Economic Incentives for SFM and Landscape Restoration: A Workshop Summary. *Innovative Financing for SFM, 1 (2)*. Washington, DC: World Bank, Program on Forests (Profor).

REECS. 2003. *Developing Pro-poor Markets for Environmental Services in the Philippines*. London: International Institute for Environment and Development (IIED).

Rojas, M. and B. Aylward. 2002. *The Case of La Esperanza: A Small, Private, Hydropower Producer and a Conservation NGO in Costa Rica*. Land-water linkages in rural watersheds case study series. Rome: Food and Agriculture Organization (FAO).

Rojas, M. and B. Aylward. 2003a. *Initiatives Based on Payments and Markets for Environmental Services in Costa Rica*. London: International Institute for Environment and Development (IIED), Environmental Economics Program (EEP).

Rojas M. and B. Aylward. 2003b. *What are We Learning from Experience with Markets for Environmental Services in Costa Rica? A Review and Critique of the Literature*. London: International Institute for Environment and Development (IIED). At: <<http://www.iied.org/eep/pubs/documents/MES2.pdf>>, consulted on 21 January 2004.

Rosa, H. and S. Kandel. 2002a. *Pagos por Servicios Ambientales y Comunidades Rurales: Contexto, Experiencias y Lecciones de México*. Fundación PRISMA.

Rosa, H., and S. Kandel. 2002b. *Payments for Environmental Services: Brazil*. Ford Foundation and Fundación PRISMA.

Rosa, H. and S. Kandel. 2003. *Gestión Local y Participación en Torno al Pago por Servicios Ambientales: Estudios de Caso en Costa Rica*. Fundación PRISMA.

Rosa, H. et al. 1999a. *Trade in Environmental Services and Sustainable Development in Central America: The Cases of Costa Rica and El Salvador*. Winnipeg: International Institute for Sustainable Development (IISD).

Rosa, H. et al. 1999b. *Valoración y Pago por Servicios Ambientales: Las Experiencias de Costa Rica y El Salvador*. Boletín 35. Fundación PRISMA.

Rosa, H. et al. 2002. *Payment for Environmental Services and Rural Communities: Lessons from the Americas*. Tagaytay City, The Philippines: International Conference on Natural Assets, Political Economy Research Institute and Centre for Science and the Environment.

Rosa, H. et al. 2003a. *Compensation for Environmental Services and Rural Communities. Lessons from the Americas and Key Issues for Strengthening Community Strategies*. Fundación PRISMA.

Rosales, R.M.P. 2003. *Developing Pro-poor Markets for Environmental Services in the Philippines*. London: International Institute for Environment and Development (IIED).

Schelske, O. 1998. *Financial Innovation for Biodiversity: the Swiss Experience. Two examples of the Swiss Experience: Ecological Direct Payments as Agri-Environmental Incentives and Activities of the Foundation for the Conservation of Cultural Landscapes*. Bratislava, Slovakia: Fonds Landschaft Schweiz.

Scherr, S. et al. 2004. *A New Agenda for Forest Conservation and Poverty Reduction. Making markets Work for Low-income Producers*. Washington, DC: Forest Trends.

Smith, J. and S.J. Scherr. 2002. *Forest Carbon and Local Livelihoods: Assessment of Opportunities and Policy Recommendations*. Jakarta: Center for International Forestry Research (CIFOR).

Snider, A.G., et al. 2003. *Policy Innovations for Private Forest Management and Conservation in Costa Rica*. *Journal of Forestry* 101(5): 18–23. Maryland: Society of American Foresters.

Tsen, W. et al. 2002. *Payments for Environmental Services in Mexico*. Berkeley: University of California at Berkeley, Goldman School of Public Policy.

Unidad Regional de Asistencia Técnica (RUTA). *Ruta en Centroamérica*. Boletín trimestral (25), December 2003.

World Wildlife Fund and Danida. 2003. *From Good-will to Payment for Environmental Services. A Survey of Financing Alternatives for Sustainable Natural Resource Management in Developing Countries*.

World Bank. 2000. *Ecomarkets project: Project appraisal document. Report No.20434-CR*. Washington, DC: World Bank.

World Bank. 2002a. *Market-based Mechanisms for Conservation and Development*. Annual Review: July 2001–June 2002.

World Bank. 2002b. *Colombia, Costa Rica, and Nicaragua regional integrated silvopastoral approaches to ecosystem management project: project appraisal document*. Report No.21869-LAC. Washington, DC: World Bank.

World Bank. 2003a. *El Desarrollo de Mercados para Servicios Ambientales de Ecosistemas Forestales, Una Iniciativa en curso*. Washington, DC: World Bank.

World Bank. 2003b. *Guatemala Western Altiplano Natural Resources Management Project: Project Appraisal Document*. Report No. 25660-GUA. Washington, DC: World Bank.

World Bank and World Wildlife Fund Alliance for Forest Conservation and Sustainable Use. 2003. *Running Pure: The Importance of Forest Protected Areas to Drinking Water*. Washington, DC: World Bank and WWF.

Internet Sources

Arocena-Francisco, H. 2003. *Environmental Service "Payments": Experiences, Constraints and Potential in The Philippines*. Indonesia: World Agroforestry Centre (ICRAF), Southeast Asia Regional Office. Available at: <<http://www.worldagroforestrycentre.org/sea/Networks/RUPES/paper.htm>>, consulted on 17 February 2004.

Carbon Finance at the World Bank. At: <<http://carbonfinance.org>>.

Comisión Centroamericana de Ambiente y Desarrollo (CCAD), 2004. *Meso-American Biological Corridor: Payment for Environmental Services*. <<http://www.sgsica.org/centrodoc/libros/transform/catalogo/pdf-en/IV/16/16a.pdf>>, consulted on 9 February 2004.

Conservación para el Desarrollo, 2004. *El Pago de Servicios Ambientales en Costa Rica. Información General*. Available at: <<http://inbio.eas.ualberta.ca/en/default2.html>>, consulted on 3 February 2004.

European Tropical Forest Research Network (ETFRN). 2001/2002. *Innovative Financing Mechanisms for Conservation and Sustainable Forest Management*. <www.etfrn.org/etfrn>, consulted on 9 February 2004.

Fondo Nacional de Financiamiento Forestal (Fonafifo). *Pago de Servicios Ambientales para Proyectos Forestales*. <http://www.fonafifo.com/paginas/PSA_Publica.pdf>, consulted on 9 February 2004.

Fondo Nacional de Financiamiento Forestal (Fonafifo). *Programa de Pago de los Servicios Ambientales*. <<http://www.fonafifo.com/paginas/psa.htm>> consulted on 9 February 2004.

Forest Trends and CIFOR. *Colombia Takes the Lead in Payment for Environmental Services*. 13 May 2000. POLEX. <http://www.forest-trends.org/keytrends/pdf/POLEX_May_2000.pdf>, consulted on 9 February 2004.

Fundecor, Haciendo Sostenible el Desarrollo, 2004. *Tecnologías y Esquemas: El Sistema Pago y Cobro de los Servicios Ambientales*. <http://www.fundecor.org/transferecia/sistema_es.shtml>, consulted on 3 February 2004.

Fundecor, Haciendo Sostenible el Desarrollo, 2004. *Tecnologías Financieras- Proyectos de Pago de Servicios Ambientales de Fundecor*.

<http://www.fundecor.or.cr/transferecia/proyectos_es.shtml>, consulted on 5 February 2004.

Gouyon, A. 2003. *Rewarding the Upland Poor for Environmental Services: A Review of Initiatives from Developed Countries. Indonesia: World Agroforestry Centre (ICRAF), Southeast Asia Regional Office*. Available at:

<<http://www.worldagroforestrycentre.org/sea/Networks/RUPES/paper.htm>>, consulted on 17 February 2004.

Gutiérrez, M. 2004. *Acceso al Pago de Servicios Ambientales en Costa Rica*. Presented at the Conference on “Potencialidades de los Sistemas Pecuarios Tropicales para la Generación de Servicios Ambientales,” FAO, LEAD, CATIE. Anthropology PhD Program, Graduate School and University Center, City University of New York. At: <<http://www.lead.virtualcenter.org/es/ele/conferencia3/articulo11.htm>>, consulted on 3 February 2004.

IUCN, 2002. *Pro-poor Markets for Environmental Services: A New Source of Finance for Sustainable Development?* Workshop presented at the World Summit for Sustainable Development, Johannesburg, South Africa, 28 August–4 September 2002. <<http://biodiversityeconomics.org/incentives/020828-01.htm>>.

Katoomba Group’s Ecosystem Marketplace.

See: <<http://www.ecosystemmarketplace.com/>>.

Kiersch, B. and J. Van Wambeke. 2002. *Servicios Ambientales*. FAO: Oficina Regional para América Latina y el Caribe. 26 de Noviembre de 2002.

<<http://www.rlc.fao.org/prior/reclnat/docs/pago.pps>>, consulted on 9 February 2004

Organización de las Naciones Unidas para la Agricultura y la Alimentación (FAO). Oficina Regional para América Latina y el Caribe.

<<http://www.rlc.fao.org/prior/reclnat/pago.htm>>, consulted on 9 February 2004.

Ortiz Malavasi, E. and J. Kellenberg. *Program of Payments for Ecological Services in Costa Rica*. Costa Rica, United Kingdom, IUCN, WWF, ITTO, CIDA, CIFOR, NEAFF.

<http://epp.gsu.edu/pferraro/special/lr_ortiz_kellenberg_ext.pdf>, consulted on 9 February 2004.

Powell, I. *et al.* 2002. *Developing Markets for the Ecosystem Services of Forests*. Washington: Forest Trends.

At: <http://www.foresttrends.org/resources/pdf/powellwhite_ecoservices.pdf>, consulted on 7 February 2004.

Rewarding Upland Poor for Environmental Services (RUPES). *RUPES Newsletter*. Vol.1, Issue 2, December 2003. <<http://www.worldagroforestry.org/sea/networks/rupes-old/index.asp>>, consulted on 11 February 2004.

Rosales, R. 2003. *Developing Pro-poor Markets for Environmental Services in the Philippines*. Resources, Environment and Economics Center for Studies. International Institute for Environment and Development (IIED). February 2003. <<http://www.worldagroforestrycentre.org/sea/Networks/RUPES/paper.htm>>, consulted on 17 February 2004.

Sistema Nacional de Áreas de Conservación (Sinac), Ministerio del Ambiente y Energía (Minae), Costa Rica, 2004. *Pago de Servicios Ambientales, Cuadro Descriptivo de Incentivos Forestales Aplicados a Costa Rica*. At: <http://www.sinac.go.cr/fomento/pago_servicios_ambientales.html>, consulted on 3 February 2004.

University of California, Berkeley. *Payments for Environmental Services in the Mexican Ejido*. At: <<http://are3.berkeley.edu/courses/DEVELOPMENT/research.html>>, consulted on February 2004.

World Bank Group (The). 2004. Environmental Economics and Indicators. *Payment for Ecological Services*. At: <<http://Inweb18.worldbank.org/ESSD/envext.nsf/44ByDocName/PaymentsforEcologicalServices>>, consulted on 22 January 2004.

World Bank Group (The). *Payments for Ecological Services*. <<http://Inweb18.worldbank.org/ESSD/envext.nsf/44ByDocName/PaymentsforEcologicalServices>>, consulted on 3 February 2004.