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Equity implications of marketing ecosystem services in protected areas and rural communities: Case studies from Meso-America

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Abstract

This paper investigates the equity implications of marketing ecosystem services in protected areas and rural communities. We use a three-tiered equity framework to analyse four distinct efforts to commercialise watershed recharge and carbon dioxide fixation by forests in Meso-America. We show that project development and participation are strongly mediated by organisational networks, as well as existing rights of access over land and forest resources. We demonstrate that procedural fairness diverges strongly when initiatives are implemented in protected areas or in rural communities. While in the former reserve managers and intermediaries concentrate all decision-making power, initiatives working with rural communities are able to integrate more significantly service providers in management decisions. Marketing ecosystem services in protected areas contributes to reduce expenditure rates for protected area management, but also results in less equitable outcomes, as rural communities and forest resource users become excluded from receiving sustained development benefits. When ecosystem services are commercialised by rural farmers, payments do not cover opportunity costs but act as a significant incentive for participation in most cases. Ecosystem service providers also benefit from complementary project activities, such as forest management training and agricultural extension support. We argue that limited economic impact and existing inequities in decision-making and outcomes can be explained by problems of institutional design, in particular the inability of markets and payments for ecosystem services to account for context-related factors, such as property rights.

Keywords: Equity; Ecosystem services; Development; Poverty; Participation; Property rights; Meso-America

1. Introduction

Ecosystem services regulate and support natural and human systems through processes such as the cleansing, recycling, and renewal of biological resources, and they are crucial for the sustainability of human development in economic, social, cultural and ecological terms (Daily et al., 1997). However, as the world's population and the global economy grow in the future, the demand for these services and the likelihood of negative impacts are likely to increase (Millennium Ecosystem Assessment, 2005). For this reason, markets for ecosystem services (MES) and payments for ecosystem services (PES) have been advocated by global environmental institutions as a means to secure the provision of these services and ameliorate problems ranging from biodiversity and habitat loss to climate change (Adger et al., 2005; Scherr et al., 2004). Such advocacy is embedded in a logic of market environmentalism which has become prominent since the late 1980s (Smith, 1995). As the benefits provided by ecosystem services are neither priced nor marketed, resource users do not take into account the degradation of these services in their resource management decisions. Market environmentalism promotes the assignation of property rights and pricing of nature's services, which can

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then be traded within a market that will assign high prices to scarce services and encourage the sustainable management of renewable resources (Liverman, 2004).

In practice, MES and PES consist of transferring economic resources from providers to consumers of ecosystem services so that the former benefit economically while the latter receive the *right* to use the resources provided by the service in question. The difference between MES and PES resides in their underlying institutional framework. MES must have a well-defined ecosystem service and a well-defined trading commodity, and active supply and demand sides must coexist. An enabling legislative and institutional framework outlining the rules for commodity trading and for the contractual relationship between the supply and the demand side is also necessary, and transaction prices are set by the laws of supply and demand. In contrast, PES are not actual markets where ecosystem services are sold to service buyers. The commodity is ill-defined and, in most cases, governments play an intermediary role by mobilising resources from consumers to a government fund, which then distributes financial resources to ecosystem-service stewards at a pre-established price. Other experiences, however, involve directly private organisations and individual or collective providers of ecosystem services without any intervention from the State who also negotiate the "commodity" price at a more or less flat rate. MES and PES are thus defined by distinct procedural rules, more or less complex evaluation mechanisms, different types of actors involved at both the supply and demand sides, and a different set of expectations for success, in addition to contrasting levels of potential demand.

To date, MES and PES have covered a wide range of ecosystem services, including biodiversity conservation, watershed conservation and carbon dioxide fixation by forests (Table 1). In the United States, for instance, the federal government has established a national system of wetlands banking. Through this system, construction developers offset the destruction of natural habitats by obtaining wetland conservation permits and financing wetland conservation elsewhere in the country (Robertson, 2004). Latin American countries, particularly in Meso-America,[1] have pioneered the implementation of these initiatives in the developing world. In the mid-1990s, Costa Rica brokered the first agreement between its National Institute for Biodiversity and a major US pharmaceutical company to facilitate the company's access to genetic resources in exchange of a share of eventual product developments (Rojas and Aylward, 2003, 13–14). At the same time, the Costa Rican government also established a PES scheme through which forest resource owners were paid for forest conservation, management and reforestation activities. The State gained carbon emission offsets and watershed rights which were in turn distributed to the private companies in charge of financing the scheme (Rojas and Aylward, 2003, 37–43). Other countries, such as Brazil and Mexico followed suit and established PES schemes in recent years (Pagiola et al., 2005).

In the context of the United Nations Framework for Climate Change (UNFCCC), over a dozen of pilot carbon forestry projects were initiated in the late 1990s under the activities implemented jointly (AIJ) pilot phase in countries such as Mexico, Belize, Costa Rica, Brazil, Bolivia, Vietnam and Indonesia, among others. These projects provide Voluntary Emission Reductions (VERs) to governments and private organisations in developed countries and have become learning-by-doing initiatives to assess the viability of using land-use projects in developing countries to offset global greenhouse gas emissions (UNFCCC, 2002). Recently, more carbon forestry projects are being designed across the developing world under the Kyoto Protocol's Clean Development Mechanism (CDM). These projects expect to generate Certified Emission Reductions (CERs) for parties and organisations in developed countries, which can then use such reductions to comply with emissions targets under the Kyoto Protocol (World Bank, 2006).

It is emphasised that MES and PES can be powerful tools for poverty alleviation and rural development and they can be more economically efficient and environmentally effective than previous strategies for resource conservation, thus providing a more equitable distribution of economic and social benefits (Pagiola and Platais, 2002). It is also argued that MES and PES can improve livelihoods and well-being, promote local sustainable forest management and strengthen community-based institutions (Smith and Scherr, 2002), enhance ecosystem health (Matthews et al., 2002) and secure new sources of funding for biodiversity conservation (Gutman, 2001; McNeely, 1999; Walsh, 1999). However, it is also suggested that such initiatives can be ineffective in involving poor landowners, either due to an institutional framework biased against small land properties in order to reduce transaction costs, or because the poor may not be able to invest or allocate land for forest protection in limited land endowments (Albán and Argüello, 2004; Grieg-Gran et al., 2005; Rojas and Aylward, 2003). Pilot carbon forestry projects in Bolivia and Brazil have found difficulties in channelling economic resources towards strengthening community-based organisations and implementing other productive activities besides sustainable forest management (May et al., 2004).

In this paper, we use the three-tiered equity framework proposed by Brown and Corbera (2003) in four distinct efforts to commercialise watershed recharge and carbon sequestration by native forests in Meso-America, through either existing protected areas or rural farmers and communities. Equity is a key component of sustainable

[1]The term 'Meso-America' was coined by Paul Kirchoff in 1943 as the geographical region between Mexico's Sinaloa, Lerma and Panuco rivers and Costa Rica's Nicoya Peninsula. This region has a common ethnical configuration, with a number of ancient cultures sharing religious beliefs, art, architecture, migration and colonisation patterns (Kirchoff, 1943).

Table 1
Examples of traded ecosystem services and derived commodities

Ecosystem service	Commodity	Description
Biodiversity conservation	Bio-prospecting rights	Investors collect and test genetic material from a designated forest area and compensate property holders for their access
	Debt for nature swaps	Involves the purchase of discounted developing-country debt, which is exchanged for domestic financial resources to invest in conservation
	Conservation easements	Landowners are paid to manage their land in ways to achieve conservation objectives
Watershed conservation	Watershed protection contracts (best management practices)	Watershed landholders and downstream beneficiaries set out resource management practices which must be implemented in return for payments
	Water quality credits	They are generated when water-polluting companies offset such pollution by investing in watershed protection elsewhere
Carbon dioxide fixation	Voluntary emission reductions	They are generated when private or public companies/agencies offset their carbon emissions on a voluntary basis by financing forest conservation or plantation in developed and developing countries. VERs are used to green investors' corporate image
	Certified emission reductions (CERs)	They are generated when investors from Annex-I countries under the Kyoto Protocol fund reforestation and afforestation activities in developing countries through the Clean Development Mechanism. CERs are then used to meet investors' emission reduction targets under the Protocol
	Emission removal units (ERUs)	They are generated when investors and governments from Annex-I countries fund the protection and management of forest stocks in their own countries. ERUs are also used to meet emission reduction targets under the Kyoto Protocol

Source: Landell-Mills and Porras (2002) and own modifications.

development and a key criterion to take into account in the development and implementation of MES and PES (Mayrand and Paquin, 2004; Scherr et al., 2004). Following Brown and Corbera (2003), equity comprises three elements: equity in access, equity in decision-making and equity in outcome. The paper is structured in five sections, including this introduction. Section 2 presents a research framework to examine the equity implications of MES and PES, which draws on elements of institutional theory of global environmental change (Adger et al., 2003; Young, 2002; Young et al., 1999). Section 3 describes the study sites and the methods employed for data collection. Section 4 outlines and discusses the results, deriving some lessons for the future marketing of ecosystem services. Section 5 summarises and concludes the paper.

2. Conceptual and analytical framework

2.1. The institutional nature of MES and PES

In the context of environmental change, institutions exist or are created to influence the way in which humans relate to their environment. They have been defined as systems of rules, decision-making procedures, and programmes that articulate or give rise to social practices in relation to the environment, assign roles to participants, and guide interactions among individuals and organisations (Young et al., 1999). Traditionally, ecosystem services have been issued by institutions, which have set aside some parts of nature from the market through protected areas or other conservation policies. In contrast, it is now argued that marketing nature will foster its conservation and the provision of ecosystem services.

We characterise MES and PES as emerging institutions which attempt to reconfigure human–environment interactions by promoting the conservation of ecosystem services through their commodification. Their constitutive projects represent the institutional arrangements encompassing the sets of rules, rights and obligations through which MES and PES organise, govern and operate themselves. Where effective institutions for environmental management already exist, projects commercialising ecosystem services can reinforce existing institutions and sustainable practices. When land-use management practices for the maintenance of ecosystem services are not in place, the provision of direct economic incentives is expected to act as stimuli to change individual and collective behaviour for the conservation of these services.

We acknowledge that MES and PES do not operate in isolation. Their constitutive projects may be strongly influenced by existing institutions, including formal (e.g., agricultural and forestry policies, collective action institutions) and informal (e.g., traditional practices for natural resource management), which may enable or undermine effective resource management (Agrawal, 2002; Dietz et al., 2003). Therefore, a research challenge is to become sensitive to the institutional context in which projects are implemented as it can ultimately influence the effectiveness of MES and PES (Swallow et al., 2005).

As shown in the introduction, the State has played a pivotal role in the establishment of PES. The level of involvement of the private sector and individual consumers

is still limited but growing, particularly in the area of carbon forestry where buyers are purchasing CERs for compliance under the Kyoto Protocol or accruing VERs to meet corporate environmental responsibility standards (Taiyab, 2006). MES and PES are then evolving institutions, where trust between present and future involved actors still needs to be further strengthened, specifically by ensuring that payments demonstrate clear additionality vis-à-vis carefully established baselines and contribute to environmental conservation and social development (Wunder, 2006).

2.2. Analytical framework

We propose to investigate the equity implications of MES and PES using a three-tiered equity framework (Brown and Corbera, 2003). Equity is a central pillar of sustainable development (World Commission on Environment and Development, 1987), global environmental justice (Scholsberg, 2004), and a key criteria for sustainable environmental governance, jointly with economic efficiency, environmental effectiveness, and political legitimacy (Adger et al., 2003). Equity has been recognised as a key element to be taken into account when designing and implementing MES and PES, specifically if the poor and the most disadvantaged are to be involved in these initiatives (Rosa et al., 2003). It has also been highlighted that there may be implicit trade-offs between equity, economic efficiency and environmental effectiveness, as those individuals and organisations delivering the service in the most cost-efficient and environmentally effective way may not necessarily be low-income farmers and community organisations (Scherr et al., 2004, 59).

Brown and Corbera (2003) propose to distinguish between three elements of equity: *equity in access*, *equity in decision-making* and *equity in outcome*. *Equity in access* concerns the way in which individual farmers, rural communities and organisations are able to participate in emerging markets. This depends on access to information, knowledge and networks, as well as on access to land and forest resources. *Equity in decision-making* concerns procedural fairness within the project framework, and relates to issues of recognition and inclusion in strategic management decisions (Fraser, 1997; Paavola, 2003). Finally, *equity in outcome* refers to the distribution of project outcomes across project participants, including economic payments and their perceived fairness. Distribution of project outcomes will in turn be determined by access to project activities and decision-making (i.e., those without a voice in project management may not be able to benefit from specific outcomes, such as forest management training activities).

3. Case studies and research methods

3.1. Study sites

Las Escobas River Basin is located in the *Reserva Protectora de Manantiales Cerro San Gil* (Cerro San Gil water source protection reserve), cutting across the municipalities of *Livisgton*, *Puerto Barrios* and *Morales*, Guatemala (FUNDAECO, 1999). The river basin has an extension of 707 ha and supplies drinking water to 5319 households in *Puerto Barrios* (FUNDAECO, 1999, 2004). In 1998, the *Fundación para el Ecodesarrollo y la Conservación* (FUNDAECO), which administers the Reserve on behalf of the Guatemalan State, negotiated a PES scheme with the *Empresa Hidroeléctrica del Atlántico* (HEDASA), a local hydroelectricity company, on the premise that an increase in forest conservation efforts would ensure continuous water flows and a reduction in sediment loads. In 2002, HEDASA, which also acts as the public water provider, started transferring a monthly payment of US$17.86/ha/year to FUNDAECO in order to improve the management of the river basin. The activities promoted include protecting and managing the hydrographical basin; encouraging sustainable agricultural practices; providing opportunities for low impact ecotourism; and promoting sustainable forest management through agro-forestry. PES funds come from an increase in the water tariff of US$0.20/month.

Paso de Los Caballos River Basin has an extension of 740.6 ha and it is located in the municipality of *San Pedro del Norte*, Nicaragua. The main economic activity in the area is agriculture, primarily small-scale cattle ranching and basic grain crops, which account up to 70 per cent of household income (Ardón Mejía and Barrantes, 2003). Problems regarding water quality and quantity led 125 households from *San Pedro del Norte* to propose and negotiate a PES scheme with the support of a local NGO (PASOLAC) and other regional civil organisations, which identified priority areas for funding in the upstream basin recharge area. The 125 households created a Water Committee and reached 5 individual agreements with upstream landowners, covering a total of 39.2 ha for reforestation and conservation of the prioritised areas. Each household contributes with US$0.31/month to the PES scheme and landowners receive US$26/ha/year. Landowners commit to avoid fires before, during and after sowing; develop organic agriculture; conduct soil conservation practices; develop agro-forestry systems; promote fore regeneration and commit to prevent livestock from invading the PES areas.

The *Fondo Bioclimático* Carbon project (FBC) in Mexico is one of the first carbon forestry projects in the world. Participant farmers and communities rely on subsistence and semi-subsistence maize and bean cultivation, livestock and relatively little commercial agriculture. The project's objective is to provide carbon benefits through forestry systems, which are economically viable, and socially and environmentally responsible. There are a total of 4738 ha under reforestation and conservation activities funded by several investors—The Carbon Neutral Company, Tetra Pak, International Automobile Federation and The World Bank—which in exchange receive VERs to offset their greenhouse gas emissions and to provide 'carbon neutral'

products and services to their clients. Between 1997 and 2000, the project secured funding for the sale of 60,498 tonnes of carbon dioxide equivalent (tCO_2eq)[2] over 30 years at a price of US$3.27/$tCO_2eq$, from which a 66.6 per cent (US$2.18/$tCO_2eq$) is allocated directly to farmers, and the rest is used to cover project administration and managers' salaries. Between 2000 and 2005, investors further contracted an approximate annual average of 36,666 tCO_2eq (Corbera, 2005b).

The *Rio Bravo* Carbon project is located within the Rio Bravo Conservation Management Area (RBCMA), a national protected area hold in trust by a Belizean NGO—Programme for Belize. The project aims to demonstrate a technical balance between cost-effective carbon sequestration, economically sustainable forest yield, and environmental protection (Programme for Belize, 2000a). The area dedicated for carbon sequestration occupies 55,000 ha, representing 52 per cent of the RBCMA. Within these, 14,000 ha have been allocated for conservation purposes while another 39,000 ha have been allocated for sustainable forest management and community development projects. The project has involved one international conservationist organization—The Nature Conservancy (TNC)—and one consultancy firm—Winrock International—in brokering an agreement with investors, and preparing carbon sequestration scenarios and forest management plans, respectively. Investors include a consortium of US and Canadian energy utilities. Based on project management figures, the project expects to sequester 10 million tCO_2eq over the period 1995–2035 with a total expenditure of US$2.6 million in the first 10 years and of US$3 million in the following 30 years. This translates into an approximate undiscounted price of US$0.25/$tCO_2eq$ (Programme for Belize, 1996, 2000b).

3.2. Research methods

Research methods encompass both qualitative and quantitative techniques. Interviewees are classified into four main categories: *users*, *providers*, *potential providers* and *intermediaries*. *Users* are groups of organised people or organisations benefiting from the ecosystem service in question and paying for the coordination and implementation of management activities in the forested areas. *Providers* are stakeholders holding a contractual relationship with the *users* and who commit to implement forest conservation and management practices on their landholdings. *Potential providers* also own land in the area where projects develop but do not hold any contractual relationship with *users* or *intermediaries*. *Intermediaries* are organisations in charge of defining the conservation activities to be performed by the *providers*, and they are held responsible for collecting funds derived from the *users* in order to pay to the *providers*.

In the watershed cases, we conducted a total of 18 semi-structured interviews with members from intermediary organisations (HEDASA and the Water Committee). We also randomly surveyed 165 users, providers and potential providers' households involved in both PES schemes. In the carbon cases, we conducted 11 in-depth interviews with investors, intermediary organisations and former project managers (The Carbon Neutral Company, Programme for Belize, AMBIO and ECCM). In the Mexican project, where communities participate directly in tree planting, we selected two participant villages[3] and randomly interviewed 108 farmers and conducted 11 discussion groups (Table 2). Such imbalance across interview samples and the lack of control groups can be explained by the fact that we are relying on two different research projects. This drawback should be addressed in future collaborative work.

Nevertheless, all interviews across case studies include a range of questions concerning the project origins, the selection of service providers, the project perceived success and failures regarding local participation in decision-making and in the distribution of project outcomes, and the identification of existing trade-offs between the consecution of their environmental objectives and the provision of local development benefits (Box 1).

We analysed projects economic impacts and their perceived fairness by means of different proxies. For those initiatives concerning the provision of ecosystem services through protected areas (Guatemala and Belize), monetary compensation was calculated as the percentage of recurring costs covered by PES payments (%compensation = PES annual income/protected area protection and monitoring costs). These costs allowed us to investigate the relative importance of PES for the financial sustainability of protected areas. Indirect or opportunity costs of maintaining protected areas were not estimated since protected areas were already established by the time of fieldwork, hence these land plots already changed their land use to allow for environmental service conservation and provision. For community-based schemes (Nicaragua and Mexico), the impact of monetary compensation was estimated by using two proxies of opportunity cost. We define on-farm income as the total production multiplied by the average price of products, minus the cost of inputs for production and the cost of labour, including imputed (own) labour, in a year. The other proxy related PES payments to what providers perceive as a fair price for it. Monetary compensation was then analysed by comparing the above-mentioned proxy variables with the actual amount paid by the PES scheme. These calculations provided key insights on payments' contribution to the

[2]Measurement unit equalling the concentration of carbon dioxide that would cause the same amount of temperature change in the climate system as the given mixture of carbon dioxide and other greenhouse gases (Intergovernmental Panel on Climate Change, 2001).

[3]One village encompasses 555 households, 53 of which involved in carbon planting. Another village counts with 1141 households who collectively develop carbon plantations on common forests and grazing lands.

Table 2
Users, intermediaries and providers of ecosystem services

Case study	Users	Providers	Potential providers	Intermediaries
Las Escobas	Urban households ($N = 5319$, interviewed: 100)	FUNDAECO (three members interviewed, including current project managers)	None	HEDASA (seven members were interviewed, including local government officials)
Paso de los Caballos	Rural households ($N = 125$; interviewed = 56)	Small landholders ($N = 5$; interviewed = 5)	Small landholders ($N = 4$; interviewed = 4)	Water Committee and Municipality (eight members and representatives interviewed, including town's Major and users assembly's president)
Fondo Bioclimático	International private companies ($N = 5$; interviewed = 1)	Small landholders and communities ($N = 450$; interviewed = 108)	Small landholders and communities	AMBIO, ECCM, former project managers (five members interviewed, including the three current project managers, ECCM director and three former project managers)
Rio Bravo	Utility companies (no interviews)	Programme for Belize (director and technical coordinator interviewed)	None	The Nature Conservancy, Winrock International (no interviews)

long-term financial sustainability of protected areas and their fairness and ability to alleviate rural poverty.

The following section outlines the equity implications of our case studies. In each sub-section, a clear-cut distinction is made between the initiatives protecting watershed and carbon forest stocks through protected areas (Guatemala and Belize) and community-based schemes which manage landscapes to guarantee water quality and enhance forest cover (Nicaragua and Mexico).

4. Results and discussion

4.1. Equity in access

In Belize, access to carbon funding by Programme for Belize was determined by its ongoing collaboration with TNC, which was responsible for securing carbon finance, designing the project jointly with Winrock International and registering the project under the UNFCCC AIJ pilot phase. The relationship between Programme for Belize and TNC dates back to the early 1990s, when US conservation organisations purchased land rights to create the RBCMA. During the nineteenth century and most of the twentieth century, property in the RBCMA area was in hands of logging concessions and rubber tapping industries. In the early 1980s, with logging nearly moribund as a commercial activity, property was purchased by two agroindustries, and a cattle ranching and logging company. At the end of the 1980s, one of these agroindustries donated 16,968 ha to the US conservationist organisation Massachusetts Audubon Society, which was interested in creating a tropical reserve for wintering migrant birds. This was the initial stimulus for the creation of Programme for Belize and the RBCMA. The area expanded through the acquisition of 44,440 ha from the other agroindustry, at the same time as the other company passed the rest of its land, another 20,200 ha to TNC, which bypassed it to Programme for Belize. All these tracts of land became united through the purchasing of another 10,827 ha from the logging company (Brown et al., 2004, pp. 44–45).

Therefore, the RBCMA expanded within a 5-year period (1990–1995) to cover approximately 92,435 ha, with Programme for Belize holding title to the entire property (Programme for Belize, 1996, p. 20). Carbon funding helped to purchase another 13,309 ha of more land from the logging company in the eastern and southern part of the reserve, which was threatened of being converted into farmland (United States Initiative for Joint Implementation, 1995). During all these years, local residents continued to usufruct available forest resources for subsistence purposes and, while some of them worked for the different land owners, others worked elsewhere. The fact that local residents have never hold formal property rights within the RBCMA explains why they were considered secondary actors in the design of the carbon project and have never been considered direct service providers.

The PES scheme in *Las Escobas* watershed (Cerro San Gil protected area) is the result of a two-sided negotiation process between FUNDAECO and HEDASA. The PES started in 1998 when FUNDAECO appropriated this conceptual approach as a means of increasing financial

Box 1: Questions address to project individuals and organisations

Questions addressed to:

All interviewees:

- How did the project start and which factors explain its effective development?
- What is the role of the government in the project (if any)?
- How is the monitoring of payments' effectiveness being undertaken?
- Are there any providers who have dropped already from project activities?
- Do you think that payments are fair? Which other benefits provides the project?
- Have there been any problems when implementing the project (e.g., social conflict)?
- In which ways has the project modified locally existing rules and practices for land-use management? Has this caused any problems for participating communities and farmers (e.g., disputes over property rights)?

Intermediaries (HEDASA, Water Committee, Programme for Belize, AMBIO, Edinburgh Centre for Carbon Management):

- How were the providers selected?
- Who are the actors involved and which is their role in the project?
- Are there any communication strategies in place between service providers, intermediaries and service users?
- How do service providers participate in strategic management decisions?
- Which is the ability of service providers to grasp the nature of the project?
- What is the nature of contracts between providers and users? Are there sanctions in place for non-compliance?
- Have women been involved in project design and implementation? If so, in which way? (not directly addressed in watershed case studies)

Providers (civil organisations and farmers):

- When did you start participating in the project, with how many hectares, and why?
- To which extent land endowment limits people's ability to join the project?
- What are the most important benefits derived from the project?
- Which are your obligations as a participant in the project? And what do you expect from project intermediaries and service users?
- Who does not participate in the project and why (e.g., historically rooted conflicts with external organisations)?
- Which factors explain local participation in the project, either individually or collectively?
- How do you participate in project decision-making?
- Which aspects do you think that the project should improve?

Users (urban households, investment companies):

- Why did you decided to participate in the project?
- Which benefits do you expect to accrue from the project?
- How often do you interact with other actors involved in the project? (not directly addressed in watershed case studies)

Box 1. Questions address to project individuals and organizations.

reviews. Since HEDASA had almost spent 40 years providing the water service in Puerto Barrios, FUNDAECO discussed with this company its willingness to participate in the PES. In 2001, Puerto Barrios Municipality also became the largest shareholder in HEDASA, and appointed FUNDAECO to conduct an environmental assessment of the water company. As a result of this collaboration, both organisations agreed on technical and financial cooperation activities, and the PES was approved. The financial cooperation was oriented exclusively towards the protection of the water recharge area, although funds were also being used for the integrated management of Las Escobas watershed.

The design of the PES scheme brought out a series of historical conflicts between FUNDAECO and its neighbouring communities. Historically, a chaotic cadastral

situation had created incentives for illegal encroachments, since working and living in a land plot had given local peasants the opportunity to access *de facto* land rights. In addition, gravel extraction in the watershed area had also induced the creation of new illegal settlements. These processes were forbidden by the NGO at the start of the PES scheme.

The origins of the Fondo Bioclimático project should be traced back to the early 1990s, when a researcher from the Edinburgh Centre for Carbon Management (ECCM) and the local credit union Unión de Crédito Pajal Ya kac'tic (hereafter referred to as PAJAL), together with other researchers from the Mexican research institution El Colegio de la Frontera Sur (ECOSUR), conducted a feasibility study for the development of carbon forestry activities in Chiapas (de Jong et al., 1995). The study involved farmer groups affiliated to PAJAL across eight rural communities from this Mexican state. In 1997, the project was registered under the United States Initiative for Joint Implementation (USIJI) of the UNFCCC under the name of Scolel Té. The Mexican government's Environment Ministry (SEMARNAT) endorsed the project that same year (de Jong and Tipper, 1997) and, soon after the project was registered, a trust fund named Fondo Bioclimático was created to administer carbon investments, with the international broker acting as its only trustee.[4] The project started to operate only in the communities which participated in the feasibility study and the management team consisted of the project broker and PAJAL directors, who oversaw the administrative aspects of the project, four community representatives and three technicians employed by PAJAL but paid with carbon project funds who focused on designing each forest management plan. Five researchers from ECOSUR, including two foresters, one economist and two anthropologists, provided technical advice for the design of local carbon forestry activities.

Since 1997, however, several organisational changes have occurred in the project framework as a result of changes in power distribution across participating actors (Corbera, 2005b). The most important changes include the creation in 1998 of the current project management entity, AMBIO, and the expansion of the project across other rural organisations and communities across the State due to an increase in carbon funding. The latter permitted other farmers and communities which did not belong to PAJAL to access the project. While in its origins the project only involved 42 individual carbon providers from six distinct communities belonging to PAJAL, in September 2005 there were 650 individual participant providers representing 33 communities, and three of the latter developing carbon plantations on the forest commons. The project's inclusion of a diversity of rural organisations and participants within its framework, its respect for local knowledge, and a process of trial and error in the design and development of carbon forestry activities are a major cause of providers' interest in the project (Phillips et al., 2002).

The PES scheme in *San Pedro del Norte* was initiated through a regional NGO (PASOLAC), which soon involved the local community, the local municipality and other regional organisations. The scheme's design and implementation was inspired by an existing PES in a Honduran watershed, and a number of workshops took place between the local community and Honduran organisations for the exchange of experiences and know-how (Ardón Mejía and Barrantes, 2003). In fact, the idea of creating the Water Committee in *San Pedro del Norte* emerged as a result of this exchange.

This watershed has been historically subjected to human activities, mainly timber extraction about 40 years ago, leading to the rapid destruction of most local forests. Local residents relate limited water availability with forest cover reduction, a view which is also shared by upstream landowners. In addition to water scarcity problems, there was also mismanagement of the water service by ENACAL, the National water company. Both factors played a crucial role in the active involvement of local residents to solve local water issues and, inspired by the Honduran experience, they resolved to create the water committee. Moreover, the municipality supported the committee by developing a local bill for the regulation of PES.

Thus, the design of the PES scheme involved the water committee, the municipality, PASOLAC and other local NGOs. Upstream providers and potential providers were not actively involved until later, when the scheme began its implementation. The definition of the water recharge area was based on a technical study developed by PASOLAC, and along with the water committee, they established recharge priority areas and negotiated with the correspondent landowners. However, prioritisation of recharge areas was not transparent and generated resentment between potential providers who felt marginalised from PES implementation. Nowadays, the water committee is actively promoting a providers' association so as to allow potential providers to participate more actively in the scheme.

The first lesson distilling from our results so far concerns the importance of socio-political and expert-based networks to be able to design MES and PES projects and access national and international funding. In Belize and Mexico, for instance, collaboration between international consultants, research and rural organisations was critical to access funding and develop studies for the viability of carbon forestry. The professional relationship between these organisations also implied that trust already existed between project developers and farmers, and the latter became interested in the project. The intermediary's ability to identify an opportunity for investment and being

[4]A trust fund is a bank account in which economic resources are held in trust until transactions between buyers and sellers are complete. This article names the project according to the name of its trust fund because the majority of communities involved are more familiar with the name of the trust fund and the present management organisation, AMBIO, than with the original name of Scolel Té.

capable of securing international funding in the carbon cases was also critical for project set-up. We also mentioned that a series of organisational changes, accompanied by an increase in the levels of funding, allowed project managers to maximise the access of a higher number of local communities to the project. However, such increase in access to project activities translated into a reorganisation of project management and an abandonment of the project's early development focus. According to former project managers, between 2000 and 2002, the project underwent a transition from a development project to a carbon bank, whereby the concept of the project 'has changed from a community development project to a carbon bank with which farmers can contract to deposit carbon and withdraw payments' (Nelson and de Jong, 2003, 25–26).

In Nicaragua, the relationship between PASOLAC and the local community allowed for an exchange of experiences with a Honduran rural community, thus transferring know-how for the creation of a local organisational model for water management. According to the Vice-Major of *San Pedro del Norte* the relationship with PASOLAC allowed for local empowerment and appropriation of the PES scheme:

> The exchange experience with Honduras helped us to realise that water can be locally managed without the intervention of a National or foreign company, and as a result of such regime, water users were willing to pay or contribute with labour days for the PES scheme.

Our case studies also revealed that access to MES and PES can also be strongly mediated by property rights. For example, participation in the first community of the Mexican case was driven by the productive structure of the land endowment, with only richer households being able to allocate land for tree planting. Households' participation was dependent on the ability to carry out planting activities in woodlands and pastures while maintaining other hectares for oxen to graze. We found that land-use change from maize cultivation to planting trees for carbon fixation did not occur because it would put farmers' subsistence at risk. A more extensive participation of community members in the scheme was constrained by former social conflicts between the families who had early become involved in the carbon project and those who had not. This was in part caused by local villagers' unwillingness to cooperate and develop plantations in the commons, which was in turn explained by historical conflicts regarding the internal distribution of property rights (Corbera, 2005a). Some of the non-participants in this village were also reluctant to participate in the FBC project because they thought that it would alienate their property rights (Corbera and Adger, 2004). In the case of protected areas, organisational networks which enable protected area managers to consolidate exclusive property rights and specific land-use management activities makes unnecessary the involvement of local resource users, particularly if these users do not hold *de jure* property rights over the ecosystems which provide the service in question.

4.2. Equity in decision-making

This section analyses procedural fairness in project decision-making. In *Las Escobas* initiative, only FUNDAECO and HEDASA were involved in the negotiation process. FUNDAECO, as protected area manager, promoted the creation of a PES scheme with HEDASA, the closest and largest beneficiary of the watershed service provided by Cerro San Gil protected area. The tariff was set between FUNDAECO and HEDASA as a contribution for the conservation of the watershed. Communities living around the protected area and involved in clandestine logging were left outside of the negotiation. Lack of widespread participation in the design of the scheme spurred local conflict, as there was no attempt to mediate the competing interests that existed regarding access to and use of land and forest resources in the watershed area. As highlighted by the protected area manager:

> There is a conflict of interests around the watershed. FUNDAECO tries to conserve the natural resources and community members surrounding the reserve try to appropriate these resources by expanding the agricultural frontier (Manager of *Cerro San Gil* Protected Area, pers. comm.).

As a result of these conflicts, FUNDAECO has recently made a conscious effort to increase public awareness about the environmental benefits deriving from the reserve. Yet, these informative campaigns have not had much impact. In September 2004, an 88 per cent of *Puerto Barrios* citizens had no information about the PES scheme. Activities involving communities neighbouring the protected area were still not in place and education efforts were perceived by local users as informative rather than empowering.

Seemingly, in the Belizean RBCMA, conversations with project managers revealed that carbon funding has been used to increase the technical know-how of existing personnel, specifically on developing carbon sequestration baselines and forest management plans, and to provide some employment to local people as guards and cooks for ecotourism facilities. However, only a small component of carbon funding has been used in trying to sensitise local people to the importance of Programme for Belize activities for national and global interests in terms of climate change mitigation and biodiversity conservation.

In order to bring local people into the project framework, pilot projects on environmental education, local crafts production and agroforestry schemes were implemented during the early 1990s in the buffer zones of the reserve (Programme for Belize, 1996; United Nations Development Programme, 1996). Two years later, however, these programmes faded out due to a lack of financial resources and a lack of tourists interested in visiting the villages.

In community-based initiatives, local farmers and communities should, at least theoretically, play a more important role in decision-making processes. However, our results are not encouraging at this respect. In *San Pedro del Norte*, for instance, PASOLAC's efforts to involve service providers and users in making decisions over the PES scheme did not seem to be very effective: 68 per cent of users' interviewed manifested that they were not aware of PES and 78 per cent responded that they were never consulted regarding its implementation. We also found out that the areas subject to PES payments were not defined in a participatory manner, since some potential providers claimed to have land eligible for the programme. Other potential providers argued that they did not participate in the scheme because payments did not compensate for the costs of establishing the new land-management options or, as outlined previously for the Mexican case, they thought that PES were simply a mechanism to alienate their land rights.

In its early years, the Fondo Bioclimático project was characterised by a shared decision-making system at both implementation and strategic levels, based on a committee which incorporated community representatives, project managers and the intermediary between providers and service users. Later on, changes in the project organisational arrangements translated into a concentration of decision-making power in the hands of the project broker (Nelson and de Jong, 2003).

This situation of uneven power at project management level started to change in 2003 with an increase in project managers' decision-making power. This was caused by the broker's progressive disengagement with project development and a growing shared control of carbon funding expenditure between managers and the broker. Still, however, direct providers lack a central role in decision-making. Bi-annual meetings among project managers, rural organisations and community representatives have become institutionalised as a central element of decision-making but they play a mere informative role and no strategic decisions are made in this context:

> The project would have to be an organisational rather than an administrative body, in which local communities could be more fully involved in making strategic decisions. However, the people who are now working in the project do not have the necessary experience to organise people to make decisions' (FBC project manager, pers. comm.).

The project has also been gender biased by promoting the planting of native timber-oriented species, such *Pinus* sp. or *Cedrela* sp., which benefit men's interests. Women from the second researched community, for instance, manifested an interest in planting fast-growing species on common land, which could be used as sources of poles and fuelwood. And, although they play an active role in the management of the forest commons as fuelwood gatherers and herders (Silva, 2002), they have not been involved in project meetings. Project managers have only interacted with local authorities, who traditionally marginalise women from decisions concerning the forest commons (Corbera, 2005a). Moreover, in both communities, farmers were generally unaware of where the carbon revenue was coming from and their rationale for participation was often based on assumptions that can be scientifically contested, such as that planting trees would lead to future increases in rainfall (Calder, 1999). At present, project managers acknowledge that the number of visits to local communities is being progressively reduced due to the expansion of the project and the lack of human and financial resources to visit communities more often. The visits put their emphasis on carbon accounting and monitoring, rather than on the educational side of the project.

4.3. Equity in outcomes

4.3.1. Economic outcomes

In this section, we pay attention to the distribution of project outcomes, starting with an analysis of the impact of payments on protected area management and farmers' livelihoods. PES in *Las Escobas* watershed represent an annual transfer of US$12,642.24 (US$17.86/ha/year) to FUNDAECO, an amount partly obtained from charging an additional US$0.20/month to the households receiving water from HEDASA in *Puerto Barrios*. FUNDAECO annual expenditure is approximately US$158,028, which covers the organisation administrative and operative costs, including the protection of the *Cerro San Gil reserve*. The reserve annual protection expenditure is estimated around US$31,608. Therefore, the PES annual payment accounts only for a 6 per cent of the NGO's total expenditure but a 40 per cent of the total costs of protecting and monitoring the reserve. The Belizean case shows certain parallelism to *Las Escobas* in the sense that carbon payments contribute positively to the protection of the reserve. Programme for Belize, has to date received US$2.38 million of carbon investment, from which US$1.28 million has been used to purchase land and expand the protected area, and US$1.09 million has been used to create a resource protection endowment, cover management costs, and finance monitoring and verification studies of existing carbon stocks over a period of 10 years (Programme for Belize, 2000a). The average annual carbon income, excluding land purchasing costs and the resource protection endowment, is US$68,447. Programme for Belize estimates its total annual expenditure in US$1.5 million, including US$775,000 to cover general site maintenance, personnel and ecotourism management, and US$725,000 to cover the costs of developing specific projects (Programme for Belize, 2000b). Consequently, the carbon-NGO expenditure ratio is approximately 4 per cent while the annual average percentage of the RBCMA protection costs covered by carbon funding is 9 per cent.

In *San Pedro del Norte*, Nicaragua, most people are involved in agriculture and cattle ranching. The opportunity

costs for forest cover depend on which land uses are most common and profitable. In the specific area of our study, maize and beans are the most important subsistence crops. Providers and potential providers' income is about US$2000/year and US$1200/year, respectively, including on-farm and off-farm activities. When accounting only for on-farm activities for providers, therefore including all the activities performed on each landholding providers' on-farm income is about US$126/ha/year. When providers were asked about which price was fair for the provision of water environmental services, most of them agreed to a mean price of US$147/ha/year. Both proxies lead to similar values for the monetary compensation of forgone opportunity costs when implementing PES, showing some robustness in our results. Then the actual level of monetary compensation of about US$26/ha/year for the provision of water environmental services does not cover estimated opportunity costs. If compared to providers' annual income, PES compensation accounts for less than 10 per cent.

In the Mexican case, the first community researched has 42 farmers planting trees for carbon fixation on fallow lands, which previously contained shrubs or open pine forests. Individual farmers' carbon income represents a total of approximately US$280/ha distributed in six payments over 25 years. Some of these providers deviate part of such income to employ labourers for planting and felling activities. Some others rely on family labour and carbon incentives are used exclusively to provide for household needs. Income has been spent in a number of ways, including items for agricultural production (e.g., tools, fertilizer, oxen rent), clothes, drugs or food for the household. Project managers have estimated the costs of establishing and managing forestry systems, as well as the opportunity costs of different land-use options, across the region where the project operates (de Jong et al., 2000) (Table 3). Assuming that carbon payments are equally split in the 25-year period, we come to the figure of undiscounted carbon payments of US$11.2/ha/year, a value which may cover opportunity costs but would hardly meet both establishment and operational costs in open pine forests.

Table 3
Costs of different forestry systems in Fondo Bioclimático

Land use system	Cost of establishing forestry system (US$)	Operational costs (US$/year)	Opportunity costs (US$/year)
Milpa	212.2	36.1–49.1	0–358.5
Cattle ranching	282.5	39.1–65.1	39–152
Thicket	285.7	76.7–102.7	0–215
Tree fallow	223.4	75.4–101.4	0–215
Oak and montane forest	186	64.3	6.5–130
Pine-oak forest	208.5	63–76	6.5–130
Pine forest	192	87.7–100.7	0–65
Open pine forest	217.5	100.7	0–65

Source: de Jong et al. (2000).

The second researched community in the Mexican case has a forest conservation area of 1800 ha, and another 30 ha are being reforested on common forests and grazing lands. The community has received a total of US$18,000 in three payments for the conservation area between 2000 and 2003 and it will receive an approximate total of US$29,592 for the reforested areas over the next 30 years. To date, the community assembly has been in charge of deciding how to spend the carbon revenues received since 2000. In some occasions, the community invested carbon revenues in collective goods (e.g., community roads, land tax) while in some years community members split the total carbon revenue among themselves, leaving each household with very little, approximately between US$5 and US$10. In this case, there exist local resource management rules, which forbid the use of those areas for other than fuelwood collection purposes and subsistence grazing activities and only during the wet season. Then an estimation of monetary compensation of opportunity costs would not make economic sense since alternative uses in these forests are not marketed within nor outside the community.

4.3.2. *Non-monetary outcomes*

For protected areas, non-monetary outcomes concern capacity building and training on PES concepts and monitoring for members of the local organisations managing the protected area. We have also mentioned that carbon funding has also been used to promote development projects for the communities living within or outside the protected area but these programmes have rarely been sustained in time. Community-based initiatives have also promoted training programmes on accounting and monitoring procedures for members of intermediary organisations and service providers, but also have generated other side-benefits, such as technical support for agricultural activities.

Providers in *San Pedro del Norte* acknowledged that they had received technical assistance from PASOLAC for forest protection and regeneration activities, and they had participated in other projects focused on improving agricultural production through sustainable management practices (e.g., crop rotations, organic compost). In turn, urban households also perceived that the local water service had improved, although not up to the level they wished to and several users still lacked a daily water supply. Since the creation of the Water Committee, users became aware of their daily water restrictions and took an active role in defining water quotas in each community sector. The PES is thus acting as a mechanism to empower the local community, which has taken control of the public water service, increasing its transparency and local participation. In Mexico, project managers have benefited from participating in international negotiations under the Kyoto Protocol and farmers have been trained in several occasions on carbon accounting and monitoring. They have also received information about climate change and the relationship of the project

with this global environmental problem. More recently, farmers have had the opportunity to join training courses for sustainable agriculture production and ecotourism (Corbera, 2005b). Table 4 summarises our findings before the final discussion.

4.4. Discussion

The results from our case studies indicate that projects marketing ecosystem services may become an effective mechanism to increase the economic resources available to protected areas, reducing the burden on governmental expenditures in this sector and allowing other individuals and organisations to participate in forest conservation efforts. Wilkie et al. (2001) present data on government expenditure on protected areas in Africa, Europe, USA and Canada, ranging from 0.19% in African countries and half of this in wealthy European and North American nations, a figure they claim should be increased in African countries for making effective conservation efforts. Particularly, Mesoamerican countries have in sum 13% of their total land area under some form of protection, with countries such as Belize with 37 per cent of its country's land under protection to others such as El Salvador with only 2% of its land being protected. Increasing expenditure for conservation of natural resources is needed in some Meso-American countries, while financial sustainability is required in others for consolidating protection efforts. Yet, ecosystem services revenues still fall below the overall expenditure of protected areas.

The relative low impact of payments allocated to individual and community-based providers poses a critical concern, since these instruments are expected to contribute to economic development and poverty alleviation. However, even with limited monetary compensation of opportunity costs in individual and community-based initiatives, some farmers are willing to participate, which can be explained by several factors. Firstly, farmers may overestimate the value of their land, even if they are aware that it is not valuable for farming or cattle ranching due to, for instance, steep hills or poor soil. They may do so as a strategy to bargain for higher payments in the thought that they would receive a higher compensation payment. In the second community of the FBC project, for instance, community authorities recognised that the carbon project has made it possible to extract economic revenue from an area of preserved forests whose resources are hardly used and accessed by community members. Moreover, community authorities highlighted that the carbon project is a cost-effective strategy for collective income generation, as it only implies the dedication of two or three days of collective labour a year and the financial returns benefit all members equally.

Another factor explaining farmers' participation despite low economic compensation are the implicit environmental benefits associated with forest conservation and management

Table 4
Equity implications of marketing ecosystem services in the study sites

Case study	Equity in access	Equity in decision-making	Equity in outcome
Las Escobas	HEDASA and FUNDAECO reached agreements without accounting for marginalised neighbouring communities	Communities marginalised in project design Limited participation of service providers in decision-making	PES represent a 6% of NGO total income and cover a 40% of total protection costs
RBCMA Bravo	Secondary actors have never been considered direct service providers in the design and implementation of the carbon project	Communities marginalised in project design Payments are managed exclusively by the local NGO Persistent conflict regarding access to forest resources	Carbon payments represent 4% of NGO total income and cover 9% of total protection costs Communities outside the reserve areas involved in complementary activities (i.e., ecotourism) but only in the early stages of the project Provision of some employment to members of local communities as reserve guards and cooks
Paso de los Caballos	The implementation of the PES scheme involved active participation the water committee, the municipality, PASOLAC and other local NGO's. Potential providers lacked sufficient information on land selection process	Limited participation of potential providers: insufficient communication and involvement in project planning Provision of technical assistance to local providers for forest and agriculture management activities	20% compensation of land opportunity costs <10% compensation of providers' total income No apparent conflict with service providers The Water Committee has increased users' sense of control over water quotas allocation
Fondo Bioclimático[a]	Increasing access to project activities across participant communities Marginalisation of poor households due to limited land endowment and poor collective action	Women marginalisation due to a local patriarchal system of decision-making concerning the management of the forest commons Centralised decision-making in project management strategic decisions	100% coverage of opportunity costs only for some farmers developing plantations in open pine forests

[a]Only refers to the two participant communities analysed in this study.

options. These include value gained from both marketable and non-marketable goods such as timber, non-timber forest products, firewood, shade, scenery or environmental legacy. Participant farmers in both the Nicaraguan and the Mexican case emphasised that forests constitute a legacy for their children, which will have both economic (timber and improved water quality) and intrinsic (a recovered environment) benefits. A third factor driving participation despite low compensation costs is that farmers do not use PES as a main source of income but as a small incentive, which does not entail changing the household productive structure significantly. Finally, in-kind payments to farmers and communities, such as training and technical advice, may also be participation drivers, although not many of our service providers indicated these as key motivating factors.

Our results also show that the provision of ecosystem services through protected areas results in a lack of equity in access, process and outcome. Protected areas initiatives have been less able to incorporate local communities in project implementation and they have reinforced existing contests over access and control of forest resources within and along protected area boundaries. Such conflicts are common in protected area management (Ghimire and Pimbert, 2000) and PES schemes should confront these issues in order to ameliorate conflict and establish more equitable forms of resource management. When payments are directed to individual landholders and rural communities, we have shown that access to project activities can be strongly influenced by land endowment and the existence of viable collective action institutions at local level (Saunders et al., 2002). This demonstrates the importance of dedicating substantial resources to map local ecological and social conditions, including awareness of environmental histories and property rights struggles.

Our results also reveal the importance of investing in information sharing and communication when establishing MES and PES. A clear explanation of the projects means and ends may contribute to increase local people's trust and to maximise local populations' access to negotiation and decision-making processes (Boyd et al., 2005). Our four case studies show that there is still room for improvement in this sense and that projects often lack sufficient resources to increase information activities, promote inclusive mechanisms of decision-making and establish new strategies through which trust can be built across all participants. These are common features that have been also emphasised in other recent studies, which underscore the importance of these criteria to promote pro-poor MES and PES schemes (Wunder, 2006).

Our case studies reflect the existing relationship between the institutional nature of MES and PES and their equity implications. In all cases, we have made clear that PES, either through international carbon voluntary arrangements or locally-negotiated schemes, bring together a diversity of actors holding competing interests over why and how an ecosystem service should be secured and managed in the long-term. Therefore, it is urgent that MES and PES do not focus only on the negotiation of a monetary transaction but also invest in building trust across service providers, users and intermediaries. Without such investment, the risk of marginalising some providers and exacerbate historical conflicts increases, and the likelihood of long-term project failure is also maximised.

We have also shown that property rights over those resources providing ecosystem services play a determinant role in project design, procedural fairness and outcome distribution. Financing PES in protected areas may induce conservation at the expense of informal land managers, and therefore projects may need to be accompanied by the clarification of rights and duties and, if possible, the establishment of cooperation strategies between formal and informal resource managers. When operating through local communities and farmers who hold legal land titles, it is important to take into account who has access to project activities and who is left behind. For the Mexican case, we have shown that some poorly endowed farmers are not able to participate in the project because they do not have enough hectares to bring into the payment scheme, which becomes further undermined by the lack of local collective action institutions in their community (Corbera, 2005b). In contrast, the second research community offers a good example of how MES and PES could built upon existing forms of successful natural resource governance to minimise project management costs and ensure a fairer distribution of project outcomes.

Finally, it can be argued that MES and PES should not be regarded as the ultimate solution for conservation and development. It is still early to analyse the former dimension, as projects need of long-term monitoring efforts to validate their contribution to the provision and maintenance of ecosystem services. However, it seems apparent that social outcomes will be strongly mediated by project developers' willingness to deal with competing interests and re-negotiate the *status quo* in what concerns property rights (both formal and informal) and decision-making power over how and who should provide ecosystem services. The commodification of ecosystem services does not account for total land opportunity costs and local participation is explained by other factors, including people's perceived environmental benefits and their ability to have access to technical support in, for example, agriculture and forest management. Unfortunately, economic resources for direct compensation and for diversifying the range of non-economic outcomes remain scarce regardless of whether payments are defined on a project basis or are influenced by emerging international markets for carbon emission reductions.

This is indicative of the power structures governing MES and PES, which are characterised by the exclusion of the beneficiaries in the negotiation of compensation payments or, in the case of markets, their lack of power to intervene in market development and price formation. These considerations exemplify the relationship between the broader institutional context in which these projects

develop and their ability to become effective from an equity and development perspective. Financial decisions lay in the hands of project developers, brokers or even international markets, while the rural poor only decides whether they are willing to participate at that specific price. The lack of other economic opportunities is likely to make them committed participants in these projects. Moreover, in some cases, they may not even be explicitly involved in defining which type of development activities each project should support (Brown et al., 2004; May et al., 2004).

MES and PES represent a virtual transfer of property rights from service providers to resource users, who often control the nature of this transaction. This justifies why, in market-based approaches to the conservation of public goods such as the atmosphere, there is a need to see beyond their quest for resource efficiency and environmental conservation. As we have attempted in this paper, it is necessary to look at the equity implications of these approaches because they can reproduce unequal power relations among project actors. As O'Neill (2001) suggests:

> Where new property-rights regimes are introduced, they are defined by those with economic and social power. To invoke 'market solutions' is to invoke a particular distribution of power to determine outcomes … Market solutions are mechanisms for defining and defending particular distributions of social power, and should be understood and contested as such' (O'Neill, 2001, p. 710).

The commodification of ecosystem services has to be seen as part of a broader project of green developmentalism, which globally socialises the environmental costs incurred by the world's rich so that those who are "underpolluted" can bear such costs at a cheaper rate, and which continuously re-conceptualises environmental problems without changing 'existing political institutions, distributions of economic power, and patterns of resource flows' (McAfee, 1999, 136). In other words, behind the logic and apparent objectivity market environmentalism, there is a failure to recognise that global environmental problems, such as climate change or biodiversity loss, are rooted in the invisible structures of global energy resource flows, government export policies and corporate economic interests.

5. Conclusion

This paper has analysed the equity implications of marketing forest carbon and watershed recharge in Meso-American forests. We have found that, when payments are channelled to an NGO towards the protection and management of protected areas, they partially compensate the costs of protecting and managing such area. When payments are allocated to individual farmers and rural communities, these hardly compensate for local opportunity costs or what farmers perceive as a fair price. Nevertheless, we also found that these payments can contribute to household and community well-being through the provision of material household needs and collective benefits. Critically, all case studies show participation deficiencies in their design process and they are severely centralised when it comes to making decisions about how projects are implemented.

We have argued that a more contextually informed calculation of the compensation payment and a better awareness of institutional contexts, particularly property rights conflicts and social relations regarding access to forest resources, are critical to ensure the effectiveness of these activities from an equity and poverty-reduction standpoint. When projects are not able to account for the existence of informal or customary property rights over forest resources, they can induce social conflict and generate direct confrontation between rural inhabitants and project managers. Seemingly, project activities which are developed by local communities but fail to account for informal forest resource users can contribute to reify existing inequities in decision-making and favour some local actors' interests over others.

In order to account for these factors and processes, the extent to which investors are willing to pay for implementing projects with inclusive design frameworks and a dynamic account of local social relations is critical. Otherwise, these emerging projects and institutions run the risk of benefiting only well-established conservation organisations and powerful individuals without involving the poorest in conservation efforts or tackling existing inequalities. If emerging MES and PES schemes do not provide more substantial degrees of compensation and do not guarantee more equitable processes and outcomes than those outlined in this paper, they may only help to aggravate existent inequities in accessing and benefiting from the local environmental commons.

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