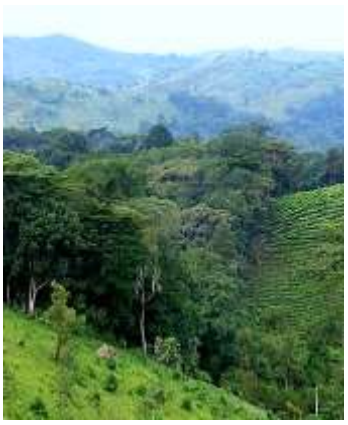
PES incentives for smallholders to avoid deforestation: lessons learned and factors for success

A review for the SHARP partnership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Summary

This report is based upon a desk-based study of various, diverse Payments for Ecosystem Services (PES) projects that involve smallholder farmers in tropical forested areas. It presents an inventory of 28 relevant projects and selects seven cases for in-depth assessment. The report uses online literature and project documentation to evaluate these PES examples in terms of feasibility, effectiveness, efficiency, sustainability and equity. Drawing on documented experiences with PES, the report then discusses common challenges and best practice in key areas of PES project development, to make recommendations for the design of future projects.

The main findings are:

- **Successful PES schemes** use participatory approaches, build local institutions, instil good governance and identify marginalised groups early on in the project development process.
- PES projects are strengthened by **collaborative capacity building with a local partner**, ideally one that is already known and trusted by the targeted smallholder group.
- Projects should be **flexible** – project implementers should be prepared to react to changing smallholder circumstances and requirements. Schemes should review, evaluate and make changes if required.
- PES proponents should **understand the local context and the needs and circumstances of potential smallholder participants**. PES projects in agri-industrial landscapes must take account of smallholders' use of forests for agriculture and food security.
- The less technically complicated the ecosystem or environmental service is to identify, measure and monitor, the more **cost-effective** the project can be.
- **Conventional economic inducements are not always appropriate** as compensation in PES projects and cannot ensure behavioural changes among smallholder farming communities that will encourage forest protection. Options involving land tenure, improved agricultural activities, civic projects, village savings and loans schemes or alternative enterprise models are often as appropriate as direct cash incentives.
- The **risks** associated with direct cash payments, such as escalating resource conflict or potential for financial misappropriation and corruption, should also be investigated.
- **Secure land tenure** can be particularly valuable as an incentive or form of compensation for participating smallholders. At the same time, insecure tenure may pose a barrier to entering a PES scheme. Existing tenure arrangements in the proposed project area should be investigated during the project design phase.
- It is important to gather **good quality baseline information** for use as reference points. Baseline data should then be collected again at an agreed point in time, after the PES scheme has been initiated. Robust monitoring and evaluation processes should be implemented.

1. Introduction

The Smallholder Acceleration and REDD+ Programme (SHARP) aims to increase the participation of smallholders in sustainable agriculture supply chains, resulting in decreased deforestation, increased yields and improved rural livelihoods in tropical forest countries.[1]

The purpose of this desk study is to review PES projects that have attempted to incentivise smallholders to conserve forests, whether for water catchment purposes, carbon sequestration or the conservation of biodiversity, and to draw on project lessons to discern practical approaches that could be explored within the SHARP partnership.

Payments for Ecosystem or Environmental Services (PES) are incentives to change behaviour. They are used to encourage the protection of natural goods and services, particularly through good land or water management. Most PES schemes operate on the basis that the payments or incentives are conditional on the land user or owner performing a land management task that results in an improved or maintained environmental benefit. PES schemes targeted at smallholder farmers have been in existence since the mid-1990s. Payments or non-cash incentives are commonly channelled directly to farmers or to farmer cooperatives or community groups. The most common forms of PES relate to carbon sequestration, water catchments and biodiversity conservation.

The cases chosen for this study involved smallholders to varying degrees, and all involved forest management including reducing deforestation, afforestation and reforestation.

The report comprises five sections. Section 2 provides a detailed inventory of 28 PES projects located across Latin America, Asia and Africa. These examples have been identified during a thorough review of online material (including material from CIFOR, IFAD, World Bank[2], The Carbon Fund[3] and Climate Standards[4]). Section 3 presents in-depth case studies of seven of the projects and Section 4 draws on the case material to present overarching observations and evaluations of these projects. In Section 5 we present lessons learned for four crucial design elements of PES projects: tenure; information-gathering; opportunity costs, participant choice and contract terms; and financial risks. Section 6 concludes by summarising our recommendations for PES approaches. Reference material is listed in Annex 1 and the start date, location and web references of the 28 case studies are contained in Annex 2.

We evaluated the feasibility, effectiveness, efficiency, sustainability and equity of different approaches to PES by referring to the PES literature. Many examples focus upon REDD+ (the mechanism for reducing emissions from deforestation and forest degradation, including through conservation, sustainable forest management and enhancement of forest carbon stock). We also refer to Bioclimate's experiences with relevant projects.

Case study literature from the project developers and other observers was interrogated to identify environmental, financial, socio-economic, monitoring and evaluation information. Much of the information is of variable quality and unstandardised, which makes it difficult to use in comparative analysis. Most project case studies do, however, contain environmental services data, relating to hectares of forest, tonnes of biomass or sediment loads; where possible this information is cited.

[1] http://www.sharp-partnership.org/.
[2] http://www.forestcarbonpartnership.org/sites/forestcarbonpartnership.org/files/Documents/Full%20version%20of%20PES%20Lessons%20for%20REDD+%20March%202012.pdf.
[3] http://www.carbonfund.org/reforestation-and-avoided-deforestation.
[4] http://www.climate-standards.org/category/projects/.

2. Inventory of PES models

This section presents an inventory of 28 documented PES projects or schemes. Their characteristics are summarised in Table 1, and further details are presented in Annex 2. The projects are categorised into four types, as differentiated in PES literature and project documents, depending on whether the payments are associated with carbon offsetting, biodiversity conservation, water management or forest conservation. The examples are intended to illustrate the diversity of PES schemes in existence, covering projects at both national and sub-national scale. The inventory can be used as a resource of information on smallholder-oriented PES initiatives.

2.1. The range of projects

To select projects for the inventory and in-depth reviews, we placed emphasis on geographical diversity, relevance to risks of deforestation through agricultural commodity production, and availability of online literature from which lessons might be drawn. Trade-offs in the selection process occurred. Examples of PES schemes are fewer in Asia and Africa than in Latin America and the schemes implemented in Africa in particular are relatively recent. While they are *not all* directly intended as forest conservation initiatives, all the selected projects do contain an element of reduced deforestation, afforestation or regeneration (see Box 1). All examples involve smallholder farming communities.

The forest areas targeted in the projects vary from several hundred to hundreds of thousands of hectares. Drivers of forest degradation in each case include: conversion to commercial forestry, agricultural concessions (soya, oil palm) or mining (iron ore, bauxite, coal) operations; population settlement or encroachment; cattle ranching; and road construction.

The smallholders influenced by these PES schemes are characteristically engaged in agroforestry and/or subsistence cropping (often slash and burn), perhaps in addition to fishing and hunting. Many residents in PES scheme areas have been involved in paid labour relating to deforestation.

Box 1 **Forest terms**

Afforestation and **reforestation** refer to human-induced conversion of non-forest land to forest through planting seedlings and/or human-induced promotion of natural regeneration. **Avoided deforestation** protects standing forest carbon stocks that would otherwise be converted into carbon dioxide emissions when felled through unsustainable logging or clearance for agriculture, including cash cropping (Smith and Scherr 2002).

Most of the PES projects involve activities such as agricultural improvement, enterprise development, training in forest regeneration, tree-nursery establishment and management, sapling establishment and native species re-introductions. Many advocate and assist in the development of non-timber forest product (NTFP) enterprises. NTFPs encompass a diversity of foodstuffs, medicinal and cultural goods and can include bamboo, rattan, cinnamon, cardamom, honey, moringa, cola and the provisioning of alternative fuelwood sources. Supplementary finances may also be directed towards civic projects such as infrastructural improvements for schools, transport, health centres, dental clinics, housing and ecotourism.

The projects often target the most vulnerable in society

Training activities provided through the PES projects are designed to facilitate capacity building, support legal representation for smallholders in tenure disputes, assist empowerment or co-ordinate land-use planning or protected area management. The projects often target the most vulnerable in society, from low-income groups and/or indigenous minorities; many specify the importance of women's involvement in decision-making and project implementation. Ultimately, the PES schemes presented here aim to improve the use of forest resources, in locations where activities are currently considered unsustainable.

Table 1 **Inventory of PES models**

	PES type	Name and location	Objectives	Payees (those being paid or compensated for supplying the ecosystem service)	Payer (those paying for investing in or buying the ecosystem service)	Lead implementer (those facilitating or assisting in coordinating project activities)	Spatial scope
1	Carbon offsetting	Bolsa Floresta, Juma Sustainable Development Reserve (Brazil)	Deforestation prevention	Smallholder communities	Public	Amazonas Sustainable Foundation (Fundação Amazonas Sustentável) in partnership with the State Secretariat of the Environment and Sustainable of Amazonas (Secretaria de Estado do Meio Ambiente e Desenvolvimento Sustentável do Amazonas) with technical assistance from the Institute for Conservation and Sustainable Development of Amazonas (Instituto de Conservação e Desenvolvimento Sustentável do Amazonas)	329,483 ha
2	Biodiversity conservation	Purus Project (Brazil)	Mitigate deforestation and preserve biodiversity	Landowners	CarbonCo LLC	Moura and Rosa Investments (LTDA) – an Acre, Brazil-based organisation created by the landowners; Freitas International Group LLC	35,169 ha
3	Water management	Pimampiro (Ecuador)	Maintain water supply and quantity by conserving forest at the headwater of municipal supply	Private landowners	Inter-American Foundation (IAF); FAO community forest project; municipality pays 20% more for water supply	Corporation for the Development of Natural Resources (CEDRENA)	390 ha
4	Carbon offsetting	PROFAFOR (Ecuador)	Carbon sequestration through reforestation and afforestation	Landowners	PROFAFOR – an Ecuadorian company acting in extension of the Forests Absorbing Carbon Dioxide Emissions (FACE) consortium	PROFAFOR	22,287 ha

5	Carbon offsetting	Noel Kempff Mercado Climate Action Project (NK-CAP) (Bolivia)	Reforestation and regeneration of an area degraded by former logging activities, slated for future logging or predicted to be deforested	Indigenous communities inside the national park and on the periphery	Funds from The Nature Conservancy, American Electric Power, PacifiCorp and BP America	Fundación Amigos de la Naturaleza	642,184 ha
6	Water management	Payments for Hydrological Services (PSA-H) (Mexico)	Secure water flow and water quality while conserving natural forests under the greatest threat	Individual landowners and communities (*ejidos*)	Federal water users pay charges	Funds are managed by CONAFOR (Comisión Nacional Forestal) of the State Forestry Commission	Nationwide
7	Water management	AIJ Pilot Project (carbon sequestration) and CNFL Project (watershed conservation) (Costa Rica)	Reforestation and forest conservation for improvement of hydrological resources	Landowners	National Power and Light Company (CNFL) – a private company majority-owned by the Costa Rican Institute of Electricity (ICE); Government of Norway, which purchases certifiable tradable offsets	Costa Rican Joint Implementation Office (OCIC)	4,000 ha (1,000 for reforestation, 2,000 for conservation of existing forest)
8	Water management	Empresa de Servicios Públicos de Heredia (ESPH) (Costa Rica)	Watershed management through reforestation and regeneration	Landowners	City of Heredia water users pay a tariff to ESPH	Authority for Public Services	Not available
9	Forest conservation	Community Forest Ecosystem Services (Indonesia)	Forest conservation (protection and restoration including natural regeneration)	Durian Rambun village in Jambi Province and Laman Satong village in West Kalimantan Province	Packard/CLUA; EU; USAID; ICAP; Darwin Initiative; UK-FCO	Flora and Fauna International; local partners LTB (Jambi) and Yayasan Palung (West Kalimantan)	Jambi Province: 4,484 ha; West Kalimantan Province: 1,070 ha

10	Forest conservation	Bujang Raba Community PES Project (Indonesia)	Forest conservation for biodiversity, hydrological function and NTFPs	Five forest-dependent communities	Rainforest Foundation Norway	Komunitas Konservasi Indonesia	7,292 ha
11	Carbon offsetting	Ulu Masen Ecosystem (Indonesia)	Reduce emissions from deforestation and forest degradation; maintain significant biodiversity values and enhance community development opportunities	Five districts adjacent to the project area	Provincial government of Aceh; Carbon Conservation Ltd	Flora and Fauna International	750,000 ha
12	Water management	Sumber Jaya Forestry Project (Indonesia)	Contribute to watershed health through improved coffee management practices and forest protection	Coffee farmer groups and organisations	National government on behalf of water users; IFAD	Rewarding Upland Poor for Environmental Services; West Lampung district forestry office; local NGOs YACILI and Watala	11,633 ha
13	Water management	River Care (Indonesia)	Reduce sedimentation	Local households	ICRAF (2006–2007); IFAD (2007–2011); PLTA Way Besai (Hydropower company)	Rewarding Upland Poor for Environmental Services; Community Forestry Farmers' Groups Communication Forum; University of Lampung	670 ha
14	Water management	Lake Singkarak (Indonesia)	Landscape rehabilitation	*Nagaris* (villages that adhere to the traditional system of governing of the area)	Hydropower plant	Rewarding Upland Poor for Environmental Services	10,780 ha
15	Forest conservation	Sloping Lands Program (China)	Reduce soil erosion by returning crop land on steep slopes to forest and grassland	Farmers	Central government	Local government	15 million ha

16	Water management	Maasin Watershed (Philippines)	Watershed protection, rehabilitation, flow regulation and siltation control by reforestation and reduced deforestation	Farmers organised into the Maasin people's federation (KAPAWA)	Japan Bank for International Cooperation; Asian Development Bank; Overseas Economic Corporation Fund (OECF) Japan	Metro Iloilo Water District; Department for Environment and Natural Resources; National Economic and Development Authority; Kahublagan Sang Panimalay Foundation; Tigum-Aganan watershed management council	2,685 ha
17	Water management	Makiling Forest Reserve (Philippines)	Community partnership in protection of forests	Upland communities	University of the Philippines Los Banos	Local government unit	4,244 ha
18	Forest conservation	Khulekhani watershed (Nepal)	Forest conservation and livelihood support	Upstream communities in Khulekani watershed	Makawanpur DDC; Nepal Electricity Authority; Khulekani hydroelectricity projects	Rewarding Upland Poor for Environmental Services	12,492 ha
19	Carbon offsetting	Ngoyla-Mintom forest block (Cameroon)	Promote sustainable management of forest resources; conserve carbon stocks, biodiversity; introduce forest zonation; improve local governance	Four villages with community forests	EU	WWF; Coopérative Agro Forestière de la Trinationale; Bioclimate (consultation)	7,750 ha
20	Carbon offsetting	Wonegizi community-based REDD+ project (Liberia)	Reduce rate of forest clearance; increase sustainability of NTFP harvesting	Twenty Ziama Clan communities	NORAD	Flora and Fauna International; Skills & Agriculture Development Services	37,979 ha
21	Carbon offsetting	Trees for Global Benefits (Uganda)	Afforestation	Smallholders	Credit buyers: TetraPak UK, Future Forests, INSAP, Katoomba Group, Puma, Nedbank; investors: UK DFID and USAID	Environmental Conservation Trust of Uganda (ECOTRUST)	3,168 ha

22	Forest conservation	Forest Again Kakamega Forest (Kenya)	Reforestation	Kakamega Forest Participatory Management Committee	EU	Kenya Wildlife Services; Kenya Forest Service	Not available
23	Carbon offsetting	Humbo Community Managed Natural Regeneration Project (Ethiopia)	Reforestation and regeneration	Community forestry protection and development cooperative societies	World Bank Biocarbon Fund (carbon credits); Government of Canada	World Vision Ethiopia; World Vision Australia; Federal Environmental Protection Authority; Ministry of Agriculture and Rural Development; Bureau of Agriculture and Rural Development; Humbo Woreda (District) Agricultural, Rural Development and Forestry Development Coordination Office; Forest Farmers' Union	2,728 ha
24	Carbon offsetting	N'hambita Community Carbon Project (Mozambique)	Develop forestry and land-use practices that promote sustainable rural livelihoods and generate verifiable carbon emission reductions	EnviroTrade; smallholders; community trust	Private buyers	University of Edinburgh; Edinburgh Centre for Carbon Management; EnviroTrade (UK); Park Administration of the Gorongosa National Park (Mozambique)	8,000 ha
25	Carbon offsetting	Ibi Bateke (Democratic Republic of Congo)	Grassy savannah conversion for sustainable fuelwood supply	Smallholders	UMICORE; SUEZ; AFD	NOVACEL; BioCarbon Fund	4,200 ha
26	Carbon offsetting	Reforestation in Grassland of Uchindile, Kilombero, and Mapanda, Mufindi (Tanzania)	Permanent emission reduction, reforestation and biodiversity conservation	Local communities	Voluntary over-the-counter market	Green Resources Ltd	10,814 ha
27	Biodiversity conservation,	Chimpanzee Conservation	Enhance biodiversity conservation	Smallholders	GEF/UNEP/NEMA (Uganda); private sector	ECOTRUST; Chimpanzee Sanctuary & Wildlife Conservation Trust; IIED;	1,437 ha

	forest conservation	Corridor Pilot PES Scheme (Uganda)				Nature Harness Initiatives; Innovation for Poverty Action	
28	Carbon offsetting	Community PES (C-PES) Project (Cameroon)	Support two communities to protect forests by finding ways to integrate PES with community forest management	Two villages with community forests	UK DFID	Bioclimate Research and Development; Centre pour l'Environnement et le Développement	2,801 ha

3. Case studies

This section contains seven case studies selected from the inventory of PES projects. They are described here in greater detail and have been selected on account of their well-documented and diverse stories. The section gives readers an opportunity to explore and compare the design, context, implementation and results of different approaches to smallholder-oriented PES projects. It describes a range of funding structures and types of compensation, from cash payments for individual farmers to community-wide programmes. Cases are included from Latin America (Bolivia), Asia (Indonesia) and Africa (Uganda, Ethiopia, Cameroon).

3.1. Noel Kempff Mercado Climate Action Project (NK-CAP), Bolivia

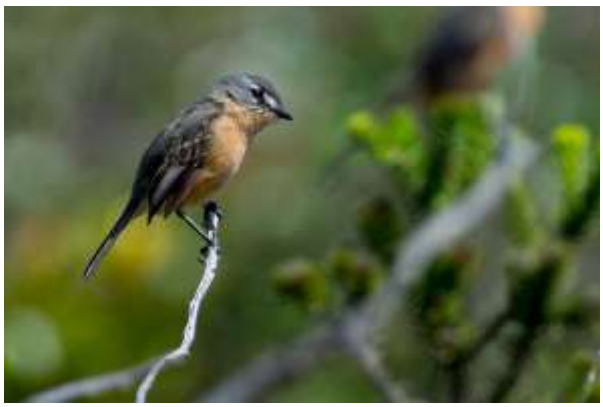
Year established: 1996/97 **Type:** Carbon offsetting
Objective: Reforestation and regeneration
Finance source: Carbon market, donors
Compensation: Economic and community activities, tenure security

The objective of the Noel Kempff Mercado Climate Action Project (NK-CAP) is reforestation and regeneration of an area that has been already degraded by logging and is gazetted for future logging or predicted to be deforested. The project covers an expansion zone (established in 1997) located inside the Noel Kempff Mercado National Park of approximately 642,184 ha. This has been designated by the Government of Bolivia in a legally binding document under the auspices of the National Service of Protected Areas. The Bolivian project partner and administrator is Fundación Amigos de la Naturaleza (FAN). Funds for the project (provided by The Nature Conservancy, American Electric Power, PacifiCorp and BP America) as well as returns on the initial investment are distributed by The Nature Conservancy to FAN. The NK-CAP project was acclaimed the first forest carbon protection project worldwide.

Under this project, seven indigenous communities (population 1,025) adjacent to the NK-CAP area have received livelihood support (rather than direct payments) in the form of economic development initiatives and community-based benefits. The Program for the Sustainable Development of Local Communities ran from 1997 to 2001 and improved community access to basic health, education and communication services. The Community Development Program ran from 2002 to 2006 and initiated income-generating activities (community forestry and micro-enterprise). There have also been community initiatives in capacity building, organisational empowerment and securing land titles. These development programmes have been designed to encourage long-term commitment of indigenous communities to the conservation project.

Two baseline studies were carried out at the outset, relating to (a) avoided deforestation and (b) avoided degradation. Both baselines have been amended since 1996. The first baseline contains information which can be used to determine deforestation rates under a 'business as usual' scenario, predict likely areas of future deforestation, estimate carbon content in areas predicted for future clearance, and calculate the greenhouse gas emissions that would result from anticipated deforestation. The second baseline has incorporated an econometric model of Bolivian timber markets, predicting the volume of future harvests in Bolivia both within the project area and in the country as a whole, and the carbon impacts of those harvests.

Several strategies have been introduced to address potential leakage of deforesting and degradation activities to other geographical areas. These have included educational campaigns, workshops and training in sustainable agriculture. The activity considered most successful has been assistance in securing legal status, tenure and a management



The national park is home to several endangered species, such as this pygmy-tyrant. Image: Joao Quental

plan for ancestral lands. This has resulted in the declaration of a 360,565 ha indigenous ancestral territory for border communities, officially granting them property rights. Within this area, community members have exclusive rights to harvest heart of palm and practice sustainable forestry.

The NK-CAP project has also acted to close down sawmills in the area through concessionary buyout schemes, while simultaneously purchasing and decommissioning harvesting equipment. This strategy has prevented the re-sale of equipment and subsequent leakage of logging activity. Project developers have assisted communities in gaining access to the correct government officials and preparing the paperwork for inclusion in the official Central Indígena Bajo Paraguá (CIBAPA). Today, CIBAPA is registered as an organisation with legal standing. It represents the indigenous communities around the park, is running its own sawmill and is the first such group with a timber selling point in the capital of Santa Cruz. Employment opportunities generated by the project, such as surveying forestry resources, guarding forest areas and acting as tourist guides, have provided alternative income sources for those who previously undertook seasonal employment in sawmills.

NK-CAP has acted to close down sawmills in the area

In the 1997-2005 verification period 763 ha were saved from deforestation; a further 468 ha of timber slated for harvest were protected from degradation. The carbon benefits attributed to the project were verified by Société Générale de Surveillance (SGS) in 2005, using standards based upon those described in the Kyoto Protocol's Clean Development Mechanism. Of the resulting certified emission reductions, 51% have been assigned to corporate investors. The remaining 49% are assigned to the Bolivian government, which agreed to allocate proceeds from sales of this share to park protection (31%), Bolivia's national protected area system (10%) and otherwise for biodiversity protection, indigenous community livelihood development schemes and national greenhouse gas mitigation strategies (59%).

The total cost of NK-CAP was USD 11.5 million of which USD 0.32 million were development costs, with the major costs being monitoring and verification (USD 1.72 million), compensation to concessionaries (USD 1.6 million) and park endowment (USD 1.5 million). The value of the reduction in greenhouse gases is estimated at USD 3.2 million over the short term (up to 10 years) and USD 5.95 million over the long term (beyond 10 years) (Asquith et al. 2002). The project implementation costs have included the purchase and retiring of logging concessions, community development activities, carbon accounting, park management and monitoring. An endowment fund managed by The Nature Conservancy was created with USD 1.5 million to finance long-term monitoring. As of 2006, the fund had grown to nearly USD 3 million through philanthropic contributions and returns on investments. Local partner FAN executes activities financed by this fund, generating annual progress reports. After the project concludes in 2026, it is anticipated that the endowment will have funds remaining, which will be used for long-term benefit of the park.

Evidence points to a real conservation gain that NK-CAP has produced in terms of biodiversity conservation. The park is now larger and able to protect more of the rare and diverse species and ecosystems of the region. Using estimates from 2009, the NK-CAP project had achieved some 5.8 million tonnes of avoided CO_2 equivalent emissions. The overall effects on the communities are more complex, but appear to be positive. Overall the NK-CAP, through reaching agreements with the groups involved, has had positive environmental effects in storing carbon and reducing threats in the park. Logging in the expansion area has stopped, and the conservation gain is significant.

3.2. Sumber Jaya Forestry Project, Indonesia

Year established: 2001 **Type:** Watershed management **Objective:** Improve watershed health; afforestation; reforestation; fire control; soil conservation; conflict resolution; poverty alleviation **Finance source:** National government; IFAD **Compensation:** Tenure security

A range of PES mechanisms are operating in developing countries, particularly in Latin America, but they are still nascent in Asia. To facilitate Asian development, IFAD (the International Fund for Agricultural Development) supplied funds for the

Coffee roasting in Sumatra. The PES project recognises the value of smallholder coffee farming. Image: Richard Austin

World Agroforestry Centre (ICRAF) to establish the organisation RUPES (Rewarding Upland Poor for Environmental Services) in 2001. RUPES projects are found in 12 sites across eight Asian countries: China, Vietnam, Indonesia, Philippines, Nepal, India, Thailand and Cambodia.

In the Indonesian sub-district of Sumber Jaya in West Lampung, Sumatra, land cover has been experiencing extensive deforestation and degradation since the 1970s on account of population growth and the establishment of coffee gardens, or smallholdings. In 1990, the government declared 40% of Sumber Jaya land (55,000 ha) as 'protected forest' and a further 10% as 'national park'. Between 1991 and 1996 thousands of farmers were evicted. In 1998 ICRAF, local NGO Watala, the Ford Foundation and the UK government (DFID) initiated negotiations to resolve social conflict and violence in the region. In 2000, a legal decree established the basis for 'community forestry contracts' (known locally as Hutan Kemasyarakatan or HKm). Distribution of these HKms began in 2001 when the Sumber Jaya Forestry Project was initiated by RUPES in allegiance with NGO Watala.

This public-led PES scheme rewards upland farmers with enhanced land tenure security in exchange for adherence to land-use agreements and provisioning of environmental services. RUPES calls such arrangements Rewards for Environmental Services (RES; Kerr et al. 2005). Coffee gardens cover around 70% of the total land area in Sumber Jaya. The reward scheme acknowledges that multi-strata coffee farms (coffee agro-forestry systems) provide significant livelihood opportunities and control erosion in a way similar to that of natural forest. A complex canopy structure protects the soil from heavy rainfall and creates leaf litter, which weakens the erosive force of water (Suyanto 2006). For an HKm to be awarded, smallholders must contribute to watershed health by using good coffee management practices (multi-strata techniques rather than monoculture); remaining areas of natural forest must be protected from logging and forest fires; that soil conservation strategies are adopted; and additional trees must be planted. When an HKm contract is signed, an inventory of existing trees on the contracted land is made and the composition of agroforestry plots to be maintained through the contract, is set. These activities constitute the project baseline component. Permission is issued for a five-year trial with the possibility of extension for a further 25 years.

RUPES has worked to empower farmer groups through participatory mapping, development of work plans and tree nursery management, strengthening farmer groups and communicating the reward mechanism to members. By engaging with the scheme, smallholders are no longer at risk from eviction. To date, more than 6,500 smallholders have received conditional land tenure, providing motivation to protect remnants of native forests and engage in sustainable replanting activities.

3.3. River Care, Indonesia

Year established: 2006/2007 **Type:** Water management
Objective: Improved watershed function sediment control; tree-planting; conflict resolution; poverty alleviation
Finance source: ICRAF/IFAD Hydropower company (PLTA Way Besai) **Compensation:** Cash payments and tenure security

Indonesia's 55,000 hectare sub-district of Sumber Jaya coincides with the Way Besai upper watershed, which reaches 720–1,900 metres above sea level. Plans for a hydropower plant were conceived in the region during the 1960s when river sedimentation levels were reportedly low. A hydro-electric dam was installed in 2001. However, on account of land-use change, most notably the conversion of forest to coffee plantations between 1973 and 2000, rapid sediment accumulation quickly threatened operation of the dam. At the time of the PES project inception, the power plant was providing more than

River Care has two components designed to address erosion

60% of power to Lampung District and experiencing considerable sedimentation of 3kg/m^2/second.

The River Care[5] Initiative was established in 2006 when ICRAF funds (provided through IFAD and mediated by RUPES) were used to buy ecosystem services in Gunung Sari village. This provided villagers with a performance-based cash payment for reducing sedimentation. The RUPES-mediated agreement ended in 2012 after additional communities became involved and negotiations were made between PLTA Way Besai and the Community Forestry Farmers' Groups Communication Forum (FKKT HKm). These negotiations transformed the initiative into a privately funded PES scheme.

The River Care scheme comprises two components designed to address the erosion problems of the area. First, the PLTA Way Besai provides 70 households with corporate social responsibility funding to incentivise sediment reduction. In 2012 PLTA paid the community USD 1,000 to cover the costs of digging sediment, litter pits, dead-end trenches and drainage ditches (to reduce soil erosion in coffee plantations), and check dams in some rough sections of the river and sediment traps on public footpath and in gullies. In subsequent years, the community has received payments according to the percentage of sediment reduction obtained. In addition to these cash transfers, PLTA invests in a revolving fund for farming, livestock rearing, micro-hydropower and tree seed distribution (Fauzi and Anna 2013).

A second component of River Care involves tree planting. RUPES undertook an auction process to estimate the costs that farmers would face planting trees in the sub-catchment area, as a soil erosion preventative measure (Pasha and Beria 2011). Several auction trials were undertaken to familiarise participants with the process. The resulting contract price per hectare of land replanted under the PES scheme has been set according to the average opportunity costs estimated at auction. Funds are therefore invested by PLTA into tree planting. The additional non-cash incentive is the offer of secure tenure through an HKm contract.

[5] The River Care Community is an organisation formed by local NGOs.

3.4. Trees for Global Benefits, Uganda

Year established: 2003 **Type:** Carbon offsetting **Objective:** Afforestation or reforestation **Finance source:** Voluntary carbon market, donors **Compensation:** Cash payments

Voluntary carbon market projects have been operating in Uganda since the mid-1990s (Peskett et al. 2011). The Trees for Global Benefits (TFGB) project was implemented by an environmental NGO, ECOTRUST (based in Entebbe), in 2003, making this one of the oldest carbon finance projects in Uganda (Schreckenberg et al. 2013).

The TFGB project has entered into long-term contracts with smallholder farmers (initially 50 years, now reduced to 25 years) who have planted a variety of indigenous tree species on their (private) land. Verified emissions reductions are then sold on the voluntary carbon market.

Participants in the Trees for Global Benefits project need enough land to plant 400 trees. There is emphasis on involving women in the scheme. Image: TFGB

In order to participate in the project, farmers must have enough land with secure tenure to plant 400 trees (approximately 1 ha if planted as a woodlot) and no native woodland should be cleared for planting. A stipulation of 400 trees is deemed necessary in order to keep monitoring costs affordable. The project also insists that farmers have sufficient additional land for subsistence production – in practice this means that farmers must have about 3 hectares of land (Fisher 2011). Farmers must also have a bank account in their own name. This is usually held at the local savings and credit cooperative organisation, one of which exists in

Box 2 **What is Plan Vivo?**

Plan Vivo is a certification standard for community-based climate and ecosystem services programmes. It has evolved to focus on climate, livelihoods and ecosystems, and provides flexible requirements to fit different legal, ecological and socio-economic contexts. Following a clear certification pattern the standard promotes smallholder projects involving ecosystem restoration (e.g. assisted natural regeneration), rehabilitation (e.g. inter-planting of naturalised tree species), prevention of ecosystem conversion (e.g. REDD+) and improved land-use management (e.g. no/minimum till agriculture). It is designed to send a clear signal to potential buyers that the scheme has included local communities and considered livelihoods and the potential for poverty alleviation. The hope is that buyers will seek out these credits in the marketplace – either preferring to buy them relative to a non-certified credit or paying a premium.

The performance-based approach requires that at least 60% of the payments stay in the community. For example, payments of USD 6.5/tCO_2 could be expected to be divided into USD 3.90 for stage payment for communities; USD 1.70 for local administration and monitoring; USD 0.50 for verification and marketing and USD 0.40 for certification costs. Plan Vivo certificates are traded on the Markit Environmental Registry and sold directly to international buyers or to specialised intermediaries such as Zero Mission.

Source: Porras and Blackmore 2014. Image from www.planvivo.org/wp-content/uploads/Plan-Vivo-Standard-2013.pdf.

every sub-county in Uganda. The cost of opening a new account is deducted from the farmer's first carbon payment.

Interested smallholders work with a volunteer coordinator to submit an application. This includes a plan or sketch map of owned land, showing current land use (to assess the baseline for additionality), all the land under control (to assess the risk of leakage) and the intended work-plan for the land (tree species, planting-density, time allocation and labour). A signature is then required from a local council chairman to confirm the applicant in question does have secure land tenure. If the application meets the requirements in relation to land ownership and size and access to a bank account, the farmer's Plan Vivo is registered by ECOTRUST. For full details on Plan Vivo certification standards, see Box 2. Project staff then calculate the exact amount of carbon credits from the farmers' sequestration activities.

As with a number of carbon offset projects using the Plan Vivo Standard, carbon credits in the TFGB project are sold up front. These upfront payments are passed on to participants in five instalments over the first 10 years of their 25-year contract, with the aim of helping producers cover some establishment costs. The average purchase price per tonne of CO_2 equivalent is USD 7 and the project recommends that at least 60% of this goes to smallholders. As a result, households involved in the TFGB project receive an average carbon payment of USD 904/ha over the course of 10 years. The payments received per household on account of tree planting vary by number and species planted.

> TFGB was established at relatively low cost and has benefited from strong local coordination

After the last payment, it is expected that the value of the trees will be sufficient for smallholders to continue without further incentives. In 2010, 323 farmers were reportedly managing some 1,210 ha with an average carbon payment of USD 904 over 10 years for a woodlot of 1 ha. In addition to individual farmer payments, each project community has a Community Carbon Fund which is used for community infrastructure and replanting. Farmers contribute 10% of their earnings into the fund.

The project was established at relatively low cost using donor funds (less than USD 50,000), and has benefited from having a strong local coordination effort with good fund-raising. Private companies have also provided financing by purchasing Plan Vivo certificates. Smallholder interactions are managed through farmer coordinators, including women, and there is strong emphasis on involving women farmers.

3.5. Humbo Community Managed Natural Regeneration Project, Ethiopia

Year established: 2004 **Type:** Carbon offsetting
Objective: Reforestation and regeneration
Finance source: Carbon market, donors
Compensation: Transfer of legal land titles

The Humbo Community Managed Natural Regeneration Project[6] (located in Wolayita Administrative Zone in South Nations, Nationalities and Peoples' Region, southern Ethiopia) is an initiative coordinated by World Vision Australia (WVA) and World Vision Ethiopia (WVE). This project involves the community management of public land to promote natural resource management, poverty alleviation and biodiversity enhancement. In Ethiopia all land is public by status and before the project began, the area was managed in an open-access regime. Although local communities around Humbo have always used public land, the natural regeneration project has focused upon community empowerment and the transfer of legal land titles.

The project area covers seven administrative units, each of which has instated a Forest Development and Cooperative Society (FDCS) to maximise local involvement. WVE has been supporting and training these seven FDCSs since the project's inception. Each FDCS has attracted widespread membership and drawn up a list of bylaws by consensus which effectively close off each community forest to ecologically damaging uses and encourage farmer-managed natural regeneration (FMNR) techniques for forest restoration. The bylaws are negotiated between communities and the local government; they detail community use and management of forest resources. Each FDSC has developed an activity plan including establishment of community nurseries, tree planting, sapling protection and adoption of FMNR techniques. FDCS project plans have also detailed community-specific benefit-sharing schemes.

The seven FDCSs are guided by a Forest Farmers Union run by cooperative society representatives

Local societies develop elements of their project action plans, such as community nurseries. Image: World Vision

along with a team of technical professionals as a steering committee. This arrangement is strengthened by the role of local government, which maintains an office dedicated to monitoring and supporting the activities of cooperative societies. The FFU acts as an umbrella group, bringing together all seven FDCSs and linking these cooperatives with local government and with WVE.

Humbo is the first compliance carbon project (recognised by the UN Framework Convention on Climate Change, UNFCCC) in Ethiopia and the first forestry Clean Development Mechanism project in Africa, registered under the UNFCCC. Project activities have included developing a community land-use model, which results in greenhouse gas removal through natural regeneration; a system to monitor the carbon stocks; a financial system to manage community investments; and connection of this financial system with international auditing. An Emissions Reduction Purchase Agreement (ERPA) was signed in 2009 by WVE and WVA on behalf of the communities. World Vision has also signed sub-ERPA agreements with the forest development and protection cooperatives and with district-level rural development office based on the main ERPA.

> World Vision disburses carbon payments to cooperatives

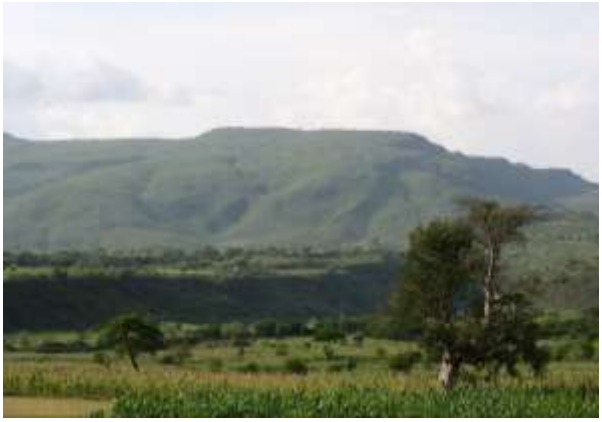
The Humbo project used the Good Practice Guidance for Land Use, Land-Use Change and Forestry (LULUCF) IPCC default values. Carbon levels for Humbo are calculated using published information for similar climatic zones and vegetation types following an approach of combined natural regeneration and

[6] Also known as the Humbo Ethiopia Assisted Natural Regeneration Project.

supplementary planting, biomass stock and annual increment figures for plantations. Two carbon pools were considered, namely aboveground and belowground carbon stocks.

The methodology used for establishing a baseline and for monitoring is the approved Clean Development Mechanism methodology (AR003 version 4[7]). As a starting point, WVE conducted a baseline study and established permanent sample plots. These are measured annually to detect any changes in the condition of the forest. But during recent initial verification, WVE was asked to re-stratify the project site due to observed changes in vegetation. This has led to re-fixing sample plots. The baseline defines the 'business as usual' scenario as the number of existing trees that would otherwise be cleared without the project. As a result, WVE receives carbon payments through WVA on behalf of the community and disburses the funds to respective cooperatives proportionately based on the amount of emissions they have reduced. This responsibility means that WVE has an active role in monitoring the project to ensure that the terms and conditions incorporated in the ERPA are adhered to.

In some cases, the project has led directly to solidification of tenure rights of communities. More specifically, cooperative societies were granted User Certificates by the government. This formal recognition of the rights of communities to manage the forest gave them control of the resources in the project area, including both the trees and the sequestered carbon.



Humbo mountain has become visibly greener since implementation of the PES initiative. Image: World Vision

To date, 2,728 ha of degraded forest which were previously unmanaged and over-exploited for wood, charcoal and fodder extraction have been protected. A further 700 ha under management have been pruned using FMNR techniques. The sapling survival rate on 230 ha of FMNR land has reached 79%. The Humbo project is predicted to accrue USD 726,000 over the first 10 years. Household income in Humbo has significantly increased, which may be due to direct and indirect provision of financial incentives for participants. Socio-economic and welfare difference between participants and non-participants is reported (Tafesse Shirko 2014).

3.6. Chimpanzee Conservation Corridor Pilot PES Scheme, Uganda

Year established: 2002
Type: Biodiversity conservation and forest conservation
Objective: Community forest management; adjusted agricultural activities; watershed protection
Finance source: UNEP/GEF/NEMA
Compensation: Cash and in-kind payments

In Uganda, chimpanzee forest habitats are increasingly threatened by conversion to agriculture and human settlements. Furthermore, 70% of forests are in the hands of private landowners and rural communities, and half of these have been degraded. At present, around 86,000 ha per year are lost in deforesting activities. Of the 5,000 wild chimpanzees in the country, 10% are found outside protected areas where the annual deforestation rate is more than twice as high as in protected areas (currently 5.1%). In unprotected habitat, chimpanzees are widely reported to raid agricultural crops. Human–wildlife conflicts have arisen due to people's concerns that conservation of habitats and chimpanzees is a potential threat to smallholder livelihoods (McLennan 2008).

In one such chimpanzee habitat area in western Uganda, a forest management initiative known as the Ongo Community Project was initiated in the early 2000s. Before this began, 86,000 ha per year were being lost on account of deforestation (largely for timber). In 2011, the Ongo project coordinators began the process of converting the scheme to a

[7] This details afforestation and reforestation of degraded land through tree planting, assisted natural regeneration and control of grazing by livestock.

Explaining the contract to a participant. Image: CSWCT

REDD+ pilot led by ECOTRUST. This conversion affected the legal status of the entire local project management association. The project incorporates numerous scattered villages comprising large households with small farming plots, commonly of insecure tenure and often characterised by boundary disputes.

After consultation with communities, government and other actors in the area, the Chimpanzee Conservation Corridor Project commenced in the Albertine Rift Forest System. The project has goals on three levels. At the local level, it aims to implement a successful PES project aimed at enhancing biodiversity and landscape conservation. At the regional level, it aims to build lasting capacity for PES design and implementation in Uganda. Finally, at the global level, it aims to deliver scientific data to inform policy and future project development. A four-year pilot (between 2010 and 2014) was developed by actors from government, civil society, both private and non-profit sectors and global multilateral organisations including the Ugandan National Environment Management Authority (NEMA) and the United Nations Environment Programme's Global Environment Facility (UNEP-GEF). Darwin Initiatives-UK has provided cash co-financing to cover input from IIED for the design and part of host institution's costs for monitoring and scheme design.

The project is using an experimental methodology. The experiment has involved 1,400 villages in eight sub-counties of Hoima and Kibaale. In half of these, residents are eligible for payments in return for avoided deforestation, reforestation, adjusted agricultural activities, forest monitoring and watershed protection; the other half are not. Every village received capacity building and training on PES, forest cover change and climate issues, forest management and sustainable forest-use options. Then, residents of villages eligible for payments have chosen whether to participate in the PES programme. This "test" group has then been offered a payment in return for contractually agreed activities. The experiment has investigated alternative incentive schemes to compensate farmers more effectively and to provide tangible reasons for conserving biodiversity. The project, however, does not attempt to fully address opportunity costs of other activities with payments alone.

In order to understand how to design potential schemes, researchers have used a series of methods, including focus group discussions and a low-cost choice experiment to examine preference. A baseline study of socio-economic conditions has been undertaken to identify the main livelihood activities. The major drivers of local deforestation and forest degradation were identified as land clearing for subsistence agriculture and production of cash crops of tobacco, rice and maize, and the extraction of timber poles.

> The project does not fully address opportunity costs

The choice experiment revealed that smallholders preferred a variety of benefits, such as generating alternative sources of income, other employment opportunities and better access to social services, over a simple 'pay and stop' instrument. Furthermore, the anticipated level of compensation was considered too small for the limitations imposed

Beehives in Hoima sub-county. Local residents voted on their preferred compensatory livelihood projects, which included apiary training. Image: T Burlace

on villagers. In response to these experiments, a series of potential packages of activities with different combinations were put to the vote by the community members to gauge preferences. Results were gender-sensitive: the majority of men preferred cash-producing activities, such as raising seedlings for income and the use of a revolving fund, while the majority of women preferred activities that involved improving (cash and subsistence) agriculture and that were targeted directly at women. The danger of elite capture was a dominant factor affecting people's responses.

So far, participation rates have been high with 82% of those asked to join, agreeing to do so. Those interested have submitted an application and negotiated an individual contract, which was finalised in a participatory process with landowners and community organisations. Each participating farmer receives a payment based on the forest area conserved and number of hectares reforested. The project payment rate has been determined with reference to other similar PES schemes. At present, each farmer receives USD 35 ha/year. Seedlings are also provided for reforestation and enrichment planting. With close to 1,500 ha committed to the project scheme, this translates to about USD 52,000/year equivalent of cash payments in addition to 44,000 indigenous seedlings worth about USD 18,000. Cash is distributed on a yearly basis, starting from the contract sign date. The scheme involves rigorous monitoring and evaluation analysis to determine its performance.

3.7. Community PES (C-PES) Project, Cameroon

Year established: 2009 **Type:** Carbon offsetting
Objective: Community forest management
Finance source: UK DFID
Compensation: Cash payments and in-kind payments

The Community PES (C-PES) Project was initiated in 2009. It was one of seven start-up projects funded by the UK government through DFID's fast track for the Congo Basin Forest Fund. The Fund[8] was established by the UK government to alleviate poverty and reduce deforestation in Congo Basin countries. DFID provided GBP 100,000.

Communal crop sorting in Cameroon. Image: Bioclimate

The overarching goal of the C-PES project was to support two communities in southern Cameroon to protect forests by finding ways to integrate PES with community forest management. Cameroon was chosen because it was the only Congo Basin country with a legal framework that recognises community forests. The Plan Vivo System was used to develop the project (see Box 2) although the project has not been registered for Plan Vivo certificate sales.

The project coordinator in Cameroon is the Centre pour l'Environnement et le Développement (CED). Bioclimate, based in Scotland, managed the UK aid grant and oversaw the development of PES activities. The Rainforest Foundation UK provided advice on the project concept and early development process. The Centre de Coopération Internationale en Recherche Agronomique pour le Développement (CIRAD) and l'Institut de Recherche Agricole pour le Développement (IRAD) in Cameroon provided technical assistance to improve soil fertility and agricultural and agroforestry practices, including the introduction of improved cocoa seed varieties, stock and farming methods.

The project reached the end of its grant-funded development phase in June 2012, at which point PES activities had been defined and were being implemented at both sites. Technical and social baselines had been developed, the expected carbon

[8] http://www.cbf-fund.org.

benefits of PES activities quantified, and technical and social monitoring systems developed and applied. PES has been integrated into Simple Management Plans for both community forests, and the plans were formally approved by the Ministry of Forests. By 2012 both communities had received training and support for improved agroforestry and agricultural practices, while benefit-sharing arrangements were put in place and income-generating activities and NTFP enterprises were introduced and/or strengthened. The first tranche of payments had been transferred following forest monitoring. CED had assumed full responsibility for ongoing coordination, monitoring and reporting of project activities and results in accordance with the requirements of the Plan Vivo System.

Approximately 50% of the PES finance from DFID was used for two civic projects in the communities: a solar-powered water supply system in Nomedjoh, and a diesel generator with electrification in Nkolenyeng. An independent trust committee meets annually in Yaounde to review the CED annual report and oversee the distribution of funds to the communities. The trustees include representatives from the two communities, government officials and members from civil society.

Based on the experience of the C-PES project, Harley et al. (2012) advanced a four-part argument about REDD+ and community PES.

First, community PES approaches can be a useful catalyst for improving community control over forests and forest resources, local institutions and livelihood opportunities.

Second, unlocking the potential of PES in impoverished rural community settings is a complex process. It involves working within existing community, political and institutional constraints in order to bring about change. It requires a fundamental consideration of equity dimensions and an emphasis on institutional and capacity development. Livelihood benefits must be an essential component of any effort to attenuate local drivers of forest loss, not an incidental by-product of such an effort.

Third, community PES projects may be relatively expensive to develop. Potential exists for some immediate cost savings. Basing PES on forest carbon stocks makes technical development costly and complex without necessarily leading to better monitoring or results.

Fourth, as a means of delivering development assistance directly to rural poor communities and helping to reduce forest loss, PES may be relatively efficient over the longer term.

4. Aspects for assessment: feasibility, effectiveness, efficiency, sustainability and equity

PES projects can be assessed in five areas: feasibility, effectiveness, efficiency, sustainability and equity. Drawing on the literature, this section discusses these areas in detail and considers them in relation to our selected projects, particularly the seven case studies, whose performance in each of the five areas and overall pros and cons are summarised in Table 2.

4.1. Feasibility

The feasibility of a PES project is conditional on local technical and institutional capacity, policy and legislation. As with any development project, PES projects have a better chance of succeeding when they are coordinated by, or through, local groups that have good project management capacity, are well organised and transparent, have good administrative and outreach systems and skills, and can competently carry out monitoring and evaluation.

Technical data requirements can be a barrier to entry for local organisations

Local groups do not need technical specialist skills to manage PES projects. Typically, for most carbon or REDD+ PES projects external groups or individuals have done much of the technical carbon work. Carbon metrics and calculations are notoriously complex and the technical data elements of PES projects can be both burdensome and a barrier to entry for local organisations. Increasingly, environmental information relating to forests, water and biodiversity is recorded and monitored using GPS and remote sensing software, often on smartphones. An example where a REDD+ project has simplified and streamlined data recording is in Guyana, where community members gather project information through the use of smartphone apps.[9]

Whilst national policy and legislation are important considerations, and are key to operating national PES schemes, sub-national PES schemes have been implemented where less than favourable government policy and legislation exists. Many sub-Saharan African countries do not have PES-friendly policies and legislation. An exception is Uganda, where the government has taken a positive approach to attracting and engaging with PES projects. During the early 2000s Uganda adopted smallholder-appropriate forestry legislation with respect to the private ownership of carbon sequestration rights and encouraged smallholder-focused PES approaches, such as the Trees for Global Benefits project.

A number of Latin American countries have PES-friendly legislative and policy frameworks, notably Costa Rica and Mexico, where PES schemes have been implemented at nationally. Mexico's Programa de Pago por Servicios Ambientales Hydrológicos, established in 2003, operated on the basis of a small water levy, charged to water consumers. The levy funds were applied to forest conservation measures through smallholder management in areas of cloud forest covering key aquifers. Conversely, the Government of Bolivia opposes the idea of commoditising nature; it operates a reciprocal agreement defined as a social contract for water services based on collective stakeholder decision-making by local stakeholders (Van der Hombergh 2013).

Most PES projects in the global South, including the longest running projects, are in located in South and Central American countries including Brazil, Ecuador, Costa Rica and Mexico. There are increasing numbers of PES projects and programmes in South-East Asian countries and some, such as Indonesia, are attempting to adopt favourable legislative and policy conditions for PES, specifically for REDD+. Vietnam has proved to be particularly adept at administering hydropower-related PES and successfully disbursing funds to local communities.

[9] http://www.globalcanopy.org/sites/default/files/community-powered_monitoring_of_redd_-_canopy_viewpoint.pdf.

4.2. Effectiveness

Effectiveness of PES projects can apply to different project dimensions (Bioclimate 2014), for example: institutional effectiveness relating to governance; social effectiveness pertaining to livelihoods; and technical effectiveness relating to a reduction in deforestation. Technical effectiveness can be considered a product of livelihood activities identified and chosen by smallholders, participatory methods, good governance, livelihood development and increased institutional capacity. There are cost implications, however. Porras et al. (2013) highlight the conundrum of trying to achieve increased effectiveness, through social targeting of PES incentives, while not increasing institutional and transaction costs.

The case studies present a mixed picture in respect of their effectiveness in reducing deforestation of high conservation value forests. Only one case study, NK-CAP, achieved tangible reduced deforestation: 763 ha between 1997 and 2005, and this at considerable cost and no little controversy (see Table 2).

4.3. Efficiency

Efficiency is the extent to which time, effort or cost is well used for the intended task or purpose. We have taken efficiency to be a product of the relationship between money invested in the project and the scale of reduced deforestation; the unit cost per hectare of achieving reduced deforestation. As with the other variables discussed in this section, efficiency is not straightforward to tease out of the case studies. The basis on which PES projects have calculated unit costs is opaque, and where we have calculated the unit cost, based on project literature, it is crude and probably inaccurate. The chimpanzee conservation corridor project in Uganda quotes a figure of USD 35 per hectare of protected forest; for Humbo we have calculated a figure of USD 26 per hectare; and for NK-CAP, applying a conservative 0.25% of total project funding to the avoided deforestation figure for 1997–2005, generates a figure of USD 3,276 per hectare.

When compared with the Plan Vivo project average of USD 7.00 (±GBP 4.52)[10], the GBP 11.83 per tCO_2 carbon abatement cost for the first five years of the C-PES project in Cameroon is very high, reflecting the complex institutional context and practical project development challenges faced by the project. The carbon abatement cost over 10 years is considerably

Box 3 Efficiency considerations for community PES initiatives

Technical

1. If carbon is retained as the basis of PES, use existing forest stratification types and carbon values for these. Estimate the expected carbon benefits by using existing carbon baselines and 'with project' scenarios and adjusting these to local circumstances.

2. Fine-tune the technical monitoring system based on practical experience, and replicate it.

3. Use trained technical staff, community fieldworkers and members to train communities at other sites.

Institutional development

1. Where there are capable community-based organisations (CBOs) and NGOs near to project sites, work closely with them in order to reduce travel costs by central project coordination teams.

2. Make project development toolkits available to project coordinators and local-level CBOs and NGOs in order to reduce travel and staff costs associated with intensive technical assistance.

3. There are few shortcuts and rushing is often counterproductive.

Social development

1. Use trained site coordinators and community fieldworkers to cover multiple communities.

2. Follow steps and use established methods to understand communities and do livelihood surveys.

3. Take advantage of ICT, particularly local radio and films, to promote local learning and communicate the idea of community PES.

[10] Based on an analysis by the Plan Vivo Foundation of project sales revenues reported in project annual reports in 2010, and reported and cited in Peters-Stanley et al. (2011).

lower (GBP 3.74 per tCO_2), but still relatively high considering the magnitude of the expected carbon saving (almost 300,000 tCO_2 in total for the two sites). The steep drop in the 10-year carbon abatement cost underlines the potential economies of scale that can be achieved with a project such as this over a longer term implementation horizon.

Generally speaking, the more technically complex the PES scheme, the higher the project development and administrative costs. Porras et al. (2013), drawing out lessons from 20 years of PES project work in Costa Rica, recommend the use of simple indicators for environmental impact such as hectares of land in management, rather than spending money on technically complex services, such as carbon sequestration or conservation. They also recommend that PES payment levels, which in the Costa Rican context were regarded as too high, be more closely aligned with local opportunity costs; that is, the revenue foregone by scheme participants. This point reinforces the need to spend time understanding local socio-economic circumstances and what smallholders require to compensate them for behaviour change.

Forest carbon projects have high establishment costs because of the technical specialisms associated with measuring and monitoring biomass, and the high cost and burdensome procedures involved in verifying and validating carbon standards. Attaining standards such as the Verified Carbon Standard (a voluntary carbon market) or for the Clean Development Mechanism (a compliance carbon market) can cost a PES project hundreds of thousands of dollars. The Plan Vivo Standard (see Box 2 above) is relatively low cost and accessible to smallholder-focused projects. However, the number of Plan Vivo projects that have been developed and managed without external technical support is small. After considering their experience with the C-PES project, Harley et al. (2012) developed recommendations for achieving efficiency in technical and other aspects of PES initiatives while aiming for strong community participation, ownership and empowerment. These are shown in Box 3.

4.4. Sustainability

Sustainability refers to the capacity of a PES project to be maintained at a certain level. Factors that contribute to a sustainable PES project include: improving agricultural practices, supporting local enterprise and savings groups, building local capacity, instituting good governance, achieving equity in benefit sharing and retaining the flexibility to change project activities and operating systems in response to evaluation. Achieving sustainability without repeated injections of external funding can only really be achieved where the PES project provides ongoing livelihood benefits that adequately compensate people for abandoning deforestation practices. A review of PES for smallholders in productive landscapes of South America (Van der Hombergh 2013) found that PES systems that work best over the long term are those that transform extra financial incentives into better productive activities that sustainably generate income.

Achieving sustainability without repeated injections of funding can only really be achieved where the PES project provides ongoing livelihood benefits

A diversity of funding sources with a mix of private and public finance can contribute to the financial sustainability of PES projects, albeit over the short term (FONAFIFO CONAFOR and Ministry of Environment 2012). Another approach to sustaining a PES project can be to establish a project fund, as was done for the NK-CAP project, where investment income was set aside at the project outset and the revenue accruing from the investment is introduced to the project over time.

In Uganda, ECOTRUST established the Trees for Global Benefits scheme in 2003 and over time has successfully applied institutional grants and funding to the organisation, helping to meet the costs of administrative overheads and extension services, with finance from buyers of ecosystem services (carbon purchase). The Community Carbon Funds, replenished by 10% of farmers' carbon payments, are used to develop community infrastructure and to operate as a risk-management mechanism to fund replanting.

Notwithstanding that land tenure does appear to be a key element in the success of PES projects, it is unclear what the long-term sustainability

implications are of providing secure land tenure versus other types of PES incentives. There is strong evidence to suggest that improving productive and/or financial activities as part of a PES project is a good strategy for long-term sustainability (Van der Hombergh, 2013; Harley et al. 2012).

4.5. Equity

The equity of PES projects refers to the extent to which projects provide an opportunity for all members of target communities to participate, including women and marginalised groups. It refers to the opportunity to participate. Initiating a PES project risks reinforcing existing inequalities or introducing new ones (Bioclimate 2014), and safeguarding equity is the responsibility of the institutions involved in developing the PES approach. Equity matters because the potential effectiveness and sustainability of community PES initiatives will derive largely from their ability to alleviate poverty and promote fair access to livelihood opportunities and benefits, as well as to bring about the institutional and capacity development needed to in order to realise these goals (Harley et al. 2012).

As illustrated by the Trees for Global Benefits and C-PES projects, households with small or insecure land holdings and landless households may be unable to participate in a smallholder PES project. This also applies to women in societies where they are unable to hold land title. Identification of social marginalisation issues and the affected groups at an early stage in the project development process gives project development institutions an opportunity to better target PES activities and incentives and to devise equitable benefit-sharing arrangements.

In both C-PES communities in Cameroon, women have become more integrated into decision-making about the community forests as a result of the project. This development has been assisted by the fact that women were able to generate income from forest products and agricultural crops which the project has supported and promoted, and have therefore agitated for a greater say in decisions about the use of land and community forest resources (Harley et al. 2012).

Table 2 **Analysis of the seven PES case studies**

Case study	Effectiveness[11]	Efficiency[12]	Sustainability[13]	Equity[14]	Pros and cons
Noel Kempff Mercado Climate Action Project (Bolivia) Administered by a national NGO (Fundación Amigos de la Naturaleza)	Between 1997 and 2005: 763 ha saved from deforestation; 468,474 m^2 of timber protected. With the project acting as a buffer zone adjacent to the National Park there have been conservation gains through enhanced protection for rare, diverse and endemic species.	The costs of design, implementation and maintenance were estimated at USD 11.5 million between 1997 and 2006. Estimated resulting cost of USD 3,276 per hectare.	The Program for the Sustainable Development of Local Communities (1997–2001) improved access to basic services. The Community Development Program (2002–2006) emphasised community development, securing land titling, assisting self-organisation and supporting income-generating activities.	Scheme targets indigenous communities although women are not targeted specifically.	**Pros:** Focus on land tenure and alternative livelihoods (enterprise); conservation gains. **Cons:** High cost per hectare and per smallholder; negative publicity and potential non-delivery of greenhouse gas emission reductions; leakage has been identified as a major problem (Greenpeace 2009).
Sumber Jaya Forestry Project (Indonesia) Part of a multi-country programme funded by IFAD; implemented by a local NGO (Watala)	Emphasis is on improving local living conditions (through restoration) rather than reducing deforestation per se. An HKm contract allows people to gain access to previously encroached state-protected forest. It is uncertain if the HKm may lead to further deforestation by people who want to gain legal tenure over forestland.	No cash payment per hectare, but rather the offer of land tenure security.	Project emphasis is local community empowerment and engagement; attention to tenure security and contract duration of 25 years contributes towards sustainability. Involvement of RUPES has assisted in establishing trust and generating mediation opportunities in a post-conflict setting.	Since the HKm application has to be made in a group, enterprising people who want to take advantage of the opportunity are required to include all their neighbours, thus potentially involving poorer neighbouring households.	**Pros:** Local empowerment through tenure security; local partner involvement; trust between farmers and buyers; high participation in scheme. **Cons:** Volatile world market price for coffee; limited human and financial resources in the Forestry Department; group application involves time-consuming mapping; household costs of joining equate to 50% of total household monthly income (Kerr et al. 2005).

[11] Avoidance of deforestation and degradation of areas of high conservation value
[12] Scheme costs (for example per hectare) where reduced deforestation has been achieved
[13] Socio-economic sustainability as well as sustainability of the financial model
[14] Equitable opportunities for women and marginalised groups to engage; and equity of the distribution of benefits

Case study	Effectiveness[11]	Efficiency[12]	Sustainability[13]	Equity[14]	Pros and cons
River Care (Indonesia) Initiated as part of a multi-country programme funded by IFAD; implemented by a hydropower company	Emphasis is on improving local living conditions (through restoration) rather than reducing deforestation per se. High uncertainty regarding continuation of certain land-use practices in the region, which may be detrimental to the project.	The hydroelectric company PLTA Way Besai provided around USD 1,100 in 2012.	Involvement of RUPES has assisted in establishing trust and generating mediation opportunities in a post-conflict setting.	Not detailed.	**Pros:** The use of auctions to deduce participant choices; project involves tenure security and in-kind compensation (livelihood diversification). **Cons:** The area is still subject to natural disasters (landslides), which increases sedimentation in the dam region.
Trees for Global Benefits (Uganda) Managed by a national NGO (ECOTRUST)	The scheme focuses on restoration of degraded land, rather than land of high conservation value, because of high population density and the project emphasis on poverty alleviation. Figures show that by 2010, 1,210 ha were under management. Project sites are located in the buffer zones adjacent to protected areas. However it is unclear if the project has reduced deforestation and degradation here. The scheme might have been more effective if the project had incorporated communal land, to allow involvement of individuals who lack secure tenure and provide space for communal cultivation.	Less than USD 50,000 establishment costs.	Upfront payments received in 5 installments over the first 10 years of a 25-year contract. This approach raises questions regarding the longevity in terms of efficiency. After the last payment, will the value of the trees be sufficient for producers to behave under contract conditions without further incentives? According to documentation, no buyers for carbon credits were found during the first year. This affected participants' trust. The year 0 payments were not sufficient to cover the start-up costs of tree planting. Project documentation describes logistical challenges of distributing payments.	ECOTRUST had already been working with a local women's development association. Involvement in the project is a household-level decision to which male and female members must agree. However, documentation reveals men and women have not been approached separately to discuss implications of 'carbon forestry' for intra-household finances. Project hopes that household firewood self-sufficiency can reduce women's work load. Requirements for payees to have 1 ha of land under secure tenure and a bank account are described as a significant barrier to women and disabled people.	**Pros:** Favourable national policy and legislative context; high uptake amongst farmers; relatively simple technically (carbon technical specifications). **Cons:** Entry barriers (e.g. length and relative complexity of the legal agreement); participants must have at least 1 ha of land and there are no project-derived goals to assist tenure security); women's engagement is planned for but difficult to achieve; extent of protection of protected areas is unclear; a lack of carbon credit buyers; participants admit to feeling dissatisfied with ECOTRUST owing to financial shortfalls and poor communication.

Case study	Effectiveness[11]	Efficiency[12]	Sustainability[13]	Equity[14]	Pros and cons
Humbo Community Managed Natural Regeneration Project (Ethiopia) Coordinated by an international NGO (World Vision) and implemented by seven local cooperative societies, supported by World Vision Ethiopia, local government and a Forest Farmers Union	2,728 ha of degraded forest protected; 700 ha pruned using natural regeneration techniques. Rate of protection is likely to be higher over the next 10 years as the project is now up and running. Project focuses on restoration of degraded land rather than avoiding deforestation.	Total project costs USD 1.3 million Project is expected to accrue USD 726,000 over the first 10 years, equating to USD 26.6/ ha/year.	The scheme focuses on local empowerment, local legal rights to access and manage land. The benefits of local secure entitlement can positively influence sustainability of the project. Humbo government cooperative office guides financial management and its annual audits of cooperative societies is expected to guide the financial sustainability of the project.	General cooperative membership is open to all, including women. However, leadership of cooperative groups is rare. Cooperative society members are trained in forest management techniques which encourages participation and aims to maximise involvement and benefit sharing among community members.	**Pros:** Supportive management framework; land tenure secured as part of participation; open to women. **Cons:** Inclusion of an international NGO, a cooperative federation and local administrative structures is complex and may dilute benefits going to smallholders; unclear how much funding reaches smallholders.
Chimpanzee Conservation Corridor Pilot PES Scheme (Uganda) Managed by a national NGO (ECOTRUST; see Trees for Global Benefits)	Not yet reported.	GEF allocation: USD 900,000 NEMA (Uganda): USD 1,232,400 Collaboration with IIED allowed funding to be leveraged. Private sector partners are waiting for further evidence from the project before making investment commitments.	Project identified problems of land tenure early on and worked with local leaders to verify ownership status. The project is woven into a regional network of organisations implementing similar conservation activities in the Albertine Rift.	Choice experiments have been conducted to understand preferences of both men and women in terms of the form of benefits to be received. Women have been trained in non-consumptive use of forest resources. Danger of elite capture is recognised, which suggests that distributional equity is a focus of the project.	**Pros:** As with the Trees for Global Benefits project, favourable policy and legislative context and supportive national and local government; high take-up by farmers; use of control plots; work on tenure issues; use of choice experiments; local trust and confidence in project on account of participant involvement. **Cons:** Unclear what has been achieved in respect of forest conservation and socio-economic impacts.

Case study	Effectiveness[11]	Efficiency[12]	Sustainability[13]	Equity[14]	Pros and cons
Community PES (C-PES) Project (Cameroon) Part of a multi-country Congo Basin initiative funded by donor governments; implemented by a local NGO (CED)	Reduced deforestation was observed in the early stages of the project.	Estimate average abatement costs: GBP 11.83 per tCO_2 for the 2010–2015 implementation period; and GBP 3.74 per tCO_2 for the 2010–2010 implementation period.	Community PES projects need time and adequate funding if they are to develop the local institutional capacity needed for this approach to be sustainable. Interventions will not be effective if they overlook the socio-economic and governance problems that have led to forest degradation in the past.	Using participatory methods helped to foster community ownership of projects and improved the representation and involvement of women in decision-making.	**Pros:** Emphasis on participatory approaches and livelihoods; vulnerable groups identified early on in the project by communities (the elderly, Baka, women) are more likely to participate. **Cons:** Relatively high costs; uncertainty about future funding and coordination; households with lower levels of wellbeing are less likely to participate in activity groups and therefore less likely to receive PES payments.

5. Case study evaluation: what can be learned from PES schemes?

The central tenet of the PES approach is that projects should have an ability to reach out to forest dwellers, or smallholders, in ways that can positively influence their land-use decisions (Pagiola et al. 2004). Whether this is achieved depends in large part on the design of the project. This section discusses PES scheme design in more detail. Returning to wider literature sources (describing the 28 projects listed in Section 2), we identify approaches to PES and lessons learned in four key design areas: land and resource tenure; information-gathering; opportunity costs, participant choice and contract terms; and financial risks.

This literature review suggests that smallholder PES approaches have the potential to catalyse greater control for local people over forest resources; improve local institutions; and expand livelihood opportunities in rural areas of developing countries where options are often limited. However, it is also acknowledged that PES schemes could undermine food insecurity (Bioclimate 2014). Case studies and evaluations of PES schemes identify outcomes that are highly dependent upon the nature of the PES scheme and the actors involved (Bond et al. 2009). PES schemes are confronting many of the same challenges that all new environmental interventions face as actors position themselves to access and capture benefits (Robbins 2004). Many of the factors that appear to affect the success of PES schemes are the same ones highlighted in discussions about REDD+: clarity of land tenure; strong local and national governance, including minimal corruption; and a supportive policy and institutional context (Wunder 2005; Wunder 2008; Sommerville et al. 2010).

Success factors are clarity of land tenure, strong governance and a supportive policy and institutional context

5.1. Land tenure

In reviewing the PES literature it emerges that the most successful projects are those that have aimed to understand and improve the local land tenure context by placing tenure security for participants high on the list of objectives.

In Humbo (Ethiopia), the project has used local community institutions such as the Forest Development and Cooperative Societies to engage, empower and incentivise participants, while pursuing communal ownership over locally managed forests. This innovation has helped to gain community acceptance of the project and overcome initial preconceptions that any primary objective was land appropriation or top-down control. Evidence suggests that forest cover has increased in Humbo on account of improved management and that livelihoods have not been compromised.

Similarly, in Indonesia, the granting of legally recognised forest management contracts in target project communities was a prerequisite to establishing the PES scheme; illustrating that PES schemes can work in the absence of property rights (Fauzi and Anna 2013). In the Noel Kempff Mercado case (NK-CAP) the customary land rights delivered by the forestry project are viewed as one of the more positive and long-lasting impacts of the project (Smith and Scherr 2002). In Wonegizi (Liberia) the project aims to ensure that forest areas are recognised as 'ancestral domains', regardless of state ownership with legally recognised forest zones, regulations and rights negotiated for local communities.

5.2. Information-gathering

Social and environmental baselines are used to quantify and qualify communities and their ecology characteristics prior to, or in the absence of, a PES scheme. They therefore provide a fundamental tool for evaluating the future success of any PES project by calculating additionality – the extent to which the project produces additional outcomes that would otherwise not have occurred in a 'business as usual' scenario (Karousakis 2007). Various techniques will be used to obtain and measure ecological and social (or economic) baseline data within the corresponding smallholder communities. There is a consensus in the literature that it is important for baselines to be monitored over time and for

corrections to be made to PES schemes to allow for changing circumstances, for example in policy, governance, deforestation rates or socio-economic conditions.

For gathering social or economic baseline information such as community-level wellbeing, discussing perceptions of wellbeing and wealth and identifying indicators of poverty, semi-structured household interviews and participatory group-level discussions and focus groups can be used. Groups may be gender-specific or target a particular age set, occupational niche or class. Group work can greatly help to understand traditional community institutions and the capacity of a community to negotiate with external actors. Group work can also open up dialogues on livelihood activity profiles and 'problem ranking', which can build momentum for action on local community issues (Jindal 2004).

To gain greater precision, household surveys or questionnaires may be used to document population size, household characteristics (occupancy), education and literacy levels, income sources, food security and asset ownership. Household-level questions may also cover land-use practices such as the use of fertilisers and irrigation and land tenure arrangements.

Techniques for collecting ecological baseline information ought to be participatory, with local groups participating in mapping exercises or making seasonal calendars illustrating annual agrarian or water cycles. Group work may reveal land-use practices, as well as identify key geographical and physical features in the area. Recently developed techniques for deriving participatory information, such as the Participatory Land Use Planning process, are being employed in PES projects in West Africa through UK NGOs TreeAid and Bioclimate. Transects or inventories may be used to assess a pilot plot or sample area considered representative of the wider habitat.

Baselines provide an opportunity to gain a basic understanding of how leakage of certain activities may influence project success. Leakage occurs when a project directly causes carbon-emitting activities to be shifted to another location, known as activity-shifting leakage, thus cancelling out some or all of the project's carbon-saving benefits. Market leakage occurs when a project changes the supply-and-demand equilibrium, causing other market actors to shift their activities. Understanding leakage is critical to evaluating the success of a PES scheme.

Carbon benefits resulting from REDD+ project activities are calculated as the difference between emissions from the baseline (without the project) and post-project emissions, minus any deductions for leakage, uncertainty and impermanence. Since additionality involves assessing what would have but did not happen, it cannot be measured exactly and is often subjective. Nevertheless, there are several suggested tests for determining whether emission reductions are additional, specifically: (1) Were project activities required and regularly enforced by law? (2) Would project activities have been financially possible otherwise? (3) Were the project activities common practice? (4) Were 'business as usual' emissions the same or lower than the with-project scenario? An answer of "no" to all four questions helps to establish additionality (The Nature Conservancy 2009).

In the case of REDD+ there are specific challenges associated with quantifying the amount of carbon held in existing forest and predicting how much carbon will be captured or released in a future scenario. A review of the C-PES project in Cameroon concluded that carbon is expensive to measure repeatedly and doing so can divert attention and resources away from activities that directly support community livelihoods. Also, its use as an ecosystem metric does not lead to better monitoring and outcomes (Bioclimate 2014). This echoes the findings of Porras et al. (2013) in their review of Costa Rica's PES experiences over 20 years.

5.3. Opportunity costs, participant choice and contract terms

5.3.1. Opportunity costs

It is important that PES project design addresses the issue of the opportunity costs that will be faced by smallholders whose access or use will be restricted by the scheme. Failure to do so is common. According to Asquith et al. (2002), the Noel Kempff Mercado project failed to fine-tune the compensation package for smallholders to compensate those hardest hit by unemployment on account of sawmill closures. In Uganda, participants

in the Trees for Global Benefits programme have complained that early payments did not cover the labour costs of establishing the 400 trees, as required under contract (Schreckenberg et al. 2013). The C-PES project in Cameroon focused on the goal of forest cover rather than inputs, such as land and labour, meaning that there are opportunity costs at various levels, and these were not fully assessed (Bioclimate 2014).

Recently, PES projects have been considering opportunity costs as part of efforts to establish what exactly is needed to achieve compliance and cooperation by participants. Some studies advocate research with individual participants, including semi-structured interviews and key informant discussion, in order to give a 'thick description' of a programme's context and open up debates regarding costs and participants' willingness to pay. Such details might then be evaluated using either narrative or discourse analysis. Conventional economic opportunity cost analysis may not be useful for gauging community interest in PES projects and many project designs overstate the importance of monetary incentives.

For the Chimpanzee Conservation Corridor project in Uganda, ECOTRUST used group-level choice experiments as a low-cost means of establishing farmer's preferences and community aspirations and assessing the resources needed to ensure project sustainability (Porras and Blackmore 2014). Other projects use auctions, where participant contracts are allocated to the lowest bidder (Wollenberg et al. 2012; Kaczan et al. 2013). A PES contract auction can elicit information on preferences, trade-offs and landowners' willingness to accept, as well as increase the efficiency of the project (Porras and Backmore 2014).

5.3.2. Participant choice

Without a trusted partner, local people often have great difficulty in forming essential relationships with outside groups or voicing opinions, concerns and needs. Where subsequent communication channels are lacking, it is very difficult to promote the dialogue needed for policy change. In Uganda, the participants of Trees for Global Benefits have reportedly lacked opportunities to engage with the lead implementer ECOTRUST. As a result, the project has received criticism for failing to engage with local communities, overlooking their needs and wishes (Fisher 2011).

Experience with PES projects suggests that schemes should have processes for planning how community funds will be spent, engaging participants in the selection of compensation activities and managing intra-community disagreements. In the case of Uganda and Trees for Global Benefits, one major problem has been that village groups had no agreed plan concerning the use of community funds. Construction projects relating to wells or roads were received negatively, as these were declared the government's responsibility and participants argued that any fund money should not be used to subsidise government activities (Schreckenberg et al. 2013). Similarly, in the forest conversation scheme in Nepal's Khulekhani watershed, participants observed that an absence of rules defining the use of community funds, led to confusion. In Khulekani, community infrastructure was eventually prioritised, but to the detriment of environmental resources.

Elsewhere the funding of NTFP projects is criticised as filling gaps – merely providing an income supplement or safety net during shortfalls rather than addressing problems of economic development or growth (Hedge and Bull, *in press*). Bioclimate experience in the C-PES project in Cameroon and from nascent PES projects such as Tree Aid's Womens' Forest Livelihoods Project in Burkina Faso runs contrary to the Hedge and Bull findings. Tree Aid is supporting women's groups to collect, process and sell shea and other NTFP products. The channelling of PES funding to support women's groups to develop NTFP enterprise activities would appear to bolster women's economic development beyond the short term.

Many project reports describe confusion regarding which tree species are to be replanted (e.g. PROFAFOR, Trees for Global Benefits, N'hambita). In most cases these are decisions over which participants feel either disempowered or excluded. Many project teams arrive in a location with preconceived ideas about replanting strategies. Some reports even suggest that smallholders lack awareness of drought tolerance; or are misinformed with respect to species introductions, vulnerability and pest invasions. In Uganda, farmers stated they were still waiting for information from ECOTRUST about the diseases affecting an indigenous species,

almost two years after the information was first requested (Schreckenberg et al. 2013). While in N'hambita, where both timber and agroforestry trees have been included in the project technical specifications, farmers did give preference for fruit tree planting (Jindal 2004). Invariably, a species deemed suitable for re-planting is linked with the contract cycle. For example, one oversight by the long-running PROFAFOR project, which specialises in pine and eucalyptus planting, has been that all contracts signed before the year 2000 (which constitutes about 60% of their total support) were for 15–20 years. This interval only covers one single cropping cycle.

Schemes should have processes for planning how community funds will be spent

5.3.3. Terms of participation and equity

Participation in a PES project should be predicated on FPIC (free, prior, informed consent) principles and it is important that participants fully understand the proposed PES activities. Ideally, as discussed in the previous section, smallholder participants will have identified PES project activities that they feel are suitable for their circumstances, such as an alternative land management practice like agroforestry, participation in a village savings and loans association, enterprise support or a land tenure arrangement.

Similar care must be taken with the design of contracts that PES schemes require participating individuals or communities to sign. Some reports note that many participants do not understand the terms of conditions in the contract documents, owing to illiteracy or preferences for project intermediaries to use 'colonial' rather than local languages. The terms and conditions of contracts for carbon offsetting projects appear to be particularly unclear. For example in N'hambita (Mozambique) it is assumed that after seven years of payments, the benefits from planted trees will be 'evident' to participants and incentive enough to secure protection until the trees reach 100 years old. In reality, many farmers are unaware of any obligation to conserve trees (let alone carbon) for 100 years. This point is important, given that carbon investors, consumers and companies are buying credit on the basis that they are supporting future carbon stocks and stores. Many of the PES schemes reviewed offer relatively long contract terms, particularly the carbon offsetting programmes. One PES critique questions the fairness of imposing 25- to 50-year contracts on people in developing countries where life expectancy is often low (Schreckenberg et al. 2013).

Many participants declare a lack of clarity over contract enforcement (legal action that would be undertaken if project terms and conditions are not met); insurance mechanisms to protect against natural disasters; and whether land acquired through secure tenure schemes might ever be sold.

Most contracts fail to mention any type of exclusion or barrier to entry. PES schemes may be open only to individuals or households in possession of secure land rights. It has been argued that this favours community elites and goes against the grain of a fundamental principal of the PES approach, to reach the poorest and most vulnerable groups (Schreckenberg et al. 2013). That is not to say that the opinions of better-off community members are not valuable. They are sometimes the ones most likely to take risks and can be valued as early participants or pioneers in a new scheme. But unless projects are grounded in local realities, then elites will be the only ones to benefit. It follows that without a clear goal to improve local-level equity and not just the livelihoods of participants, a PES project cannot be sure that it will not increase disparities by providing a new income-generating activity to people who tend, on the whole, to already be better off than their neighbours.

However, designing PES schemes to include the poorest in society, particularly those without tenure security in areas where other people do have land title, can be more challenging and pose some complications for the project developers. For non-elites, engaging in long-term activities rewarded under PES schemes such as reforestation may divert land and resources that are important for their food security. Insecure or customary land rights and patterns of migration (in and out of the community) can affect land ownership and distribution, as well as rights over the ecosystem services in question – ultimately complicating the design of PES schemes and the potential costs and effectiveness in delivering ecosystem services (Porras and Blackmore 2014). An opposing viewpoint is that

excluding those without title still leaves the majority of projects available to most service providers (Carter 2009).

The final point concerns conditionality of the PES project. Conditionality refers to the environmental or ecosystem service which must be protected or increased in order for the PES scheme to be recognised as such. Examples of conditionality in forest conservation include tree planting, cessation of forest degradation or involvement in regeneration. Unless conditionality is clearly stipulated a PES-designed scheme quickly loses recognition as such and instead is viewed as an integrated conservation and development programme involving compensatory payments, as occurred with the Noel Kempff Mercado scheme.

5.4. Financial risks

Problems associated with securing finances for PES schemes are common. Attributing any carbon capture to a REDD+ sequestration project (rather than a change in policy or location-specific socio-economic circumstance) is difficult. Further, allocating carbon values to existing forests and unplanted trees can only be done using proxy measures with concomitant levels of accuracy (The Munden Project 2011). While successful examples of REDD+ related PES schemes using carbon as a metric are available, the spectacular controversy surrounding the N'hambita Community Carbon Project in Mozambique highlights the risks that go with providing financial incentives to the rural poor in return for behavioural changes (Kill 2013).

Proponents of the Trees for Global Benefits project (Uganda) have also realised the significant dilemma associated with carbon credit sales. As Schreckenberg et al. (2013) explain, in 2011 more than half of the carbon credits generated by the TFGB project were not sold. As chief intermediary, ECOTRUST has no power over the international price of credits, though it can negotiate with and encourage potential buyers, to pay more than the going rate (on the basis of the developmental co-benefits being achieved by the project) or to buy larger volumes of credits, thus reducing project transaction costs. This point raises two key questions: To what extent should carbon be treated like any other global commodity with prices set by the market? Is more political will needed to ensure that the price of forest carbon is set at a minimum level that compensates participants' production costs?

Late payments can mean that many producers go into debt to maintain their trees and employ labour for clearing land or pesticides for infestation control. Participants may even divert necessary food funds for the sake of investing in a PES project. Unlike other commodity markets, the fact that carbon prices in PES contracts are fixed over long periods may protect participants from price fluctuations. Conversely, fixed prices may increase the opportunity costs of participation through time (Peskett et al. 2011).

Other financial risks involve over-capacity or conflict. For example, in China, the scale of the Sloping Lands afforestation project has encouraged thousands of workers to migrate cross-country expecting work. Resultantly, many have been left unemployed on account of insufficient funds. In cases where accrued funds are allocated to external groups, such as the government, there is a need to clarify where this money will be spent. In C-PES Cameroon, where financial support was successfully sourced, PES payments (like other forms of community revenue, such as from logging or agribusiness) have led to violent conflict and have exacerbating existing inequalities in the project area (Harley et al. 2012). In Noel Kempff Mercado (NK-CAP), financial allocations were not negotiated up front and communities are currently negotiating with the Bolivian government to define their share of government spending. Finally, in Bujang Raba (Indonesia) the involvement of external funders has led to local government disengagement, leaving communities with little institutional support.

6. Recommended elements of a PES project

This final section presents a list of recommendations to be considered during a PES scheme design process. We follow the same four key areas described in Section 5: land and resource tenure; information-gathering; opportunity costs, participant choice and contract terms; and financial risk.

Securing land tenure is a success factor in project areas where there is land tenure uncertainty or threats to traditional land ownership or use. It is therefore advisable to evaluate the state of smallholder tenure and to investigate what actions may be required to secure appropriate and equitable land tenure for smallholder participants.

Information-gathering is a crucial element of PES project design. To make any claims of success a project needs to be able to demonstrate that the ecosystem service has been enhanced or conserved, usually with quantitative data. This also applies to socio-economic factors, such as participant wellbeing.

Another element of PES project design that contributes to success is establishing the opportunity costs for smallholders of participating in a PES project. This can only be done effectively where participants have been involved in the design of PES activities and fully understand the implications of project participation on their livelihood. This also applies to the design of contractual terms.

Financial risks, whilst significant for project developers, will have the greatest impact on smallholder project participants. Where a PES project depends on a carbon market it is often difficult to predict income streams beyond the project development phase. One way of mitigating financial risk for participants is to set a short time period where there is certainty over the PES income.

6.1. Acknowledged importance of tenure

Working with a respected and experienced local group or organisation; understanding and potentially improving the local land tenure context; and building capacity and governance from the bottom up – all of these approaches can provide a solid basis for PES project design. Specific recommendations for understanding tenure arrangements are:

- Invest time in conducting participatory group exercises with smallholder communities.
- Adopt a rights-based approach that respects internationally agreed safeguards.
- Prioritise gaining an understanding of tenure security in the study region and aim to verify how smallholders' position in terms of tenure might be improved.
- Look to develop legal entry points (such as forest management contracts, forest development and cooperative societies or customary land rights) from which to negotiate a better position, in terms of land tenure, for smallholder participants.
- Explore options for overcoming tenure-related barriers to participation.

6.2. Accurate and participatory information-gathering

The acquisition and evaluation of project information is key to successfully developing and managing a PES project or scheme. Baseline information contextualises the project while highlighting the changes and progress to be monitored, specifically in relation to smallholders: their livelihoods and agricultural practices; their participation and engagement; and their expectations and capacity to provide the ecosystem service. Specific recommendations for gathering information to inform PES activities are:

- Use appropriate participatory techniques to build a picture of land use, smallholder livelihood options and likely smallholder livelihood choices.
- Prioritise social and ecological baseline surveys and adopt an array of techniques including individual interviews and group-based discussions (e.g. focus groups, wealth ranking exercises).
- Where possible integrate social and ecological baselines, for example through participatory resource mapping or local inventories which provide local species names and cropping cycles.
- Understand local terms and definitions for the ecological systems and cycles under scrutiny.
- For the purposes of a REDD+ baseline, consider alternatives that avoid the carbon measurement dilemma.
- Develop a monitoring plan that refers to the baseline information. Incorporate credible monitoring of social outcomes and impacts.
- Be prepared to re-measure baselines at regular intervals, such as every five years.
- Establish a means of measuring and monitoring leakage.
- Develop a process of relaying monitoring information and project progress back to the participants. Design a system of feedback: is the project processing as participants wish? Are there changes that should be made? How can these be recognised and identified? And how any desired changes can be incorporated into the programme?
- It could be beneficial to pursue a local, smallholder definition of forest valuation (e.g. in relation to economically or culturally important tree species). Use these attributes as the focus of an 'offsetting baseline'.

6.3. Clarification of opportunity costs, participant choice and optimal contract terms

Engaging with smallholders to understand their context and livelihood situation, and ensure their understanding of what the project is offering in respect of PES incentives, is fundamental. Specific recommendations for this part of the PES design process are:

- Engage with a project partner that is well established and trusted by the smallholder groups that the PES scheme is targeting.
- Follow the principles of FPIC (free, prior, informed consent).
- Use targeted outreach and capacity building and control transaction costs to overcome obstacles to participation, particularly for poor or marginalised people. Design programme activities to minimise the costs of participation while allowing for productive activities to occur alongside REDD+.
- Take steps to understand local preferences for PES activities and incentives. Where possible and feasible, organise contract auctions as a public alternative to choice experiments, and use these events to understand target communities' willingness to accept a particular activity or scheme.
- Use auctions to also understand opportunity costs faced by participants and the compensatory payments likely required.
- When writing a contract, keep it simple and support it with clear, easy to reference programme guidelines. Translate it into local languages and redistribute it willingly on multiple occasions.
- Take time to arrange meetings with illiterate project participants.
- Do not assume everybody understands the contract. Explain conditionality, sanctions and eventualities under various circumstances (e.g. disaster, theft, accidental damage, livestock grazing).

- Set the contract duration by balancing the need for certainty in ecosystem delivery with the need for flexibility for those enrolled in the scheme.
- Be aware that PES payments can lead to conflicts and exacerbate inequalities.

6.4. Financial risk management

The efficiency of a PES project should be gauged by setting project development and management costs against the expected PES outputs and livelihood benefits. To this end PES project developers should clearly detail the costs of development and the likely costs of ongoing management, monitoring and recording project outputs and assessing the socio-economic benefits accruing to the smallholders over time. Specific recommendations to navigate financial risks are as follows:

- Ecosystem service agreements involving rural communities are most likely to succeed when created and administered at the supra-village level. This is due to the presumed high transaction costs of implementing many separate agreements with individual villages.
- Lay out the costs of developing and managing the project so that comparisons with outputs and outcomes, including ecosystem service and livelihood improvements, are clear.
- Invest in capacity building and technical support.
- Aim to maximise project transparency. Communicate the inherent risks for investors/funders and participants, whenever possible.
- Take steps to discuss in advance how community money or funds might be invested. Outline any rules regarding this expenditure.
- In the case of REDD+ and carbon credit schemes, determine in advance how smallholders will be paid if the carbon credits are not purchased.
- Make payments directly or indirectly conditional on delivery of ecosystem services by the participating smallholders.
- Provide clear, transparent and enforceable sanctions for non-compliance, in combination with risk management mechanisms.
- Support implementation with good governance and appropriate institutions at multiple levels.
- Incorporate robust and transparent guidelines for monitoring and verification.

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Annex 2. **Project location, start date and web links**

Latin America

1. Bolsa Floresta, Juma Sustainable Development Reserve – Brazil – 2006
http://pubs.iied.org/pdfs/13555IIED.pdf

2. Purus Project – Brazil – 2011
http://redd-database.iges.or.jp/redd/download/project;jsessionid=EC0DF7149AE4CC93995BFC14157F0EC7?id=88

3. Pimampiro – Ecuador – 2002
http://pubs.iied.org/pdfs/13555IIED.pdf
https://www.cbd.int/financial/pes/ecuador-pesdecen.pdf

4. PROFAFOR – Ecuador – 1993
https://www.cbd.int/financial/pes/ecuador-pesdecen.pdf

5. Noel Kempff Mercado Climate Action Project (NK-CAP) – Bolivia – 1996/1997
http://pubs.iied.org/pdfs/13555IIED.pdf
https://www.conservationgateway.org/Files/Pages/noel-kempff-mercado-clima.aspx
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http://link.springer.com/article/10.1023%2FA%3A1024712424319#page-1
http://www.greenpeace.org/international/Global/international/planet-2/report/2009/10/noel-kempff-mercado-climate-ac.pdf
http://www.redd-monitor.org/2009/10/22/carbon-scam-the-noel-kempff-project-in-bolivia/

6. Payments for Hydrological Services (PSA-H) – Mexico – 2003
http://www.oecd.org/env/cc/38523758.pdf
http://pubs.iied.org/pdfs/13555IIED.pdf
ftp://ftp.fao.org/es/ESA/Roa/pdf/aug05-env_mexico.pdf

7. AIJ Pilot Project (carbon sequestration) and CNFL Project (watershed conservation) – Costa Rica – 1990s
http://www.watershedconnect.com/documents/files/the_social_impacts_of_payments_for_environmental_services_in_costa_rica_a_quantitative_field_survey_and_analysis_of_the_virilla_watershed.pdf

8. Empresa de Servicios Públicos de Heredia (ESPH) – Costa Rica – 1997
http://bacyasociados.com/download/LeveragingAndSustainabilityOfPES.pdf
http://www.watershedconnect.com/documents/files/the_social_impacts_of_payments_for_environmental_services_in_costa_rica_a_quantitative_field_survey_and_analysis_of_the_virilla_watershed.pdf

Asia

9. Community Forest Ecosystem Services – Indonesia – 2012
http://www.planvivo.org/wp-content/uploads/CFES-Indonesia_PIN_published.pdf

10. Bujang Raba Community PES Project – Indonesia – 2014
http://www.planvivo.org/projects/registeredprojects/

11. Ulu Masen Ecosystem – Indonesia – 2008
http://www.redd-monitor.org/wp-content/uploads/2013/03/CarbonConservation_assessment.pdf
http://pubs.iied.org/pdfs/13555IIED.pdf

12. Sumber Jaya Forestry Project – Indonesia – 2000
http://pubs.iied.org/pdfs/13555IIED.pdf
http://www.sciencedirect.com/science/article/pii/S2212041613000508
http://outputs.worldagroforestry.org/record/146/files/BC11072.pdf
http://www.researchgate.net/publication/242730458_Lessons_on_the_Conditional_Tenure_and_RiverCare_Schemes_in_Sumberjaya_Indonesia_Conditionality_in_Payment_for_Environmental_Services
http://www.oired.vt.edu/sanremcrsp/wp-content/uploads/2013/11/1MoreReading.pdf
http://www.worldagroforestry.org/downloads/publications/PDFs/wp15527.pdf
http://www.watershedmarkets.org/casestudies/Indonesia_Sumberjaya_eng.html
http://www.cbd.int/financial/pes/indonesia-pesmarkets.pdf

13. River Care – Indonesia – 2006/2007
http://www.fao.org/fileadmin/user_upload/pes-project/docs/FAO_RPE-PES_ICRAF-Indonesia.pdf
http://www.cbd.int/financial/pes/indonesia-pesmarkets.pdf
http://asia.ifad.org/web/rupes/home?p_p_id=1_WAR_ifad_newsportlet&_1_WAR_ifad_newsportlet_jspPage=%2Fview_entry.jsp&_1_WAR_ifad_newsportlet_entryId=5462
http://www.ifad.org/climate/regions/apr/rupes2_booklet.pdf
http://www.eepsea.org/pub/rr/2014-RR10_Ly2_web.pdf

14. Lake Singkarak – Indonesia – 2005
http://moderncms.ecosystemmarketplace.com/repository/moderncms_documents/west20sumatra20indonesia20rupes.pdf
http://www.cifor.org/ard/documents/results/Day1_Helmi.pdf
http://www.cifor.org/ard/documents/RUPES_SingkarakWB%2007052012.pdf

15. Sloping Lands Program – China – 2000
http://pubs.iied.org/pdfs/13555IIED.pdf
http://www.pnas.org/content/108/19/7721.full.pdf
http://www.izajom.com/content/1/1/10

16. Maasin Watershed – Philippines – 1999
http://www.worldagroforestry.org/sea/Publications/files/workingpaper/WP0060-05.PDF

17. Makiling Forest Reserve – Philippines – 1996
http://www.watershedmarkets.org/casestudies/Philippines_Makiling.html
http://www.cbd.int/financial/pes/philippines-pespotential.pdf
http://www.rightsandresources.org/documents/files/doc_1125.pdf

18. Kulekhani watershed – Nepal – 2003
http://www.forestaction.org/app/webroot/js/tinymce/editor/plugins/filemanager/files/3.%20IASC%20paper%20Khatri.pdf

Africa

19. Ngoyla-Mintom forest block – Cameroon – 2012
http://www.planvivo.org/wp-content/uploads/Ngoyla_Mintom-PIN-v1.0.pdf

20. Wonegizi community-based REDD+ project – Liberia – 2013
http://www.planvivo.org/wp-content/uploads/PIN_Plan-Vivo_Wonegizi_published.pdf

21. Trees for Global Benefits – Uganda – 2002
http://www.geos.ed.ac.uk/homes/scarter/Uganda1v2.pdf
http://www.espa.ac.uk/publications/finding-equity-carbon-sequestration-case-study-trees-global-benefits-project-uganda
http://r4d.dfid.gov.uk/PDF/Outputs/CCAFS/AfricanAgCarbon-CaseStudy-Ecotrust.pdf
http://cotap.org/projects/tfgb-uganda/
http://cotap.org/projects/tfgb-uganda/#sthash.VrbM8v5B.dpuf

22. Forest Again Kakamega Forest – Kenya – 2008/2009
https://s3.amazonaws.com/CCBA/Projects/Forest_Again_Kakamega_Forest/Forest_Again_PDD.pdf
http://www.tropentag.de/2009/abstracts/links/Saizaki_WdjVsJBu.pdf

23. Humbo Community Managed Natural Regeneration Project – Ethiopia – 2004
http://ccafs.cgiar.org/fr/blog/new-study-finds-african-carbon-projects-can-help-poor-famers#.VLraSUex5yU
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http://r4d.dfid.gov.uk/PDF/Outputs/CCAFS/AfricanAgCarbon-CaseStudy-Humbo.pdf

24. N'hambita Community Carbon Project – Mozambique – 2003
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http://www.planvivo.org/wp-content/uploads/Sofala_Community_Carbon_AR2009.pdf
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http://www.eeo.ed.ac.uk/miombo/RJMSc.pdf
http://www.cifor.org/miombo/docs/Mozambiquehouseholdlivelihoods_study.pdf
http://www.foei.org/wp-content/uploads/2014/09/The-great-REDD-gamble.pdf
http://www.fern.org/nhambita

25. Ibi Bateke – Democratic Republic of Congo – 2008
http://www.vub.ac.be/klimostoolkit/sites/default/files/documents/catherine_paul_rr01_final_report.pdf
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http://www.forestcarbonportal.com/project/uchindile-and-mapanda-forest-projects
http://theredddesk.org/countries/initiatives/reforestation-grassland-uchindile-kilombero-tanzania-mapanda-mufindi-tanzania
http://www.greenresources.no/Portals/0/Carbon/FINAL_uchindile%20mapanda%20forest%20projects%20ccba%20pdd%2024%2002%2009.pdf

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http://povertyandconservation.info/docs/20101115-Ajarova.pdf
http://www.bioone.org/doi/abs/10.1896/052.023.0105
http://www.natureharness.or.ug/content/albertine-forests-corridor-pes-project
http://www.slideshare.net/IIEDslides/session-1-3rd-presentation-paul-hatanga
http://www.nemaug.org/projects_details/PES_Progress_report.pdf
http://www.ecosystemmarketplace.com/pages/dynamic/article.page.php?page_id=9067

28. Community PES (C-PES) Project – Cameroon – 2009
http://www.bioclimate.net/en/reports/item/197-redd-beyond-carbon-paper
http://www.bioclimate.net/en/policy-briefs

SHARP partnership 2015

www.sharp-partnership.org

Report published by the SHARP secretariat

info@sharp-partnership.org

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