ELLA
Evidence and lessons from Latin America

In Latin America, payments for environmental services schemes are the preferred market mechanism for forest conservation and reforestation. Success stories from the region provide a range of valuable lessons for other countries still struggling to curb deforestation.

PAYMENTS FOR ENVIRONMENTAL SERVICES: A MARKET MECHANISM PROTECTING LATIN AMERICAN FORESTS

SUMMARY

In 2008, the Millennium Ecosystem Assessment reported that 60% of the world's environmental services are in a state of degradation.[1] Of the various causes, deforestation is one of the most alarming and glaring. Curbing deforestation poses a serious challenge in developing countries where its drivers are closely linked to economic development; forests are cut down to develop new urban areas and industrial centres, for timber, energy, cash crops, and for livestock raising. For countries to develop truly green economies, they must preserve their forests and, in many cases, restore areas already lost. Over the last few decades developing regions have started working towards this goal. The market mechanism of choice in Latin America has been payments for environmental services (PES), which boasts success stories from countries such as Brazil, Costa Rica and Mexico where reforestation rates have risen remarkably in recent years. By analysing these experiences, this Brief identifies key enabling factors behind the success of PES in Latin America and provides a set of recommendations for PES design and implementation that will be useful for other regions interested in developing their own programmes.

WHY ADOPT PES TO PROTECT FORESTS?

Deforestation is a serious issue that requires urgent and comprehensive solutions. The planet lost 3% of total forest cover between 1990 and 2010. Although North America, Europe, Asia and the Caribbean have actually reforested over that same period, many developing regions continue to struggle with persistently high rates of deforestation (Table 1). This relationship between development and deforestation is strikingly clear: Africa, Latin America and South/South-East Asia all demonstrate deforestation rates three times higher than the global average. These

KEY LESSONS LEARNED

Long-term programme financing and competitive payment for environmental service providers are two core prerequisites for launching a PES programme.

Strong political commitment, institutional support and local ownership were key characteristics of successful, enduring PES programmes in Latin America.

Real results are achieved when participating communities create a local economy based on forest preservation and sustainable use of ecosystems, replacing previously unsustainable practices.

Local-level institutionalisation of PES programmes should be promoted whenever possible, cultivating a grassroots culture of conservation and administrative capacity in communities on the front lines of deforestation.

[1] The Millennium Ecosystem Assessment is backed by 1,300 scientists across 95 countries. See Katoomba Group, Forest Trends & UNEP. 2008. *Payments for Ecosystem Services: Getting Started*. Katoomba Group, Forest Trends & UNEP, Nairobi.

Table 1: Regional Deforestation from 1990 to 2010

Region	Share of world forests (2010)	Forested area (M hectares)				Forest lost (M hectares, 1990-2010)*	Forest lost (1990-2010) compared to 1990 forested area*
		1990	2000	2005	2010		
Africa	16.7%	749.2	708.6	691.5	674.4	74.8	10.0%
South/South-East Asia	7.3%	325.4	301.1	299.3	294.4	31.1	9.5%
Asia	14.7%	576.1	570.2	584.0	592.5	-16.4	-2.8%
Europe	24.9%	989.5	998.2	1,001.2	1,005.0	-15.5	-1.6%
Caribbean	0.2%	5.9	6.4	6.7	6.9	-1.0	-17.5%
Central America	0.5%	25.7	22.0	20.7	19.5	6.2	24.2%
North America	16.8%	676.8	677.1	677.8	679.0	-2.2	-0.3%
South America	21.4%	946.5	904.3	882.3	864.4	82.1	8.7%
World	100%	4,168.4	4,085.2	4,061.0	4,033.1	135.3	3%

Note: Not all regions included in table
*Minus signs indicate afforestation
Source: Adapted from 'Global Forest Resources Assessment 2010 Data' in UN Food and Agriculture Organization (FAO). 2010. *Global Forest Resources Assessment 2010: Main Report*. FAO, Rome.

regions are home to large shares of the world's forests – compounding the impact of these trends. The common causes for deforestation among these regions are socioeconomic in nature, including such diverse factors as social values, property rights, population pressures, government failure and capital accumulation.[2] In addition to the loss of these valuable forest systems and the terrestrial biodiversity they cultivate,[3] deforestation has also been shown to catalyse climate change (Tables 2 and 3). It was responsible for 18% of global greenhouse gas (GHG) emissions in 2012, which is more than the entire global transportation sector.[4] Additional effects of deforestation include reduced availability of environmental services and huge increases in carbon emissions. A striking example is Brazil, where approximately 70% of national GHG are attributed to deforestation.[5]

Table 2: Top 15 GHG Emitters from Deforestation in 2000

Country	Emissions ($MtCO_2$)	Rank	World total (%)	Per capita LUCF emissions	Rank
Indonesia	2,563.1	1	33.6%	12.4	8
Brazil	1,372.1	2	18.0%	7.9	14
Malaysia	698.9	3	9.2%	30.4	3
Myanmar	425.4	4	5.6%	8.9	13
DR Congo	317.3	5	4.2%	6.3	16
Zambia	235.5	6	3.1%	22	5
Nigeria	194.8	7	2.6%	1.7	38
Peru	187.2	8	2.5%	7.2	15
Papua New Guinea	146.0	9	1.9%	27.6	4
Venezuela	144.1	10	1.9%	5.9	17
Nepal	123.5	11	1.6%	5.1	21
Colombia	106.1	12	1.4%	2.5	33
Mexico	96.8	13	1.3%	1	53
Phillipines	94.9	14	1.3%	1.3	47
Ivory Coast	91.1	15	1.2%	5.4	18

Note: LUCF is "Land-use Change and Forestry"
Source: Minnemeyer, S. 2008. *WRI's CAIT Database of Emissions from LULUCF and Climate Applications for the World Intact Forest Landscapes*. World Resource Institute, Washington, DC.

Table 3: Top 10 Countries for Total Deforestation from 2000-2005

Country	Deforested area (average 2000-2005, in M hectares / year)*	GHG emissions from LULUCF (2000, as share of total national emissions)**
Brazil	3.1	62%
Indonesia	1.87	84%
Sudan	0.59	20%
Myanmar	0.47	84%
Zambia	0.45	40%
Tanzania	0.41	18%
Nigeria	0.41	50%
DR Congo	0.32	86%
Zimbabwe	0.31	58%
Venezuela	0.29	38%

Note: LULUCF is "Land-use, Land-use Change and Forestry"
* Source: FAO. *2005. Global Forest Resources Assessment 2005*. FAO, Rome.
** Source: World Resource Institute (WRI). *CAIT 2.0*. WRI, online database.

[2] Wibowo, D.H., Byron, R.N. 1997. *Deforestation Mechanism: A Survey*. University of Queensland, Brisbane.
[3] According to the FAO, the world's forests are home to 80% of all land biodiversity. See FAO. 2012. *State of the World's Forests*. FAO, Rome.
[4] Meridian Institute. 2011. *Guidelines for REDD+ Reference Levels: Principles and Recommendations*. Prepared for the Government of Norway, by A. Angelsen, D. Boucher, S. Brown, V. Merckx, C. Streck and D. Zarin. Meridican Institute, Washington, DC.
[5] Karstensen, J., Peters, G., Andrew, R. 2013. Attribution of CO2 Emissions from Brazilian Deforestation to Consumers Between 1990 and 2010. In: *Environmental Research Letters* 8(2).

There are many reasons why countries should protect and preserve healthy, standing forests.[6] In terms of ecosystem services, in 1997 forests worldwide had an estimated total value of US$33 trillion – nearly double the global Gross National Product (GNP) at the time.[7] The implication for countries interested in developing truly green economies is that forest conservation and protection can be key drivers of this transition. As of 2011, global investment in forest conservation had reached approximately US$70 million dollars. Though this figure is steadily increasing, it is still well below where it needs to be. Based on various forest conservation scenarios, the United Nations Environment Programme's Green Economy Report estimates that with an investment of US$40 billion in afforestation, conservation and improved forest management, forests could contribute 20 per cent more revenue value added than 'business-as-usual' (BAU) land use.[8] In developing countries across the world, payments for environmental services (PES) schemes are attracting increasing interest as policy mechanisms to improve conservation and achieve sustainable development outcomes (Box 1).

Box 1: Payments for Environmental Services

Payments for environmental services (PES) are voluntary, negotiated transactions between providers (usually landowners and farmers) and users (an individual, a company or an entire society) of a specific environmental service in a predefined area.

The majority of PES programmes are funded by governments and involve intermediaries, such as non-government organisations. To be considered a PES programme, payments must be formalised with enforceable legal contracts, specifying the ecological service (e.g. carbon sequestration, water quality improvement, soil stability and water flow stabilisation), buyer, area, and terms of the agreement (such as compensation and monitoring).

Payment types include: direct financial payments, financial support for community goals, in-kind payments, and recognition of land rights.

Contract types include: Memorandum of Understanding (MoU), Memorandum of Agreement (MoA), legal contracts, customary law agreements, 'handshake' agreements, and *quid pro quo* arrangements.

Sources: Center for International Forestry Research (CIFOR). No date. *Payment for Environmental Services*. CIFOR, online publication; Katoomba Group *et al.* 2008, see above n1.

Although PES has its origins in water management, it has now become a popular market mechanism for combating deforestation worldwide. Increasingly, PES programmes are designed to protect the entire natural infrastructure of watersheds, incorporating forests, water and soils. Latin American countries have a long history of PES implementation dating back to 1984 and currently run more active programmes than any other developing region (Table 4).

Table 4: PES Schemes in Developing Regions

Developing Regions' Watershed PES Programmes, 2012 *			
Region	Africa	Central, South, and SE Asia **	Latin America
Number of active programmes, 2011	6	18	37
Number of programmes in development	10	17	8
Countries w/ programmes	Kenya, South Africa, Tanzania, Uganda	Kyrgystan, Pakistan, Nepal, Thailand, Vietnam, Philippines, Indonesia	Bolivia, Brazil, Costa Rica, Colombia, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Peru

* China is not included within the developing regions in this chart. However, it should be noted that China, Europe, and United States all have large-scale PES programmes. China has 61 active programmes and another 19 in development.

Source: Bennett, G., Nathaniel, C., Hamilton, K. 2012. *Charting New Waters: State of Watershed Payments 2012*. Ecosystem Marketplace, Washington, DC.

PES IN LATIN AMERICA

Almost three quarters of the 38 active PES programmes in Latin America aim to tackle deforestation and land cover loss (Table 5). The environmental service ('concern') varies across these programmes, as do the groups calling for their conservation ('catalysts') and the kinds of partnerships ('intermediaries'). Table 5 shows the breakdown of this diversity within the Latin America region.

Notable success stories from within Latin America include those of Costa Rica, Mexico and Brazil.

[6] Millennium Ecosystem Assessment. 2005. *Ecosystems and Human Well-being: Synthesis*. Island Press, Washington, DC.
[7] Costanza, R. *et al.* 1997. *The Value of the World's Ecosystem Services and Natural Capital*. *In: Nature* 387: 253-260.
[8] Sukhdev, P. *et al.* 2012. *Green Economy: Opportunities for a Mutually Supportive Relationship*. United Nations Reduced Emissions through Deforestation and Degradation Programme (UN-REDD), Geneva.

Table 5: PES Concerns, Catalysts, and Intermediaries in Latin America

Concerns and catalysts of PES programmes in Latin America, 1984-2011	
PES concern incorporated in programmes	Share of programmes
Deforestation and land-cover loss	73.7%
Water pollution	31.8%
Water consumption	22.7%
Cattle expansion	10.0%
Other concerns (lack of water, sanitation, etc.)	13.7%
Catalysing organisation for PES formation	Share of programmes
National/Local NGO	40.0%
Municipality	23.7%
Government agency	18.4%
Semi-autonomous agency	16.0%
Water utility	7.9%
Active participants, (i.e. buyers and/or sellers)	15.8%
Most common PES intermediaries	Share of programmes
Multiple intermediaries	23.7%
Local NGO	26.3%
Trust funds	13.2%
Municipality	10.5%
Other (semi-autonomous agencies, water associations private actors, river basin authorities)	5.0%

Source: Martin-Ortega, J., Ojea, E. Roux, C. 2012. *Payments for Water Ecosystem Services in Latin America: Evidence from Reported Experiences*. Basque Centre for Climate Change, Bilbao.

COSTA RICA: A FLAGSHIP EXAMPLE

From the 1940s to the 1980s, deforestation was rampant in Costa Rica.[9] During the 60s and 70s, the country exhibited the highest population growth and deforestation rates in the world.[10] Policies were ill-adapted to allow for sustainable growth, and drivers of deforestation were institutionalised by policies such as cheap credit for cattle rearing leading to land clearing, land-titling laws incentivising deforestation, taxation for land left "unproductive", and rapid expansion of the national road system. The large-scale loss of forest impacted adversely on economic activities, especially on the tourism and hydropower sectors.

From 1988 to 1996, in an effort to incentivise sustainable forest plantation development, the Costa Rican government provided conservation tax credits and forest certificates to landowners, which marked the beginning of what would later become a fully-fledged PES scheme linking economic development to environmental sustainability. Over the course of those eight years, the programme evolved into Latin America's first comprehensive PES programme.[11] Developed by the Ministry of the Environment and Energy, in collaboration with the Ministry of Economy and the Ministry of Regional Development, the programme provided economic incentives to farmers and landowners to adopt sustainable land-use practices. From 2010 onwards, landowners received payments every five years for basic forest protection (US$45/ha/yr), sustainable forest management (US$70/ha/yr) and reforestation (US$116/ha/yr).[12] By 2011, Costa Rica's National Forest Fund (*Fundo National de Financiamento Florestal* - FONAFIFO) had managed over 10,000 PES contracts with the total protected area exceeding 865,680 hectares (17% of Costa Rica's territory). From 1997 to 2012, approximately US$254 million was paid to landowners and farmers.[13] This amount is several times larger than in any other Latin American PES programme. As a result of the programme, the forest cover in Costa Rica increased from 21% in 1987 to 52% in 2010; a remarkable achievement.[14]

INCREASING THE COMPETITIVITY OF PES IN MEXICO

Two-thirds of Mexican aquifers are used well beyond their sustainable extraction capacity.[15] The Mexican National Programme for Hydrological Environmental Services - PSAH was established as a national PES system in 2003 to protect the aquifer recharge function, which is provided by forests. Because Mexico's lakes, rivers and lagoons are considered national property, the government invoked the Federal Rights Law (*Ley Federal de Derechos*) to levy a fee for water use. A share of this taxation is channelled into three national PES programmes: Payments for the Carbon and Biodiversity Services (PSA-CABSA), Payments for Environmental Services (PSAB), and the National Forestry Fund, all of which are managed by Mexico's National Forestry Commission (CONAFOR). In turn, these programmes provide economic incentives for farmers and landowners to conserve forests, thereby improving the country's aquifers. Landowners are paid US$40/ha/yr for preserving cloud forest and US$30/ha/yr for conserving other types of forest. Maximum limits are 200 hectares for private landowners and between 20 and 3,000 hectares for communities, depending on their size.

Unfortunately, the per-hectare PES payments are currently lower than many BAU land-use scenarios, including corn

[9] United Nations Environment Programme (UNEP). *Forest Losses and Gains: Where Do We Stand?* UNEP, Nairobi.
[10] Karousakis, K. 2007. *Incentives to Reduce GHG Emissions from Deforestation: Lessons Learned from Costa Rica and Mexico*. OECD, Paris.
[11] Costa Rica's National Foundation for Forestry Financing (FONAFIFO) and Ministry of the Environment, Energy and Telecommunications (MINAET). 2012. *Costa Rican Tropical Forests: A Motor for Green Growth*. FONAFIFO and MINAET, San José.
[12] Bennett, G., Nathaniel, C., Hamilton, K. 2012. *Charting New Waters: State of Watershed Payments 2012*. Ecosystem Marketplace, Washington, DC.
[13] FONAFIFO & MINAET. 2012, above n11.
[14] Ibid.
[15] International Institute for Environment and Development (IIED). 2012. *Watershed Market: Mexico*. IIED, London.

cultivation (US$37/ha/yr) and livestock rearing (US$66/ha/yr).[16] This implies that in order to curb deforestation of cloud forest threatened by, say, cattle ranchers, the government needs to increase current PES payments by another US$26/ha/yr.

In order to be able to increase the competitiveness of PES payments against the BAU scenarios, the PSAB has developed an innovative differentiated payment scheme, which considers the seller's unique start-up, transaction and opportunity costs. In 2011, payments for landowners ranged from US$28 to US$100/ha/yr and were able to compete not only in areas where agriculture and livestock are not as viable, but also where conservation is most needed. Although PES monitoring mechanisms were initially weak in Mexico since they relied on self-reported data, oversight has improved dramatically since the introduction of bi-annual comparisons of high-resolution satellite imagery. These efforts have yielded positive results. As of 2012, the PSAB programme managed 2.2 million hectares of forest.[18] This is an impressive accomplishment; however, given Mexico has 64.8 million hectares of forest, 2.2 million hectares only represents about 3.4% of the country's total forested area. To achieve broader reach, the PSAB will likely need to increase annual per hectare financial incentives to get more farmers to come on board. Broadly speaking, PES and other tools used to combat deforestation have paid dividends, given that Mexico's deforestation rate has fallen steadily (Table 6).

Table 6: Average Annual Deforestation in Mexico

Mexico's Average Annual Change Rates, Forested Area					
1990-2000		2000-2005		2005-2010	
1,000 ha/yr	%/yr	1,000 ha/yr	%/yr	1,000 ha/yr	%/yr
-354	-0.52	-235	-0.35	-155	-0.24

Note: A smaller negative value for percentage (of total remaining forest) indicates less annual deforestation.
Source: FAO. 2010. *Global Forest Resources Assessment 2010: Main Report*. FAO, Rome.

GOING LOCAL IN BRAZIL

In contrast to Costa Rica and Mexico, Brazil does not have a national PES programme in place for forest conservation. Some argue that the sheer size of the Amazon rainforest and the complexity of stakeholder relations are slowing the much-needed development of such a scheme.[19] Yet, momentum is building, especially at the local level. In fact, going local is the norm for PES programmes in Latin America with 73.7% of programmes of a local scale.[20]

An example from Brazil is the Water Producer Programme (*Programa Produtor de Água*) of the Brazilian National Water Agency (*Agência Nacional de Águas* - ANA), a locally orientated PES programme aimed at maintaining and restoring vegetation.[21] ANA and the international NGO The Nature Conservancy play major roles as intermediaries that support the programme. Every project under the Water Producer Programme has a different financial arrangement. In Extrema, Brazil, for example, funding for the Water Producer Programme comes from the locally established Municipal Fund for Payment for Environmental Services (FMPES), which taxes local services and businesses. Here, project partners such as ANA, TNC, *SOS Mata Atlántica*, and the local Watershed Authority provide different inputs in terms of seeds, seedlings, technical assistance and funding for more structural interventions such as slope stabilisation.[22] In 2007, this Water Producer Programme paid US$75/ha/yr to 53 farmers, for a total of 953 hectares. Thus far, this has been ample payment to change landowner practices and sustain the system.[23]

Multilateral institutions play a major role in funding the conservation of Brazil's rainforests through the UN's international PES mechanism, known as Reduced Emissions from Deforestation and Degradation Plus (REDD+). Brazil is the leading recipient of REDD+ financing, with a total of US$143 million approved as of 2012. From 2004 to 2011, US$49 million was disbursed to the country's Amazon Fund, of which US$33 million was used to fund eight large-scale forestry projects.[24] Between 1996 and 2005, Brazil's average annual deforestation rate was 19,508 km^2, but by 2010 this had dropped by 67% to 6,451km^2, thanks in large part to local PES programmes and multilateral incentives.[25] If this trend persists, Brazil could achieve its deforestation reduction goal of 80% well before 2020.[26]

[16] Ibid.
[17] Bennett *et al.* 2012, see above n12.
[18] IIED. 2012, above n. 16.
[19] Dennis, K. *et al.* 2011. *Payments for Ecosystem Services as a Potential Conservation Tool to Mitigate Deforestation in the Brazilian Amazon*. Applied Biodiversity Sciences, College Station, TX.
[20] For additional examples, a table of 38 PES programmes in Latin America along with relevant links is included at the end of this Brief. See also Martin-Ortega, J., Ojea, E., Roux, C. 2012. *Payments for Water Ecosystem Services in Latin America: Evidence from Reported Experiences*. Basque Centre for Climate Change, Bilbao.
[21] Agência Nacional de Águas. 2008. *Manual Operativo do Programa Produtor de Água (Operating Manual for the Water Producer Programme)*. ANA, Brasília.
[22] Kfouri A., Favero, F. 2011. *Conservador das Águas Passo a Passo: Uma Descrição Didática sobre o Desenvolvimento da Primeira Experiência de Pagamento por uma Prefeitura Municipal no Brasil (Water Conservation Step-by-Step: A Didactic Description of the Development of the First Experience of Payments by a Municipal Prefecture in Brazil)*. The Nature Conservancy of Brazil, Brasília.
[23] Ibid.
[24] Schalatek, L. *et al.* 2012. *Climate Finance Regional Briefing: Middle East and North Africa*. Heinrich Böll Stiftung, Washington, DC.
[25] Union of Concerned Scientists (UCS). 2011. *Brazil's Success in Reducing Deforestation*. UCS, Washington, DC.
[26] Earth Talk. 2012. *Deforestation and its Extreme Effect on Global Warming*. Scientific American, online publication.

CONTEXTUAL FACTORS

ENABLING THE LONG-TERM SUSTAINABILY OF PES PROGRAMMES

Based on Latin American experiences with PES, it is possible to identify some key factors behind the success of these programmes that countries planning similar endeavours should consider in order to ensure longevity.[27]

First, the economics of PES schemes is a critical balancing act between buyers and sellers whereby the markets must arbitrate an 'optimal payment.' In PES schemes, there is a targeted service that buyers exhibit a willingness to pay (WTP) for. Conversely, there are sustainable practices required to provide said service, which sellers must perform to receive payment. For sellers to adopt sustainable actions (such as sustainable forest management), they must receive a payment competitive with the opportunity costs (for example, a pineapple, soy, or palm plantation), referred to as their willingness to accept (WTA). These opportunity costs are often referred to as business-as-usual (BAU) practices – the exact actions that PES programmes aim to change. In addition to opportunity costs, learning a new practice implies transaction costs in the form of time, money, uncertainty, and risk for stakeholders, especially for providers and programme administrators. A payment is optimal when a buyer's WTP plus technical assistance is equal to or greater than the sum of the potential seller's opportunity and transaction costs. If the payment is optimal and funding sources secure, then the programme is more likely to be scalable. It is common in Latin America (60% of the programmes) that buyers' WTP alone is not high enough. As a result, outside assistance (from private investors, development banks, etc.) pays for the difference between the buyers' WTP and the sellers' WTA in order to keep the programme running. These organisations can also play an important role in providing capacity building and technical assistance for sellers in order to reduce or waive their transaction costs.

In developing countries, selecting effective payment types to compensate environmental services providers is critical. In Latin America, the most common system is 'recurring contingent payments', with penalties for sellers that do not comply. In Costa Rica, for example, it is every five years. Another important point for compensation is that not all potential sellers of similar environmental services are the same, i.e. the opportunity costs and BAU practices of a large landowner are different to those of a community cooperative. In some instances (for example, tree planting), the upfront costs to sellers are high and not conducive to a recurring payment. In this instance, payment differentiation helps as do in-kind payments (for example, saplings, tools, and training provided at no cost to the seller) by intermediaries and/or buyers. In Costa Rica, economic analyses concluded that approximately 20% of the land (1.2 million hectares) was rented for grazing with relatively low economic benefits, meaning that this segment would require the lowest PES necessary to forgo their BAU land-use practices and was a logical place to start. In Latin America, providing different financial incentives to farmers and landowners proved highly effective.

The institutions of PES and their technical capacity are equally as important as the economics and markets that they support. As shown in Table 5, intermediaries between buyers and sellers are common, meaning that coordination across multiple institutions is usually necessary. On their own, most organisations lack the technical capacity, the funds, and/or the social capital to build broad stakeholder support and implement PES effectively, especially in developing markets. In Costa Rica multiple institutions facilitated the country's PES programme, including the National System of Conservation Areas (SINAC), the National Forestry Office (ONF), the Association of Agronomists, cooperatives, regional agricultural centres, and NGOs.[28] For Mexico, it took two years of preparation and political negotiation before the PSAH was introduced in 2003. Having multiple partners to support PES programme administrators is also important because buyers and sellers usually have inherent conflicting interests. In this sense partners or 'intermediaries' can play an effective role by brokering deals. Finally, capacity building and institutional support from intermediaries reduces programme transaction costs, both for the programme and for the sellers especially.

It is imperative that contract laws are drafted and enforced. In order to achieve this, property rights need to be clearly defined, as do the potential practices that sustain environmental services. Contracts and institutions must also be designed to allow modifications as the programme develops. The adoption of a flexible design to adjust quickly

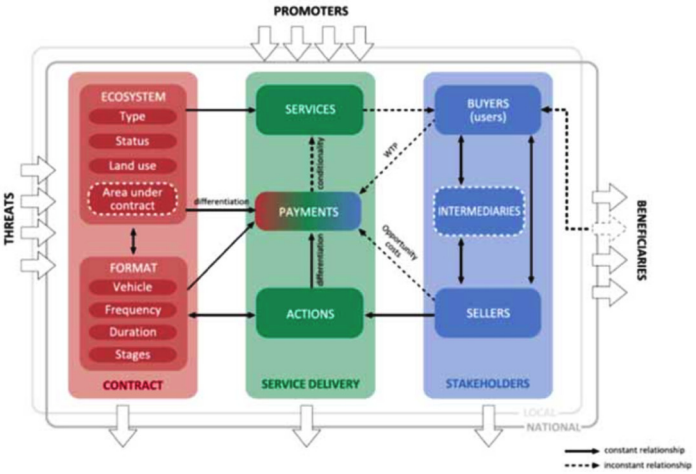
[27] Research shows that many new or developing Latin American programmes launched in 2008 with a focus on water, for example, no longer existed by 2011. See Bennett *et al.* 2012, above n12.
[28] Karousakis. 2007, see above n10.

to new legislation, scientific findings, feedback from programmes, and new land-use patterns is key. In contrast, very strict regulation or design may actually become a barrier to implementation when the deforestation dynamic is more clearly understood or when it changes over time. In general, local and national institutions in developing countries would be wise to leverage international expertise and technical support when building or altering their PES scheme structure. This was the case in Mexico, where the PSAH worked with advisors from all over the world to implement a differentiated payment system that improved competitiveness and reach. Costa Rica's programme was successful because the government creatively linked national environmental and economic development institutions through the national PES, creating direct financial incentives to reforest areas and establishing targets to become a carbon neutral country by 2021.

Going local has been key too. In Mexico, CONAFOR implements PSAH policy via 13 regional offices responsible for evaluating applicants and paying beneficiaries. CONAFUR's strategy going forward is to continue this process of decentralisation by delegating more authority to municipalities, just like Brazil's Water Producer Programme that used Municipal Funds. Local-level institutionalisation of PES programmes creates a local culture of conservation, building local capacity with respect to sustainable forest management.[29]

Lastly, an interesting development in Latin American PES programmes is the channelling of financial resources into environmental funds. These new funds are managed by a specific public entity (Costa Rica and Mexico) or a partnership (Brazil's National Water Agency with Nature Conservancy, as well as the UN's REDD+) under the supervision of representatives from all other contributing sources.

The informational aspects of PES should focus on delegating long term monitoring and evaluation (M&E) responsibilities to core members and intermediaries. If done effectively, M&E increases trust among programme participants, helps steer the practices of sellers, and ensures that the programme is achieving its objectives. There is clearly an overlap here with the institutional preconditions mentioned above, given that intermediaries need to have the technical capacity to effectively perform M&E. Additionally, PES programmes deal with complex ecosystems and diverse groups of buyers and sellers, making M&E processes extremely time and resource intensive. When possible, a control group should be included in the monitoring to verify additionality of the programme (meaning it is a positive departure from BAU practices). Assuming PES partners in a given country have the technical capacity, they should establish a 'Local Ecosystem Conceptual Process Model' that outlines the causal relationships that occur within the ecosystem and the indicators that should be monitored at permanent sites.[30] A general example of how to structure a PES concept map can be seen below.



Source: The James Hutton Institute. No date. *Payment for Water Ecosystem Services*. The James Hutton Institute, online publication.

Examples of this mapping process in Latin America exist. For example, in 2004, a socio-ecological conflict between government officials, pulp mill operators and NGOs in Valdivia, Chile was precipitated by the death of between 500-1,000 black-necked swans (reports vary) in the Río Cruces Wetland that same year. A concept map was needed to understand the complex interactions leading to the swans' demise. The report was constructed using numerous stakeholder engagements and in-depth ecological analysis to create a final integrated model of the situation. Unfortunately, the damage had already been done and the pulp mill, *Celulosa Arauco*, was found guilty of negligence. Had this process occurred earlier, such a troubling situation could have been avoided, which likely would have benefited the ecosystem, the swans, and the paper mill.[31]

[29] Kfouri and Favero. 2011, see above n21.
[30] Katoomba Group *et al.* 2008, see above n1.
[31] Delgado, L. E. *et al.* 2009. *Conceptual Models for Ecosystem Management Through the Participation of Local Social Actors: the Río Cruces Wetland Conflict*. In: *Ecology and Society* 14(1): 50.

LESSONS LEARNED

Latin American experiences provide a range of lessons for other countries looking to engage with PES as a mechanism for protecting national forests:

1. Determining the optimal payment amount is vital for incentivising long-term PES market relationships between sellers and buyers of environmental services. In Costa Rica, the dynamics of deforestation were only disrupted when more convenient incentives to promote forest conservation were introduced. These payments were competitive with BAU practices and helped to ensure the financial sustainability of the programme, as well as its remarkable results.

2. Payment differentiation schemes provide an effective mechanism for calculating payment type and frequency based on a provider's relative start-up, transaction and opportunity costs.

3. Real results are achieved when participating communities create a local economy based on forest preservation and sustainable use of ecosystems, replacing previously unsustainable practices.

4. Identifying and promoting robust institutional and technical capacity can help sustain PES market functionality, reduce transaction costs, and support monitoring and evaluation. New institutions and contract laws should be designed to promote transparency and demonstrate flexibility for improvement over time.

5. PES schemes can and should leverage the technical and financial support of international organisations as much as possible in order reduce both the start-up and recurrent transaction costs, as well as adding to programme credibility. This was the case in Extrema, Brazil, thanks to The Nature Conservancy's role as intermediary.

6. There is no single, transferable model for PES systems; rather, they should be developed on a location-by-location basis, targeting particular environmental services and stakeholders to build a sustainable market.

7. Local-level institutionalisation of PES programmes should be promoted whenever possible, cultivating a grassroots culture of conservation and administrative capacity in communities on the front lines of deforestation.

Table 7: Active PES Programs in Latin America (as of 2011)

Further Information	Country	Site	Scale	Action	Seller	Buyer
Wunder, S. 2005. *Payments for Environmental Services: Some Nuts and Bolts*. CIFOR, Jakarta.	Bolivia	Los Negros	Local	Forestry	Landowners	External donor, local NGO, municipality
Asquieth, N., Wunder, S. (eds). 2008. *Payments for Watershed Services: The Bellagio Conversations*. Fundación Natura Bolivia, Santa Cruz.						
Wunder. 2005.	Bolivia	La Aguada	Local	Forestry	Landowner, farmers	Water cooperative, local NGO

Greiber, T. (ed.) 2009. *Payments for Ecosystem Services: Legal and Institutional Frameworks*. IUCN, Gland.	Bolivia	Comarapa	Local	Multiple	Landowners	Domestic water users, local NGO
Greiber. 2009.	Bolivia	Mairana	Local	Multiple	Landowners	Domestic water users, local NGO
Veiga, F. 2007. *A Construção dos Mercados de Serviços Ambientais e suas Implicações para o Desenvolvimento Sustentável no Brasil*. Universidade Federal Rural do Rio de Janeiro. Rio de Janeiro; Grieber. 2009.	Brazil	Extrema	Local	Forestry	Farmers	Municipality
Grieber. 2009.	Brazil	Paraiba do sul	Local	Forestry	Landowners	Municipality
Porras, I., Neves, N. 2006. *Markets for Watersheds Coutnry Profile: Costa Rica*. IIED, London. Porras *et al.* 2008. *All that Glitters: A Review of Payments for Watershed Services in Developing Countries*. IIED, London.	Brazil	Piracicaba, Capivari and Jundiaí	Local	Watershed protection	Landowners	Water utility
Grieber. 2009.	Brazil	Sao Paulo	Local	Forestry	Landowners	International NGO
Tognetti, S., Johnson, N. 2008. *Ecosystem Services from Improved Soil and Water Management: Creating a Return Flow from their Multiple Benefits*. CGIAR, Montpellier; Grieber. 2009.	Colombia	Fuquene	Local	Agriculture	Farmers	International NGO
Porras *et al.* 2008	Colombia	Plan Verde	National	Forestry	Landowners	Farmers, hydroelectric, government

Corporación Andina de Fomento. 2008. *Taller Regional: Conservando los Servicios Ambientales para la Gente y la Naturaleza (Regional Workshop: Conserving Enriovnmental Services for People and Nature)*. CAF, San Jorge.	Colombia	Procuenca	Local	Forestry	Landowners	Water users, government, external donor
CAF. 2008; Grieber. 2009.	Colombia	Valle de Cauca	Local	Multiple	Landowners	Water users
Rojas, M. and Aylward, B. 2003. *What are we Learning from Experiences with Markets for Environmental Services in Costa Rica?* International Institute for Environment and Development, London. Blackman, A. and Woodward, R. 2010. *User Financing in a National Payments for Environmental Services Program: Costa Rican Hydropower*. Resources for the Future. Washington, DC. Pagiola, S. 2008. *Payments for Environmental Services in Costa Rica*. University Library of Munich, Munich.	Costa Rica	Don Pedro	Local-National	Forestry	Landowners	Water users
Rojas & Aylward. 2003; Pagiola. 2008.	Costa Rica	Plantar	Local-National	Forestry	Landowners	Hydropower producer
Rojas & Aylward. 2003; Pagiola. 2008.	Costa Rica	Plantar	Local	Forestry	Landowners	Hydropower producer
Rojas & Aylward. 2003.	Costa Rica	Monteverde	Local	Forestry	Local NGO	Hydropower producer

Kosoy, N., Corbera, E. 2007. Payments for Ecosystem Services as Commodity Fetishism. In: *Ecological Economics* 69 1128-1236. Barrantes, G., Gámez, L. 2007. 'Programa de Pago por Servicio Ambiental Hídrico de la Empresa de Servicios Públicos de Heredia (Payment for Hydrological Environmental Services Programme of the Heredia Public Service Company)'. Prepared for Platais, G., Pagiola, S. (eds.) *Ecomarkets: Costa Rica's Experience with Payments for Environmental Services*. World Bank, Washington, DC.	Costa Rica	Heredia	Local	Forestry	Landowners	Domestic water users
Kosoy & Corbera. 2007; Barrantes & Gámez. 2007.	Costa Rica	Rio Segundo	Local-National	Forestry	Farmers	Water users
Rojas & Aylward. 2003; Porras & Neves. 2006; Pagiola. 2008.	Costa Rica	Rio Aranjuez	Local-National	Forestry	Landowners	Hydropower producer
Rojas & Aylward. 2003; Porras & Neves. 2006; Pagiola. 2008.	Costa Rica	Rio Balsa	Local-National	Forestry	Landowners	Hydropower producer
Rojas & Aylward. 2003; Porras & Neves. 2006; Pagiola. 2008.	Costa Rica	Rio Laguna Coste	Local-National	Forestry	Landowners	Hydropower producer
Pagiola. 2008.	Costa Rica	National	National	Forestry	Landowners	Hydropower and agricultural water users

Cordero Camacho, D. 2008. *Esquemas de Pagos por Servicios Ambientales para la Conservación de Cuencas Hidrográficas en el Ecuador (Payments for Environmental Services Schemes for the Conservation of Watersheds in Ecuador)*. INIA, Quito; CAF. 2008.	Ecuador	Celica	Local	Forestry	Landowners	Water users
Cordero Camacho. 2008; CAF. 2008.	Ecuador	El Chaco	Local	Forestry	Landowners	Water users
Porras & Neves. 2006; Porres *et al.* 2008.	Ecuador	Cuenca	Local	Forestry	Farmers, park Admin	Hydropower producer
Lloret, P. 2011. *FONAG – Fondo para la Protección del Agua, Ecuador (FONAG – Water Protection Fund, Ecuador)*. UNEP, Nairobi; Porras & Neves. 2006; Cordero Camacho. 2008.	Ecuador	Quito	Local	Forestry	Farmers	Hydropower producer
Wunder, S., Montserrat, A. 2008. *Decentralized Payments for Environmental Services: The Cases of Pimampiro and PROFAFOR in Ecuador*. CGIAR, Montpellier; Cordero Camacho. 2008.	Ecuador	Pimampiro	Local	Forestry	Landowners	Water users
Porras & Neves. 2006.	Ecuador	Pedro Moncayo	Local	Forestry	Public, private and cooperative landowners	Water users, farmers
Rosa *et al.* (2003). *Compensación por Servicios Ambientales y Comunidades Rurales (Compensation for Environmental Services and Rural Communities)*. National Institute of Ecology, Mexico; Porras & Neves. 2006.	El Salvador	El Imposible	Local	Forestry	Park admin	Water users
Porras & Neves. 2006.	El Salvador	Lake Coatepeque	National	Agriculture	Public, private and cooperative landowners	Water users

Corbera. E., Kosoy, N., Martýnez Tuna, M. 2007. Equity Implications of Marketing Ecosystem Services in Protected Areas and Rural Communities: Case Studies from Meso-America. In: *Global Environmental Change* 17 365-380.	Guatemala	Las Escobas	Local	Agriculture	National NGO	Water users, hydropower
Kosoy & Corbera. 2007.	Honduras	Jesus de Otoro	Local	Forestry	Farmers	Water users
Muñoz-Piña *et al.* 2005. Paying for the Hydrological Services of Mexico's Forests. National Institute of Ecology, Mexico.	Mexico	National	National	Forestry	Public, private and cooperative landowners	Government
Manson, R. 2004. Los Servicios Hidrológicos y la Conservación de los Bosques de México (Hydrological Services and the Conservation of Mexico's Forests). In: *Madera y Bosques*. 10(1) 3-20; Porras & Neves. 2006.	Mexico	Coatepec	Local-National	Forestry	Farmers	Water users, government
Porras & Neves. 2006; Manson. 2004.	Mexico	Coatepec	Local	Forestry	Farmers	Water users
Porras & Neves. 2006; Porras *et al.* 2008.	Mexico	Zapaliname	Local	Multiple	Landowners	Water users
Talavera, A. 2007. *Explorando la Biodiversidad: Un Estudio de los Ecosistemas desde la Perspectiva de Uso Local en Communidades de Cuatro Áreas Protegidas de Nicaragua*. Universidad Nacional Agraria. Managua.	Nicaragua	El Regadio	Local	Agriculture	Landowners	Water users

Martinez-Tuna, M. 2008. *¿Mercados de Servicios Ambientales? Análisis de Tres Experiencias Centroamericanas de Pago por Servicios Ambientales. (Markets for Environmental Services? Analysis of Three Central American Experiences of Payments for Environmental Services)*. Autonomous University of Barcelona, Barcelona; Kosoy & Corbera. 2007.	Nicaragua	San Pedro del Norte	Local	Agriculture	Landowners	Water users

Source: Adapted from Martin-Ortega *et al.* 2012, see above n19.

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