

# Payment for Ecosystem Services (PES) in Latin America: Analysing the performance of 40 case studies



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## ARTICLE INFO

### Article history:

Received 27 March 2015

Received in revised form

10 November 2015

Accepted 12 November 2015

Available online 23 November 2015

### Keywords:

Ecosystem services

Payment for Ecosystem Services

Latin America

PES performance

Case studies

## ABSTRACT

Market instruments such as Payment for Ecosystem Services (PES) emerged as a concept to compensate and encourage landowners to improve land management practices for the maintenance and provision of ecosystem services. Since the early 1990s hundreds of PES schemes have been implemented around the world with varying levels of success. The high investments required to implement such schemes, and the stakes involved, argue for an analysis of PES cases to determine factors that contribute to a particular outcome. The paper analyses 40 PES cases in Latin America providing insights that will inform policy and decision makers in designing future PES initiatives with higher chances of success. In this study we analyse each case using a set of criteria (related to ecosystem type, compensation package and incentives, spatial and temporal scales, institutional arrangements, and policy frameworks) to determine those most important for a particular outcome. These insights provide information on programme factors that contribute to the potential for success of a given PES scheme. Although this classification can be further improved, it provides a useful reference for decision-makers on what might be considered best practice on the ground concerning PES schemes.

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## 1. Introduction

Building on earlier works that emphasised human dependence on nature's services (Braat et al., 1979; King, 1966; Odum and Odum, 1972), the term “ecosystem services” was first introduced by Ehrlich and Ehrlich (1981). The concept was originally meant to raise public interest and to establish a framework to highlight the social benefits of ecosystem conservation as the rate of loss of biodiversity was becoming increasingly evident (de Groot, 1987; Pimentel, 1980; Westman, 1977). Since the 1990s, the concept of ecosystem services became the focal point of several research programmes and publications (Daily, 1997; Perrings et al., 1992). In

*Abbreviations:* COP, Conference of the Parties; FUNDAECO, Fundación para el Ecodesarrollo y la Conservación (Foundation for Eco-development and Conservation); MEA, Millennium Ecosystem Assessment; MES, Markets for Ecosystem Services; NGOs, Non-Governmental Organizations; PES, Payment for Ecosystem Services; TEEB, The Economics of Ecosystems and Biodiversity; UN, United Nations; UNDP, United Nations Development Programme; UNFCCC, United Nations Framework Convention on Climate Change; USA, United States of America; NKMCP, Noel Kempff Mercado Climate Action Project; LEHP, La Esperanza Hydroelectric Power Company; RISEMP, Regional Integrated Silvopastoral Ecosystem Management Project; PSA, Payments for Environmental Services PROFAPOR; PSAH, Payments for Hydrological Environmental Services; BR, Biosphere Reserve

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<http://dx.doi.org/10.1016/j.ecoser.2015.11.010>

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particular, the Millennium Ecosystem Assessment (MEA, 2005) was crucial to show the relationship between ecosystem services and human well-being. Follow-up international initiatives such as The Economics of Ecosystems and Biodiversity – TEEB (<http://www.teebweb.org/> – last accessed 09.03.2015), the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services – IPBES (<http://www.ipbes.net/> – last accessed 09.03.2015) and the Ecosystem Services Partnership – ESP (<http://www.es-partnership.org> – last accessed 09.03.2015) have brought the concept to centre stage of global environmental change research, and right into the green economy discussions in Rio+20.

Following the publication in Nature by Costanza et al. (1997) where the economic value of the world's ecosystem services was first estimated, there has been a tendency to further refine economic valuation methods (Kumar, 2012) as well as putting new economic values on ecosystem services (e.g. Costanza et al. (2014) and de Groot et al. (2012)). While precise motivations for such calculations may differ, a common goal is to address the global environmental challenge by making ecosystem and biodiversity loss visible through monetisation using a holistic cost-benefit analysis. On the one hand this has inspired awareness to conserve nature, on the other hand this has also been used to argue to embed environmental externalities into economic pricing of goods. As Gomez-Baggethun and Ruiz-Perez (2011) state, the idea of this approach is to correct a market failure, by internalising

environmental externalities (hitherto free public goods such as air and water) into the market prices.

The two key market instruments that currently exist are: the Markets for Ecosystem Services (MES – based on the polluter pays principle) that address negative environmental externalities, and the Payments for Ecosystem Services (PES) or “steward earns principle”, based on positive environmental externalities (*ibid.*).

The central idea of PES is that the stewards of the ecosystem services should be compensated by those who benefit. For example, good land management practices should bring benefits to landowners upstream (e.g. farmers) by users downstream (e.g. city dwellers). Similarly, the industrial societies reliant on burning fossil fuels should compensate forest dwelling communities (e.g. living in the Amazon) for protecting the rainforests as these provide carbon sequestration functions and thereby serve to stabilise the global climate. While rudimentary forms of PES have existed for decades, the widespread expansion of PES as an integrated conservation and development mechanism began to emerge only in the 1990s (Wunder et al., 2008).<sup>1</sup> PES schemes are not without criticism. Besides the general criticism that economic pricing of nature is unethical (Martinez-Alier, 1987; McCauley, 2006; Peterson et al., 2010), the technical implementation of PES schemes has also received widespread criticism (i.e. Schröter et al. (2014) and Simpson (2011)).

Despite the criticism, today, hundreds of PES schemes (mostly local level arrangements) are being implemented around the world (Perevochtchikova and Oggioni, 2014) covering four main ecosystem services: biodiversity conservation, watershed services, carbon sequestration and landscape beauty (Arriagada and Perrings, 2013).

Some studies have attempted to evaluate the performance of PES schemes on the ground, but each with its own limitations (see Section 2 for a review). This paper is an effort to contribute to the ongoing discussion on PES performance drawing on 40 PES cases in Latin America, a region that has pioneered PES but has not yet been comprehensively analysed, barring a few cases here and there. We begin with a brief review of the key literature in this field, we introduce the cases and the method used followed by discussion and analysis.

## 2. State-of-the art in assessing PES performance

Following the increasing popularity of the PES concept to address social and environmental challenges, few authors have made efforts to evaluate the performance of PES on the ground. The aim of these studies were not always about the success or failures of the PES schemes, but often on the process and identification of relevant factors that determined outcomes. Sometimes the focus was on analysing the equity implications of PES schemes dedicated to specific services. For example, Corbera et al. (2007) analysed several cases in Mesoamerica related to the provision of carbon and water services with respect to distribution of benefits. Swallow et al. (2010) compared five cases from Latin America, Asia, and Africa against a set of criteria to understand whether PES schemes altered institutional arrangements in the region.

Trying to provide a broader view of PES performance, Arriagada and Perrings (2013) undertook an analysis of several cases from Latin America, Asia, and Africa. However, their study was focused not on evaluating the success of the PES schemes, but on technical efficiency. In this work, the authors assigned an efficiency index to

each one of the cases, based on a cost benefit analysis, the “additionality” of the scheme as an outcome, and three design criteria (participants, ecosystem service, and penalties).

In 2013, Martin-Ortega et al. (2013) published a study where they analysed 40 cases in Latin America. The study is a comparative analysis of implemented cases across a set of criteria to understand the process of implementation on the ground and the constraints faced. Although this is a comprehensive study, it is focused solely on cases related to the provision of water as the ecosystem service being traded. Thus, the choice of criteria was specific to the provisioning of water as an ecosystem service.

By far the most comprehensive assessment of PES performance that took into account several ecosystem services provided was done by Sattler et al. (2013). In their work, the authors discuss when and under what circumstances the implementation of PES schemes would generate benefit, and how these programmes could be improved. They provide information from actual PES schemes in Germany and the USA, relating the characteristics of those PES schemes to their overall success. However, their classification is not well-suited to a developing country context where information is limited and so not all criteria can be satisfied.

The few studies that exist on PES performance, all used secondary sources of information for their analysis for comparing the cases across a set of criteria as established by the authors. The criteria is almost always contingent on the goal of the analysis. Often the studies focus only on one ecosystem service with a particular interest in a single aspect of a scheme. What is lacking is an interest in the wider system performance using a set of inter-related social and environmental criteria. Thus, the goal of this study is to take a broader view in understanding the preconditions and criteria contributing to the different degrees of success of PES schemes. We not only take into account multiple ecosystem services, but also a more suited set of criteria to capture the social and environmental dimensions of the PES case.

## 3. Methods

Analysis of published PES cases was the primary data source for this study. The data was gathered using computerised searches (through Google Scholar and ScienceDirect search engines). The search terms used were “Payment for Ecosystem Services”, “PES”, “PES implementation”, “PES project”, “PES report”, and “PES case study”. We focused on published peer reviewed journal articles and research reports on PES from 1990 onwards. This resulted in a PES database of 140 PES cases from across the world. Three-fourths of the cases in this initial list were from developing or transition economies. As suspected, Latin America featured prominent in PES studies with 60 cases, but with no comprehensive comparative analysis of these cases. Of these 60 cases, 40 cases carried information related to the criteria we developed for our comparative analysis (ecosystem services being traded, criteria related to spatial and temporal scales, transaction types, and actors involved). Also, an important condition in our selection was that the PES scheme should already be implemented (or in progress) and there should be available at least one comprehensive evaluation report on the project. Table 1 shows the sources of information for the 40 cases selected.

Our analysis used a limited set of criteria from the ones originally proposed by Sattler et al. (2013) due to data limitations. As mentioned previously the cases used by Sattler et al. (2013) were from a developed country context for which more documentation was available. In contrast, this was not the case for Latin America. Hence, certain criteria were eliminated for which there was little or no information available. Despite this, we were still able to retain the most important criteria for our purpose, and therefore

<sup>1</sup> Costa Rica pioneered formal PES schemes at the national scale in 1997 that offered US\$45 per hectare to land owners willing to maintain forest covers on their land, which reversed deforestation trends of the time (Pagiola, 2008).

**Table 1**  
Literature sources for the 40 cases selected.

Literature source	Number of cases
<b>Journals:</b>	
Ecological Economics	11
Forests	1
Investigación agraria: Sistemas y recursos forestales	1
Global Environmental Change	1
Environmental Policy and Law	1
Ecosystem Services	1
<b>Research reports:</b>	
TEEB: The Economics of Ecosystems and Biodiversity	13
International Institute for Environment and Development	2
CIFOR: Center for International Forestry Research	8
International Center for Tropical Agriculture	1

not compromise the quality of the analysis.<sup>2</sup>

A large number of scientific publications report on successful or partially successful PES cases, not so much on those that were not successful. However, our analysis was not intended to report on the overall percentage of successful PES cases as against unsuccessful ones, rather to understand the preconditions and criteria for varying degrees of success. The reports found were a mix of internal evaluations, but also analysis made by third parties. A full list of the 40 cases analysed is found in Table 2.

Once the cases were selected, the next step was to assess the degree of success for each of the cases. Although “success” of PES is mentioned in several studies (i.e. Corbera et al. (2009, 2007), Pagiola (2008) and Perevochtchikova and Oggioni (2014)), no clear and consistent definition was found in most of them. The most precise definition we found was attempted by Sattler et al. (2013) that was based on effectiveness and efficiency, or on acceptance and uptake of the schemes, or on other democracy-related criteria such as legitimacy and transparency. Our intention in this study was to provide a common definition of success for all our analysed cases. We defined “success” as a combination of (a) the extent to which the original or defined goals of the PES scheme were met, and (b) the added value in terms of an overall improvement of the ecological, economic and social conditions of the region, beyond intended objectives. For example, if a particular PES scheme had the defined goal to improve water quality in the area, but as an outcome, the scheme not only succeeded in achieving this, but also indirectly contributed to improvements in human health. Partially successful PES schemes were those where the key objectives were met, but which also resulted in unintended consequences such as social conflicts or trade-offs with other ecosystem services. Unsuccessful cases were clearly those that not only failed to meet original objectives but had further compromised the ecosystem service, the economy or social well-being. The assessment for each case, whether successful, partially successful or unsuccessful, was made on the basis of the qualitative information provided for each case. In some cases, where possible, the information was cross-checked with other sources such as further publications, reports or websites of organizations involved.

In order to assess the degree of success, the qualitative information from the literature regarding the outcomes of each case was listed and compared against the criteria specified in the definition of success (meeting of originally defined goals, improvement of ecological conditions of the region beyond intended goals, improvement of economic conditions of the region beyond intended goals, and improvement of social conditions of the region

beyond intended goals). This comparison allowed to classify each PES scheme into one of the three categories defined (successful, partially successful, and not successful).

After success was determined for each case, we analysed and searched for patterns inherent in the original design and implementation process of the PES schemes. Both quantitative and qualitative values of each PES case from their individual evaluation reports or studies were distilled. The information derived was then plotted on a spreadsheet against a set of criteria we decided upon with possible options usually found in the PES cases (see Table 3). It is important to note that the criteria used in the study were not used to measure “success”, rather the criteria looks into the design and characteristics of PES schemes to search for patterns on commonalities for successful and not successful cases.

The first criteria identified the ecosystem services being traded. In recent scientific literature, ecosystem services are classified as provisioning, regulating, supporting and cultural services (after MEA (2005)). However, when it comes to PES, ecosystem services focus on four categories: biodiversity, landscape, water, and carbon (Wunder, 2007). The two classifications are not in contradiction. Biodiversity conservation (through species and habitat protection) directly relate to provisioning and supporting services; landscape protection of scenic value for tourism relates to cultural services; improvement of water quality and quantity links to provisioning services; while avoiding carbon emissions or increasing carbon sequestration relates to regulating services. “Bundled” services refers to transactions where multiple ecosystem services are considered in the PES arrangement.

Our second criteria concerned scale, following the indications of Kinzig et al. (2011) and Sattler et al. (2013), which specified that scales in space and time must be taken into consideration when analysing PES implementation since they influence the outcome. In terms of spatial scale, although the provision of ecosystem services can have impacts and benefits at the global level, the three levels used in our classification (national, regional and local) referred to the land area the scheme was formally targeting.

For the temporal scale, the duration of the scheme corresponded to the time periods for which funding for the scheme was available. Schemes for which funding was longer than 30 years were classified as long-term, those between 10 and 30 years were classified as mid-term, and those for which the funding was limited to 10 years and less were classified as short-term.

The third criteria referred to the form of compensation that stewards of ecosystem services received from the buyers. The aim of this criterion was to identify whether the type of compensation provided to the sellers were cash payments, in-kind compensations, or a combination of both. Cash payments implied a direct monetary flow, while in-kind compensations could be goods and services delivered to the stewards without the involvement of money.

The last criteria in comparing PES cases reported on the actors involved (buyers, sellers and intermediaries of the PES scheme), whether these were public or private. “Public” would be government (national or local), or government agencies, while private would include landowners, farmers, private companies, NGOs, or individuals such as tourists who through their fees financed the maintenance of a given landscape or an ecosystem. Buyers were the beneficiaries of the ecosystem service, while sellers were the providers of such services and although they could be public entities, they were typically private landowners or land users who carried on management activities that ensured the continuous provision of the ecosystem services being traded.

This criterion also indicated whether in the process there were intermediaries involved or not. They could be public or private entities or organizations acting as mediators between buyers and sellers. Intermediaries could also take on administrative tasks

<sup>2</sup> The justification and relevance of each criterion has been explained in Sattler et al. (2013) but also discussed under methods below.

**Table 2**

List of studied cases.

Num	Programme name	Location	Starting year	Funding	References
1	–	Los Negros (Bolivia)	2003	Public	Asquith et al. (2008), Ringhofer et al. (2013), Robertson and Wunder (2005) and Wunder et al. (2008)
2	NKMCA	Noel Kempff National Park (Bolivia)	1997	Private	Robertson and Wunder (2005)
3	Siembra del agua	La Aguada (Bolivia)	1993	Public	Robertson and Wunder (2005)
4	Chalalán Ec lodge	San José de Uchupiamonas (Bolivia)	1998	Private	Robertson and Wunder (2005)
5	Mapajo Indigenous Ecotourism	Pilón Lajas Indigenous Territory and BR (Bolivia)	1999	Private	Robertson and Wunder (2005)
6	La Chonta ecotourism initiative	La Chonta (Bolivia)	1998	Private	Robertson and Wunder (2005)
7	La Yunga ecotourism initiative	La Yunga (Bolivia)	2001	Private	Robertson and Wunder (2005)
8	–	Eduardo Avaroa Reserve (Bolivia)	1999	Private	Robertson and Wunder (2005)
9	–	Buena Vista (Bolivia)	2003	Private	Robertson and Wunder (2005)
10	–	Comarapa (Bolivia)	2007	Public+private	Greiber (2009)
11	Rubber-tappers	State of Acre (Brazil)	1998	Private	Kugel and Jha (2013)
12	Bolsa Floresta	State of Amazonas (Brazil)	2007	Public+private	Cassola (2010a) and Ringhofer et al. (2013)
13	–	Extrema-Minas Gerais (Brazil)	2005	Public	Cassola (2010b)
14	–	Juma (Brazil)	2006	Public+private	Börner et al. (2010) and Ringhofer et al. (2013)
15	Transamazon	Brazil	2013	Public	Cromberg et al. (2014) and Duchelle et al. (2014)
16	–	Fuquene (Colombia)	2004	Public	Greiber (2009) and Tognetti and Johnson (2008)
17	Plan Verde	Colombia	1999	Public	Porras et al. (2008)
18	–	Nima Watershed (Colombia)	2000	Public+private	Rodriguez-de-Francisco and Budds (2014)
19	–	Asobolo (Colombia)	1993	Private	Muñoz Escobar et al. (2013)
20	RISEMP	Quindío (Colombia)	2002	Public	Pagiola and Arcenas (2013)
21	–	Valle del Cauca (Colombia)	1990	Private	Goldman et al. (2010)
22	Procuencas	Heredia province (Costa Rica)	2000	Private	Redondo-Brenes and Welsh (2010)
23	PSA	Costa Rica	1997	Public	Ringhofer et al. (2013) and Wunder et al. (2008)
24	RISEMP	Esparza (Costa Rica)	2002	Public	Pagiola and Arcenas (2013)
25	–	Heredia (Costa Rica)	2002	Public	Kosoy et al. (2007)
26	LEHP PES	La Esperanza (Costa Rica)	1998	Private	Porras (2010)
27	–	Quito (Ecuador)	2004	Public+private	Arias et al. (2010)
28	–	Pimampiro (Ecuador)	2000	Private	Wunder et al. (2008)
29	PROFAFOR	Ecuador	1993	Private	Wunder et al. (2008)
30	–	Ecuadorian Chocó (Ecuador)	2005	Public+private	Kosmus et al. (2012)
31	–	Celica (Ecuador)	2006	Private	Cordero Camacho (2008) and Corporación Andina de Fomento (2008)
32	–	Cuenca (Ecuador)	1997	Private	Porras and Neves (2006)
33	–	Las Escobas (Guatemala)	1998	Private	Corbera et al. (2007)
34	–	Jesús de Otroro (Honduras)	2001	Public	Kosoy et al. (2007)
35	PSAH	Mexico	2003	Public	Ringhofer et al. (2013) and Wunder et al. (2008)
36	–	La Sepultura BR (Mexico)	2004	Public	Rico Garcia-Amado et al. (2013)
37	RISEMP	Matiguás – Río Blanco (Nicaragua)	2002	Public	Pagiola and Arcenas (2013)
38	–	San Pedro del Norte (Nicaragua)	2003	Public	Kosoy et al. (2007)
39	–	Gil González watershed (Nicaragua)	2008	Public+private	Hack et al. (2010)
40	–	Moyobamba (Peru)	2007	Public	Renner (2010)

**Table 3**

Criteria used to analyse the PES cases in Latin America.

Criteria	Options
<b>1. Ecosystem services being traded</b>	[Biodiversity; landscape; water; carbon; bundled]
<b>2. Scale</b>	
<b>Spatial</b>	[National; regional; local]
<b>Temporal</b>	[Long-term; mid-term; short-term]
<b>3. Transaction types</b>	[Cash; in-kind; both cash and in-kind]
<b>4. Actors involved</b>	
<b>Buyer</b>	[Private; public; both public and private]
<b>Seller</b>	[Private; public]
<b>Intermediaries</b>	[Yes; no]

regarding the payments, counselling during the negotiations, monitoring of the land management activities, verification of the ecosystem service provision, among others.

#### 4. Results

Of the 40 cases, based on our assessment of success, 23 cases were classified as successful, 12 as partially successful, and 5 as not successful. Accordingly, these cases were arranged in an excel file, each plotted against every one of our defined criteria to produce a statistical outcome on how often a certain option was repeated. The pie charts in Fig. 1 show the distribution of PES cases showing the distribution of factors that contribute to a certain outcome.

Fig. 1(a) shows that half of the cases studied have water as a key ecosystem service traded. Bundled services comprise 28% in our sampled PES studies. In other words, these schemes do not focus on only one ecosystem service but they aim to enhance the provision of different ecosystem services at the same time. The focus and share of the remaining three ecosystem services are as follows: landscape protection (12%), maintaining carbon stocks (8%), and biodiversity protection (2%).

With respect to scale, 60% of the studied cases are found to be implemented at local scales (Fig. 1b) whereas 30% at regional and only 10% at national level. In terms of time scale, 65% of the cases are funded for over 30 years and 10% of the cases have secured funding for a time frame between 10 and 30 years. Cases with less than 10 years of funding comprise 25% of our sample (Fig. 1c).



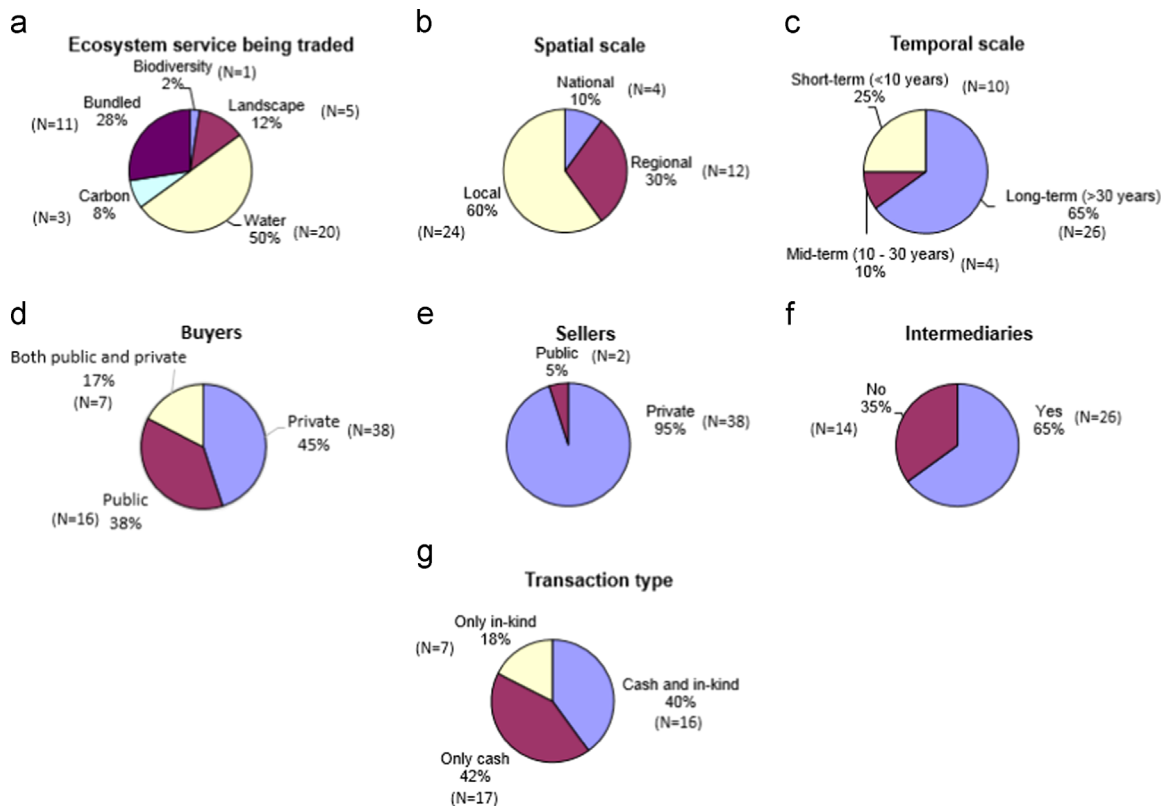


Fig. 1. Distribution of PES cases across criteria showing the distribution of factors in the design of the 40 PES cases.

For options related to actors involved, there are almost the same number of cases with private (45%) as with public (38%) buyers, leaving only 17% of cases with a mix of private and public buyers (Fig. 1d). In terms of sellers, almost all cases have a private seller at 95% (Fig. 1e) and more than half have intermediaries involved (Fig. 1f).

Fig. 1(g) shows that the number of cases that have a mix of cash and in-kind compensations are almost equal to the cases with only cash payments, at 40% and 42% respectively, while 18% of the cases are compensated with only in-kind contributions. As Table 3 below shows, these in-kind compensations are represented in decreasing order of abundance by community projects, technical assistance, materials and infrastructure, education and health programmes, training courses, and finally one only case involving micro-credits.

Table 4 gives an overview on the cases analysed across each attribute or criteria. This allows us to identify criteria that seem to have most influence on the success of a PES scheme. In other words, the percentage of schemes that are classified as successful for each option of the different criteria provide an indication of how positive an option is in order to obtain good final results for the different schemes included in the analysed sample. The graphical representation of this table is shown in Fig. 2.

## 5. Discussion: what characterises a successful PES scheme?

Of the 40 cases analysed, as stated in the previous section, 23 are classified as successful, 12 as partially successful, and 5 as not successful. In this section we will go through the criteria we used previously (Fig. 1 and Table 3) to highlight the key factors that contributed to such outcomes. In other words, which aspects played an important role in the success of a PES scheme? Fig. 2 summarises the factors that enhances the degree of success of the

analysed PES schemes. The length of petals represents the percentage of schemes classified as successful in our sample.

### 5.1. Ecosystem services being traded

From the schemes analysed, those that secure the continued provisioning and quality of a critical resource that positively contribute to local livelihoods and wellbeing are rather successful. Water is a pressed commodity and watershed protection is rapidly becoming the most important of the four types of payments for ecosystem services in Latin America. This might be because increasing water shortages in areas of high consumption have triggered the search for alternative ways to enhance supply (Southgate and Wunder, 2009). For example, the Quito water fund (Arias et al., 2010) in Ecuador that was established with the aim of improving the quality of water to provide for the city of Quito has proved rather successful. In this case community development and the improvement of local livelihoods as well as access (through preservation) to critical resources was seen as important to its success. This combination of livelihood improvement together with the provision of a critical resource (such as water and timber) is an important driver of the success of PES schemes, also in other regions of the world, for example in South Africa, where the success of a PES scheme is “largely attributed to it being mainly funded as a poverty-relief initiative, although water users also contribute through their water fees” (Turpie et al., 2008).

### 5.2. Spatial scale

Most of the PES schemes analysed were implemented at a regional or local scales, with more than half of the cases being successful on both these scales. The local and regional scales allow communities to better identify with actors and intermediaries and also for joint monitoring of costs and benefits. For example, the

**Table 4**  
Classification of the PES schemes analysed.

Criteria	Option	N	Successful	Partially successful	Not successful	% Successful	% Not successful
<b>1. Ecosystem services being traded</b>	Biodiversity	1	1	0	0	100	0
	Landscape	5	3	2	0	60	0
	Water	20	10	8	2	50	10
	Carbon	3	2	0	1	67	33
	Bundled	11	7	2	2	64	18
<b>2. Scale</b>							
	<b>Spatial</b>						
	National	4	0	3	1	0	25
	Regional	12	7	4	1	58	8
	Local	24	16	5	3	67	13
	<b>Temporal</b>						
	Long-term (> 30 years)	26	15	7	4	58	15
	Mid-term (10–30 years)	4	3	1	0	75	0
	Short-term (< 10 years)	10	5	4	1	50	10
<b>3. Transaction types</b>	Cash	17	11	3	3	65	18
	In-kind	7	3	4	0	43	0
	Cash and in-kind	16	9	5	2	56	13
	When in-kind compensation <sup>a</sup>						
	Not specified	3	2	1	0	67	0
	Materials/infrastructure	6	3	3	0	50	0
	Education and health	2	0	2	0	0	0
	Community projects	9	4	3	2	44	22
	Technical assistance	6	4	2	0	67	0
	Micro-credits	1	0	0	1	0	100
	Training courses	2	1	1	0	50	0
<b>4. Actors involved</b>							
	<b>Buyer</b>						
	Private	18	12	4	2	67	11
	Public	15	7	6	2	47	13
	Public and private	7	4	2	1	57	14
	<b>Seller</b>						
	Private	38	23	11	4	61	11
	Public	2	0	1	1	0	50
	<b>Intermediaries</b>						
	Yes	26	13	9	4	50	15
	No	14	10	3	1	71	7

<sup>a</sup>Criteria refers to the criteria used for the comparative analysis; Option refers to the possible choices included in each of the criteria; N refers to the number of cases that fall under each criteria and option, the sum total of cases for each criterion being 40; Successful refers to the number of cases for each option classified as successful; Partially successful refers to the number of cases classified as not being completely successful but not being completely unsuccessful either; Not successful refers to the number of cases for each option classified as not successful; % Successful refers to the percentage of the successful cases with respect to the total number of cases across options and criteria; % Not successful refers to the percentage of the not successful cases with respect to the total number of cases across options and criteria.

<sup>a</sup> The total number of in-kind contributions (29) is higher than the total number of schemes providing in-kind contributions (23) because some schemes provided more than one type of in-kind contribution.

case of Chalalán Ecological Reserve in Bolivia (Robertson and Wunder, 2005) was implemented in a reduced area comprising the Chalalán village and its surroundings. The scheme had virtually the entire community participating, from design, implementation, monitoring and they were the sole beneficiaries of the outcomes in the form of revenues from tourism. As an example of a scheme implemented at regional level, the case of the rubber-tappers in the State of Acre in Brazil provided benefits for an estimated 20,000 people by way of increased public services that were made possible by people's active participation to enhance biodiversity and carbon stocks in the region (Kugel and Jha, 2013). This characteristic matches with the explanations of (Singh and Dudley, 2010), where they described how working at local scale has the potential to provide advisory services, support investments creating incentives for maintaining ecosystem services, and enhance coordination through collective action. It is also supported by Corbera et al. (2009) who state that for PES schemes related to the maintenance of the natural resource base (i.e. biodiversity, water, etc.) the implementation at a local or regional scale is more efficient than at national scale. Not sufficient cases implemented at national scale have been found to clearly understand the influence of this scale to the success of the PES scheme.

### 5.3. Temporal scale

In our sample, the sustained financing for mid- and long-term planning and engagement contributed to a high level of success. Other authors (i.e. Corbera et al. (2009) and Perrot-Maitre (2006)) have as well highlighted the importance of the mid- and long-term temporal scales. This time frame is also supported by UNDP (2011) who after examining several case studies makes a clear case for a 10–20 years donor commitment for transformational change. This time frame is particularly relevant for putting in place sustainable management regimes and behaviour change with respect to the use of natural resources. A good example of this mid-term planning is the case of Procuencas in Costa Rica (Redondo-Brenes and Welsh, 2010), a PES scheme used as a model in other regions of the world, and the financial mechanism of which, was adopted by the Costa Rican government to apply it at national level. Another example is the case of Chocó in Ecuador (Kosmus et al., 2012), a region of global conservation importance where the mid-term time frame led to the maintenance of biodiversity, a development of local actors thanks to the social programmes involved in the scheme, and the strengthening of local organisational structures, local skills and land use tenure and rights.

## Factors enhancing the degree of success of PES schemes

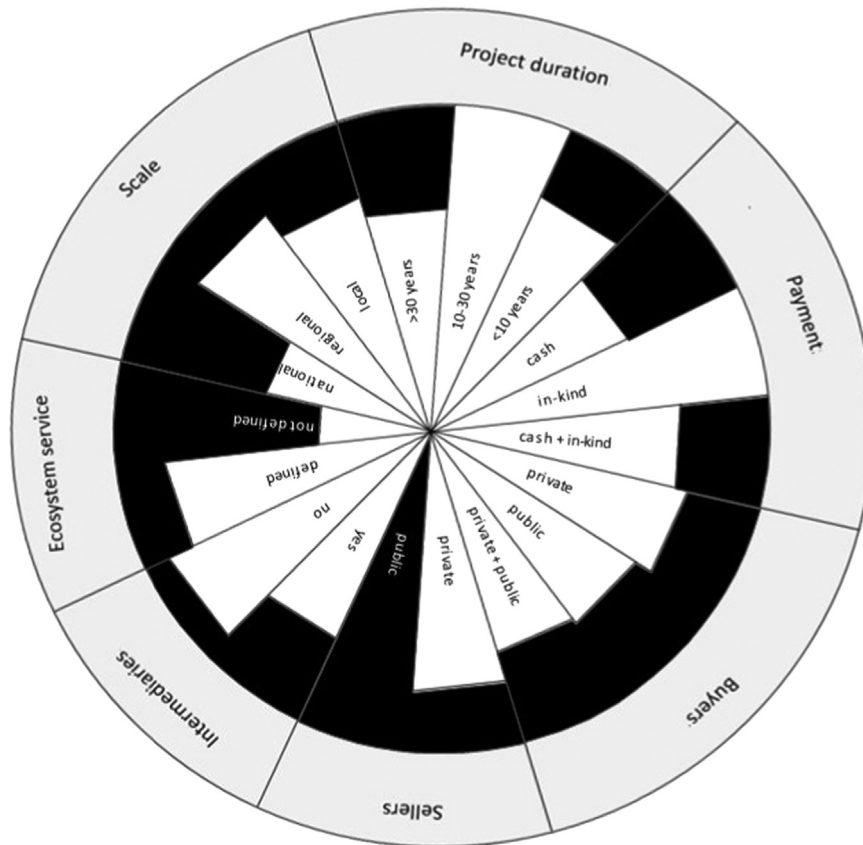


Fig. 2. Characteristics related to the potential of a PES scheme to be successful.

### 5.4. Transaction types

In our sample, cases with only in-kind contributions had quite some degrees of success as compared to only cash or a combination of cash and in-kind where respectively 18% and 13% were not successful. Supporting this finding, the literature shows that different authors emphasise the advantages of using in-kind contributions rather than only cash payments. For example, there are the risks identified by (Vatn et al., 2014) where distribution of cash payments among providers can be unfair, and to the development of corrupt practices linked to cash. In addition, (Jindal et al., 2008) state that in-kind payments help avoiding cases of corruption and unfair distribution of benefits due to the indivisible nature of the payments and the benefits for all the community. However, (Porrás et al., 2008) argue that in-kind payments once implemented lead to low conditionality attached to the payment to maintain a particular ecosystem service. In other words, in the case of in-kind contributions, sanctions are more difficult to apply. For example, a road once built as part of a PES arrangement is not likely to be removed even if the community fails to honour their share of the commitment afterwards. Nevertheless, this has often not been the case. On the contrary, the fact that the buyer of the ecosystem service actually fulfils the agreement helps in trust building and ensures commitment of the community as well. In terms of in-kind contributions, most valued in our sample are community infrastructure projects (roads, electricity, telecommunication, etc.) and services such as education, health and technical support as in the Colombian case of Asobolo (Muñoz Escobar et al., 2013) or the Ecuadorian case of Chocó (Kosmus et al., 2012). Provision of materials (such as fences, tools and seedlings) as in the Gil Gonzalez case in Nicaragua are also of importance (Hack et al., 2010) as are

capacity building through trainings such as beekeeping or organic farming as in the cases of Los Negros in Bolivia (Asquith et al., 2008), Moyobamba in Peru (Renner, 2010) and PROFAFOR in Ecuador (Wunder et al., 2008).

### 5.5. Actors involved

In our sample, we found the degree of success to be high where most sellers were private entities (which also includes collectives such as NGO's and associations).<sup>3</sup> An example worth mentioning is the simple case of Robin Clark and his neighbour (Robertson and Wunder, 2005), where two individuals in Bolivia directly arranged with each other a direct payment for the preservation of a small sized forest. Another example of this characteristic is the more complex case of Procuencas (Redondo-Brenes and Welsh, 2010) in Costa Rica, where a private company directly paid upstream landowners for the adoption of practices that preserve the quality of the water. This preference for the involvement of private actors follows the Coase theorem as a means to solve environmental externalities. The theorem states that the best way to overcome these externalities is through private negotiations (Schomers and Matzdorf, 2013). Also, Arriagada and Perrings (2013) state that “user-financed programmes are generally more efficient than government-funded programmes”. Further, cases with no intermediaries had a higher degree of success than with those that had intermediaries. Trust is an important aspect in PES schemes, and when local communities are confronted with actors estranged from the local context, chances of failure are higher (Asquith et al.,

<sup>3</sup> Since the number of cases with public actors was low, it would be worth analysing more cases with public sector engagement for a definitive outcome.

2008; Robertson and Wunder, 2005; Wunder et al., 2008).

## 6. Conclusions

In this paper we made an attempt to understand the performance of PES schemes in Latin America using a set of criteria to identify those critical for PES success. Building on 40 PES cases, this study offers the first comparative analysis using a wide range of criteria for a region that has pioneered PES from the 1990s. The key messages around what contributes to a successful PES can be summarised as follows:

(a) Ecosystem services being traded: PES schemes that secure the continued provisioning and quality of a critical resource while positively contributing to local livelihoods are quite successful.

(b) Scale: Local and regional scales are the most widely used, both with high degrees of success. Concerning the optimal time frame, projects operating within a period between 10–30 years, are regarded as most successful.

(c) Transaction types: The use of in-kind contributions reduce the probability of failure. Those transactions are preferable rather than using only cash payments.

(d) Actors involved: There is a dominance of successful PES schemes where mostly private actors are involved. Also, schemes with no intermediaries between the buyers and the sellers tend to be more successful.

While our study focussed only on what contributes to PES success, we did also observe that the cases with low degrees of success had certain common features. While a full discussion on this is outside the scope of this paper, it might be worth to briefly mention some of them: that the implementations of the PES schemes did not manage to reduce the pressures on the ecosystem; that the investors did not see the added value of their investments (additionality was not achieved); that the opportunity costs were not met; that the local livelihoods did not improve; existing land rights arrangements and power structures were threatened; and where unfair practices in the distribution of benefits were observed. Further research on an analysis focused on the factors characterising low degrees of success for PES schemes would complement the present study and contribute to the better understanding of design successful PES schemes in the future.

Methodologically, we argue that the classification used for the 40 cases across a set of criteria has proved to be rather efficient in understanding PES performance. However, we only looked at how often each option (within each criteria) was repeated, but not the causal relations between the various options. We also do not know how changing combinations of options would affect the outcome. For example, what would be the outcome of a PES scheme that is designed at a national level to protect a landscape of national importance, where sellers are both private and public, applied for a period of 10 years, and where the transaction is made in cash? Also, the use of statistical correlation methods added to the classification methods described in this work, would increase the understanding of the influence of certain aspects in the contributing to success of PES schemes. Clearly, more in-depth analysis is needed, and other methods are required to understand the interaction between criteria for a fuller understanding of PES dynamics.

PES programmes are expected to reconcile human well-being and ecosystem conservation. Despite the critiques they face, they are constantly adapting and evolving. Timely input from previous experiences into PES policies and schemes are much needed for their success. This work is a contribution to that effort, although further research is still needed. Since cultural and political contexts play important roles in successful PES schemes, it is important to conduct similar analyses on PES experiences in other

geographical areas (i.e. South East Asia, Africa, etc.). Moreover, synergy between PES schemes and development projects aimed at poverty eradication should be explored, and in effect how they can contribute to the Sustainable Development Goals (SDG) agenda. Efforts in this direction have already begun (Ringhofer et al., Submitted for publication).

## Acknowledgements

The research leading to these results has received funding from the European Union Seventh Framework Programme (FP7/2007–2013) under Grant Agreement no. 283093 – The Role Of Biodiversity In climate change mitigation (ROBIN).

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