

Payment for Ecosystems Services in Catalonia, Spain. A review of experience and potential applications

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Abstract

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Payments for Ecosystem Services (PES) are an innovative environmental policy instrument that aims to reward natural resource managers in return for maintaining or improving the provision of ecosystem services. A wide variety of PES projects and programmes have been implemented in recent years, mostly in developing countries, and the possibility of extending the application of this instrument in Europe is increasingly considered. In this paper, we discuss the key definitional and operational principles of PES and present two initiatives developed in Catalonia that can be partially characterised as PES, namely private forest reserves and land stewardship agreements. They are financed by the public administration and environmental foundations, and allow the conservation of mature forests and valuable ecosystems. We also discuss the opportunities and challenges involved in developing new PES schemes focused on the prevention of forest fires through extensive cattle grazing and the development of small-scale watershed schemes involving private water bottling companies. We conclude that PES is a promising environmental policy instrument because it allows mobilising additional resources for environmental protection by involving private companies and foundations whilst raising environmental awareness.

Keywords: Payments for Ecosystem Services, biodiversity, land stewardship contracts, forest reserves, Catalonia

1. Introduction

The causes of environmental degradation and biodiversity loss are multiple, and involve direct and indirect drivers (Millennium Ecosystem Assessment, 2005). The former principally encompass land-use change processes and the over-exploitation of natural resources, both for subsistence and commercialisation purposes. Indirect drivers, on the other hand, include economic policies, socio-political and institutional conditions, as well as scientific, technological and cultural processes. Both types of drivers act complementarily and/or synergistically, operating across geographical and governance scales (ibid.: 64-70). The multiple ways in which humans transform ecosystems also explain why the approaches and instruments to halt environmental degradation are also diverse and designed at

multiple scales, ranging from international agreements, to institutional reform, environmental taxes or protected area networks, among others.

During the last two decades, Payments for Ecosystem Services (PES) have emerged as a new policy instrument designed to address specific processes that lead to environmental degradation. PES underlying principles need to be traced back to the 1970s, when some economists insisted upon the idea that nature, besides providing us with food, timber, or water, was also providing a range of other services to the benefit of human well-being that were “invisible” to resource users and society in general (Costanza *et al.*, 1997). These included supporting services, such as primary production, soil formation and nutrient recycling; regulating processes, like carbon sequestration, water quality and flooding control; and cultural services, such as educational services, spiritual

enrichment and scenic beauty (Millennium Ecosystem Assessment, 2005). Economists followed that if we were able to acknowledge the value of such unaccounted services, we would have strong economic and political incentives to promote their maintenance and provision over time (for a review of the historical roots of the concept “ecosystem services” and PES, see Gómez-Baggethun *et al.*, 2010).

PES aim to enhance and maintain ecosystem services by transferring resources from beneficiaries to providers of these services. In doing so, PES compensate the owners and/or managers of ecosystem services for the positive externalities¹ they provide to society or to specific social actors, or for their efforts in reducing negative externalities (Engel *et al.*, 2008). However, PES can only be effective under certain social and institutional circumstances and therefore should not be regarded as a panacea or a blueprint for environmental conservation (McCauley, 2006). When the obstacle for the provision of ecosystem services is mostly economic (i.e. its lower profitability with respect to alternative land use activities), and other institutional, social or political barriers do not act as an impediment for environmental conservation, PES can be both efficient and successful in achieving their stated goals.

The terms ecosystem and environmental services are often used interchangeably in the literature but some authors have proposed to differentiate them. Van Noordjik and colleagues (2007), for example, argue that environmental services are a subset of ecosystem services encompassing all but provisioning services, insofar as the externality problem that inhibits the market development for ecosystem services is less likely to apply to provisioning services. In contrast, Muradian *et al.* (2010) suggest that ecosystem services are a subcategory of environmental services and distinguish them in terms of the landscape to which they apply. While ecosystem services are a product of natural ecosystems, Muradian and colleagues consider that environmental services derive exclusively from actively managed ecosystems, such as agricultural and rural landscapes. In this paper, we use the term

¹ An externality is a negative or positive effect to which an actor is subjected because of the activity of another actor (without being compensated for it). An example of a negative externality is the reduction of a fisherman's income due to a company's sewage discharge that pollutes the water and impacts negatively on fish stocks. An example of a positive externality would be the positive effects on biological diversity and carbon stocks maintenance generated by a landowner or rural community that conserves a large track of forest for livelihood and cultural reasons regardless of the possibility to transform the forest into more profitable, intensive and less diverse uses, such as export-based agriculture.

ecosystem services as used in the Millennium Ecosystem Assessment framework (i.e. ecosystem services as ‘the benefits ecosystems provide to human well-being’) but, in line with van Noordjik *et al.* (*ibid.*), we recognise that PES are fundamentally designed to target supporting, regulating and cultural services.

Different types of PES projects and programmes have been carried out worldwide in recent years (Pagiola *et al.*, 2007; Muñoz-Piña *et al.*, 2008; Wunder and Albán, 2008; Bond *et al.*, 2009; Kosoy *et al.*, 2007; Wunder *et al.*, 2008). Most of these have focused on the maintenance and enhancement of carbon sequestration by forest ecosystems, the conservation of upstream ecosystems in critical watersheds, and the support for specific biodiversity conservation activities (Landell-Mills and Porras, 2002; Huang *et al.*, 2009; Southgate and Wunder, 2009; Caplow *et al.*, 2011). The institutional set-up and the scale of these initiatives vary significantly, ranging from market-based and globally driven projects for the commercialisation of forest carbon credits to subsidy-oriented schemes at local level for reduced sedimentation and increased water quality in hydrological basins (see Bulte *et al.*, 2008; Engel *et al.*, 2008; Bishop *et al.*, 2009 and Pascual *et al.*, 2010 for analyses of several case studies).

There is also a strong distributional bias across the globe; while publicly-funded PES are more present in developing countries, and particularly in the Latin American region, innovative, market-oriented PES mechanisms such as wetland banking and salinity credits systems have been developed mostly in the United States and Australia (Robertson, 2004; Connor *et al.*, 2008). In the European Union, there are a few PES examples. In France, the PES financed by the mineral water enterprise Vittel at the end of the 1990s allowed to preserve the quality of its bottled water, which was being jeopardised by the nitrates and pesticides associated with the intensification of agricultural and cattle raising activities in the nearby farms (Perrot-Maître, 2006). A new voluntary programme of payments for biodiversity offsets has recently been established with the support of a multinational finance group². In Spain, Menorca's Island Council established a PES scheme in 2005 that rewards farmers who introduce more sustainable productive methods on their farms (Gomila, 2007). In addition, the ongoing European project SYLVAMED³ aim at assessing and promoting market-based instruments, including PES schemes, for the conservation of European forest areas.

² <http://www.cdc-biodiversite.fr>

³ <http://www.sylvamed.eu>

This paper contributes to this emerging body of literature by reviewing existing approaches to the PES concept, characterising its common procedural and organisational elements and discussing its application in Catalonia, Spain. The following section defines the main elements of a PES project or programme and proposes a classification system according to four key criteria, namely 1) the relation between the targeted ecosystem service and the type of payment, 2) the degree of control over the provision of ecosystem services; 3) the type of environmental externalities addressed; and 4) the type of “buyer” or “user”. Section three introduces Catalonia’s PES experiences, which encompass only two relevant initiatives to date: the development of private forest reserves and of land stewardship contracts. It also discusses the opportunities and challenges for the development of new PES initiatives in the region. Section four concludes the paper.

2. Payments for Ecosystem Services: an overview of definitional and operational issues

The most widely acknowledged and accepted PES definition considers this instrument as a voluntary transaction where a well-defined ecosystem service (or a land-use likely to secure that service) is ‘bought’ by a (minimum one) ecosystem service buyer from a (minimum one) provider, if and only if the provider secures ecosystem services provision (conditionality) (Wunder, 2005). From a theoretical standpoint, such definition derives from Ronald Coase’s theorem (1960), according to which in a situation of low transaction costs and clear property rights, the negotiation between buyers and sellers for the exchange of a pre-defined product or service should result in an efficient outcome. From a practical standpoint, the definition’s incentive and market-based character (i.e. the provider is only paid if she/he delivers a particular “product”) stems from the need to make a more efficient use of the scarce resources dedicated to conservation, thus maximising the environmental output per unit of investment (Ferraro and Kiss, 2002).

This understanding, however, excludes a large number of experiences that label themselves as PES and do not comply with at least one of the conditions set by the previous definition (i.e. voluntariness, clarity in defining ecosystem services, conditionality). This includes, for example, those programmes financially supported by public governments that ‘buy’ ecosystem services on behalf of their taxpayers who, strictly speaking, cannot decide whether or not to participate in the programme. Furthermore, in many PES cases conditionality is often uncertain. Furthermore, many experiences tend to rely on proxies of the ecosystem services being targeted in

order to reduce the transaction costs involved in modelling and accounting for ecosystem services (Landell-Mills and Porras, 2002; Kosoy and Corbera, 2010). Watershed-related PES generally support upstream landowners for the adoption of sustainable land management practices and forest conservation rather than for the actual increase in water quality or reduced soil sediments downstream as a result of the adopted practices. This reduces the costs involved in monitoring the outcomes of hydrological and soil regulation services and also fosters landowners’ participation by providing incentives in shorter periods of time (i.e. outcomes downstream would take longer to be observed and quantified than the adoption of management practices). This approach, however, has been contested in the light of the considerable uncertainty characterising the impacts of land use options in hydrological processes, particularly in tropical forests, which in turn underscores the risk of constructing PES on ecological and biophysical misconceptions (Kosoy *et al.*, 2007; Locatelli and Vignola, 2009).

For these reasons, other scholars have preferred conceptualising PES more broadly as a monetary or cash transfer among social agents with the aim of fostering protection actions by owners/managers of environmental resources (Muradian *et al.*, 2010). In this paper this latter definition is adopted, in order to encompass in the PES concept a wide range of real-world existing and potential initiatives focussed on influencing the ecosystem service providers through monetary or in-kind incentives (not only those which strictly meet Wunder’s conditions of conditionality, voluntariness from both providers and buyers, direct relation between ecosystem service provision and remuneration). PES initiatives thus involve the development of an institutional framework suited to the social, political, cultural and economic context in which they operate (Corbera *et al.*, 2007; Van Hecken and Bastiansen, 2010). Table 1 highlights a number of common constitutive and procedural elements of PES, as well as a brief characterisation of the actors who are often involved in design and implementation.

PES can involve monetary and/or non-monetary payments (the latter consisting of e.g. the provision of technical assistance, training and local infrastructures; see Asquith, 2008 for an example). In most cases, the payment amount is not based on a monetary evaluation of the ecosystem service value –which is a long and controversial process (Martinez-Alier *et al.*, 1997) – but on lengthy negotiations among providers and buyers, informed by the opportunity cost associated with the required land-use practices. Experiences with inverse auctions, where a large number of ecosystem service providers compete for a limited amount of funding, have proved

successful in guaranteeing the provision of certain ecosystem services at the lowest cost (OECD, 2010). In this regard, Ferraro (2008) notes that the use of fixed payments in PES schemes allows reducing transaction costs and simplifying administrative procedures, but results in less efficient outcomes in comparison to an auctioning approach. Auctions increase efficiency in the presence of asymmetric information, for example when those who design the PES programme do not have access to information on the opportunity cost associated to environmental protection. However, they also imply certain degree of uncertainty in PES design due to the inherent difficulty of foreseeing the potential providers' behaviour and their correspondent bids, which depend on many factors such as the degree of risk aversion, strategic behaviour and the information providers have access to, among others.

PES, if attached to Wunder's definition (2005), need to establish a direct relation between the amount or level of ecosystem services provided and the payment in order to guarantee a high level of conditionality, which can in turn be assured through 1) quantifying the relation between providers' actions and ecosystem services provision and 2) establishing a provision control and penalty system. However, whereas it is relatively easy to calculate the tonnes of carbon dioxide stored in a given forest area, it may be very difficult to measure the effects of a PES programme directed towards improving the quality of ground and freshwater in a given river basin. To which extent would any changes in water quality be attributable to the success (or failure) of the PES scheme? This problem reflects the complexities involved in establishing a clear-cut relationship between land-use management activities that PES promote (the proxy) and their supposed effects on the environment, which may be either scientifically complex or simply too expensive to determine (Kosoy *et al.*, 2007; Wunder *et al.*, 2008). Seemingly, establishing a control and penalty system for those who fail to provide the promised ecosystem services may also be expensive and, in some cases, too costly from a political point of view (Wunder *et al.*, 2008). Therefore, it seems logical to expect each PES programme to find its own optimal level of conditionality according to its available resources and other management and time constraints.

As regards the issue of "targeting", adjusting the payment to the provided ecosystem services allows involving a higher number of participants in the PES programme because it avoids assigning high payments to providers with low conservation/opportunity costs, thus hampering the participation of providers with high costs (Engel *et al.*, 2008; Muñoz-Piña *et al.*, 2008). Using data from the Nicoya Peninsula in Costa

Rica, Wunscher *et al.* (2008) indicate that ecosystem service provision may be almost doubled, the available financial resources being equal, with a high targeting level. Seemingly, Muñoz *et al.* (2011) have shown that the Mexican programme of payments for hydrological services could further reduce deforestation if deforestation risks and opportunity costs were taken into account more effectively by programme managers. It is also recognised, however, that increasing targeting levels may imply higher transaction costs for programme managers due to the increased need for scientific data collection, administrative and control activities (Mayrand and Paquin, 2004; Wunder, 2005). A high level of targeting may also create a perverse incentive for degradation, as owners may be encouraged to favour the loss of ecosystem services in order to get a payment for their restoration (Mayrand and Paquin, 2004; Salzman, 2005). If the payment is only a little higher than the opportunity cost, a small change in market conditions (e.g. an increase in the price of agricultural products) may cause that some participants abandon the correspondent PES scheme (Claassen *et al.*, 2008).

Another important issue to be considered in the development of PES projects and programmes concerns ensuring an adequate level of additionality (i.e. to ensure that users reward providers for activities that otherwise would not be undertaken). Guaranteeing a high level of additionality may translate into a higher level of efficiency, as it allows obtaining more ecosystem services for each unit of investment (Wunder, 2005; Pagiola *et al.*, 2005). However, in line with targeting, securing a high level of additionality also involves higher transaction costs because it often comes accompanied by more investment in control and measurement activities.

Transaction costs refer to additional expenditure (besides any payments) allocated towards the design and implementation of a PES project or programme. Elements contributing to such costs in the design phase include scientific research and contract negotiation and formalisation, while those associated to implementation encompass the costs associated to administrative management, monitoring systems, and both enforcement and compliance mechanisms. In general, the design-related costs tend to be higher than implementation recurrent costs (Wunder *et al.*, 2008) and at least three factors may influence the relevance of such costs: the scale of implementation, the institutional and social context, and the type of ecosystem service being provided. Transaction costs are lower if service providers are only a few (Mayrand and Paquin, 2004) whilst there is increasing evidence that small-scale projects tend to be more expensive in the provision of one single unit of ecosystem

service than large-scale programmes partly because some transaction costs are fixed and do not depend on the number of users (Wunder *et al.*, 2008). Furthermore, it is evident that PES working with small-scale landholders in poor rural areas may face higher costs in order to negotiate, agree, implement and monitor land-use activities. This can be further aggravated if local and national institutions are not supportive to the development of the scheme or are conducive towards potential inefficiencies and conflicts, as a result for example of contradictory environmental incentives or unclear and contested property rights. Seemingly, transaction costs will also be higher if the number of buyers in one single project or programme is also higher (Gutman, 2003). Finally, the type of ecosystem service being traded may also increase transaction costs. Forest carbon projects, for example, tend to show higher transaction costs than other initiatives such as watershed regulation or biodiversity payments, particularly if these are based in proxies and are not trading specific offsets. This happens because forest carbon projects must adhere to internationally recognised standards and procedures for design and implementation, particularly regarding carbon accounting and monitoring, in order to sell carbon emission reductions in voluntary and regulated carbon markets (see Neeff *et al.*, 2008, pp.25 for cost estimates).

Buyers in PES programmes may be private enterprises or citizens, governmental organisations or foundations/NGOs. In the first case, PES is voluntary for both providers and buyers, whereas in the second case it is voluntary only for providers, because the programme is financed through taxes that citizens cannot decide not to pay (Engel *et al.*, 2008). The third typology is a hybrid kind of PES, where participation is voluntary for both providers and buyers (such as in private schemes), but buyers (foundations or NGOs) reward a service that they do not necessarily directly enjoy (such as in public schemes).

In the light of what has been discussed so far, it is possible to classify PES initiatives on the basis of four key criteria:

- The relation between the targeted ecosystem service and the type of payment, which can be direct when the providers' reward is linked to the actual service provision (e.g. payment per tonne of avoided CO₂ emissions), and indirect when the reward is calculated by means of a proxy variable (e.g. protected hectares of forest as a proxy for biodiversity conservation);
- The degree of control over the provision of ecosystem services, which depends on

the resources devoted to guarantee the effective provision of ecosystem services and on the establishment of sanctions in case of non-compliance with the PES contract;

- The type of externalities being promoted or addressed, which can be positive externalities (e.g. conservation of biodiversity or landscape beauty), negative ones (e.g. nitrate contamination of water bodies) or both (e.g. the transition from intensive to organic agriculture, which provides positive externalities, such as the maintenance of soil fertility, and reduces negative ones, such as eutrophication of water bodies); and
- The type of 'buyer', which may be private (i.e. when the buyer is a private company/organisation), public (i.e. when the buyer is a governmental organisation), or hybrid (i.e. when the buyer is a foundation or an NGO).

To end this section, it is worth noting that the PES design approach chosen by each case may in turn involve decisions on how to account for environmental decision-making principles (i.e. efficiency, environmental effectiveness, equity and legitimacy) (Adger *et al.*, 2003). Should a PES project focus exclusively on achieving efficient outcomes thereby underplaying any potential positive or negative effects over poverty alleviation or procedural justice, as suggested by some scholars (Ferraro and Kiss, 2002; Pagiola *et al.*, 2005)? Or should it focus on supporting equity and legitimacy criteria at the expense of lower additionality and higher transaction costs, for example? In this regard, Pascual and his colleagues (2010) have argued that efficiency and equity cannot be detached from each other and that both should be considered and pursued in PES schemes, because practitioners are always confronted with the dilemma of balancing environmental and social benefits and costs. They show that a number of institutional factors determine the weight assigned to the equity criterion in PES schemes, particularly the bargaining power of the actors involved (for an empirical example of how Mexican civil organisations and political allegiances have shaped the rules of the national programmes of payments for environmental services, see McKafee and Shapiro, 2010 and Muñoz *et al.*, 2011). Other authors have also warned against the risk of focusing exclusively on the cost-effective and efficient provision of ecosystem services in rural areas of the developing world, as this would result in unfair and illegitimate outcomes for the most

disadvantaged social groups (Corbera *et al.*, 2007).

3. PES experiences in Catalonia

Catalonia has a rich natural heritage and a high diversity of biomes, being located between Atlantic Europe and the Mediterranean area. Its forest areas represent 64% of the total territory (more than 2 million hectares⁴). The forest sector could potentially benefit from the development of PES schemes insofar as it provides a wide range of environmental services to society: supporting services (e.g. soil formation, nutrient cycles or oxygen production); provisioning services (e.g. food, freshwater, wood and fuels); regulating processes (e.g. CO₂ sequestration and storage, water quality and quantity conservation, climate regulation, soil erosion and flood prevention); cultural services (e.g. aesthetic enjoyment, recreational and educative services). Forests also provide some mixed services such as hunting or mushrooms gathering, which include a provisioning and cultural component. Even though forest areas are steadily increasing in Catalonia, they are also increasingly jeopardized by forest fires and lack of adequate management caused by low economic profitability (Plana, 2004). Regarding land property, it should be noted that 81% of Catalan forests are private (Terradas, 2004).

There are not any PES schemes in Catalonia to date following Wunder's conditions. There is much room for PES initiatives to contribute towards better forest management and conservation, thereby increasing forest profitability and avoiding the loss of ecosystem services. In the following section, we introduce two relevant PES-like Catalan initiatives in the forest and rural sector: the development of private forest reserves and of land stewardship contracts building on the evidence presented in a recently published report (Russi, 2010).

3.1. Forest reserves

Following a broad understanding of PES (Muradian *et al.*, 2010), environmental subsidies may be considered PES as long as they are characterised by a relation, even if indirect, between payment and the provided services and it is in this sense that we have considered private forest reserves a case of PES. Forest reserves are areas where wood harvesting is prohibited in order to protect particularly valuable ecosystems. They can be established through land purchase or the acquisition of logging rights and they are generally financed by the public administration, environmental NGOs and/or private foundations.

An example of forest reserves is represented by the network of 43 mature forests created by Girona's provincial government, with a total area of 558 hectares and accounting for 0.15% of the total forest area in the province. The programme includes a scientific monitoring of the forests and the production of several communication and awareness raising materials. Mature forests (i.e. not actively managed forests in the last 50-100 years) represent a particularly valuable ecosystem because old trees and decaying wood have a key role in the maintenance of biodiversity as they provide shelter to a variety of species of plants and animals, as well as fungi, lichens and bryophytes. The presence of dead wood is also very important because its slow decomposition provides a valuable habitat for many species of insects, woodpeckers and owls (Sanitjas Olea, 2009). Likewise, mature forests have a very important landscape value.

Another interesting example of forest reserves in Girona's province are those jointly financed by Girona's provincial government and Caixa Girona –a regional financial institution in Montseny Natural Park. Private and public forest owners belonging to this programme receive economic incentives to protect mature forests for at least a 25-year period. The payment corresponds to the opportunity cost of conservation and it is awarded through a public tender where only owners without exotic species in their forests and with slopes of less than 60% can apply. Additional criteria such as the presence of native species, the number of old trees (i.e. >100 years) and the presence of dead wood, among others, allow prioritisation among applicants. Furthermore, payments are capped: the maximum funding for private landowners and municipalities for the 25 years are respectively €133,000 and €200,000. Both private owners and municipalities can be granted with a maximum funding of €25,000 each.

An example of forest reserves created by a joint effort of an environmental NGO and a private enterprise is the acquisition by the NGO Acció Natura of logging rights in the Puigforniu forest in Soriguera village⁵. Like many ancient forests, this area is the habitat of many species of great ecological interest. The forest was about to be cleared because the municipality –the owner of the land– needed financial resources. In order to protect it, Acció Natura bought the logging rights of 25 hectares for 25 years. The environmental association Lo Pi Negre acted as intermediary and the project was partly financed by the chain of retail stores Natura Selection.

The 25 sub-alpine forest reserves in the Pyrenees created between 1998 and 2003 by Obra Social de

⁴ Data for 2008 (the last available year) of IDESCAT (the official Statistical Institute of Catalonia).

⁵ <http://www.accionatura.org>

Caixa Catalunya⁶ (the foundation of a regional financial institution) constitute another interesting example: they cover 142 hectares of ancient forests with high ecological value, owned by municipalities and ‘mancomunitats’ (i.e. associations of municipalities). The foundation acquired the forest owners’ logging rights for 35-40 years, for a total economic value of €213,258. The Associació de Defensa Forestal del Mig Pallars –a social organisation– managed the project.

Forest reserves in Catalonia can thus be considered public or hybrid PES programmes, insofar as they are mostly supported by public government, foundations and NGOs. The private sector has not participated directly except for the case of the forest reserves co-financed by Natura Selection. This suggests that there is a long way to go in our efforts to involve private companies in nature’s conservation. These initiatives result in positive externalities associated to forest conservation (e.g. biodiversity protection, landscape maintenance, CO₂ storage) but we recognise that the relation between the provision of ecosystem services and the payment is rather indirect because the latter depends on a proxy variable (i.e. the hectares of protected area) and not directly on the provided ecosystem services. Forest reserves are, however, characterised by a high degree of control of such level of protection, regularly monitored by the respective buyers (e.g. the Environment Department of Girona’s Province and the Obra Social de Caixa Catalunya)

3.2. Land stewardship contracts

Land stewardship contracts consist of voluntary agreements between a landowner and a stewardship entity (although they may also involve more than one owner or entity) to promote the conservation and sustainable management of land and its associated ecosystem services, with a particular focus on the conservation and restoration of critical habitats. The concept of “land stewardship” was created in the USA by the end of the nineteenth century and gained prominence in environmental planning during the 1980s. In 2005 there were 1,667 land stewardship agreements in the USA. In Europe there are various land stewardship entities such as the National Trust in the UK, which was created in 1895, Natuurmonumenten in the Netherlands (created in 1905), Oasi WWF in Italy (1971), and the Conservatoire du Littoral in France (1974)⁷.

In Spain the concept was introduced in 2000 by the Catalan Land Stewardship Network (Xarxa de Custòdia del Territori - XCT). As of 2009, the network encompassed 73 stewardship entities and 629 stewardship agreements, developed not only

in Catalonia, but also in the Balearic Islands and the neighbouring country of Andorra. The concept was introduced in the Spanish legal framework by means of the Law on Natural Heritage and Biodiversity (*Ley 42/2007, de 13 de diciembre, de Patrimonio Natural y Biodiversidad*), which includes a definition of land stewardship (art. 3) and a specific mandate for public administrations to promote it (art. 72). Since landowners receive a monetary or in-kind payment in exchange for environmental conservation, land stewardship can be considered PES according to the broad definition adopted in this article.

There are three kinds of land stewardship contracts: 1) those where the owner retains management rights over her/his property; 2) those where the owner transfers management rights to the stewardship entity; and 3) those that involve the transfer of the full ownership to the stewardship entity. The covenants contained in the stewardship agreements are free and negotiable between the two sides, so that each agreement is different and depends on the specific conditions and expectations of the two parts. The payment in return for conservation may be monetary or in kind (e.g. improvement and management works, assessment on maintenance, management, legal aspects or financing opportunities). Stewardship contracts under Catalonia’s XTC cover 211,337 hectares, predominantly in forested areas (Puig i Sabé and Masó i Aguado, 2009).

Land stewardship entities are financed by private/social actors interested in environmental conservation, such as companies, NGOs, foundations and sometimes also the public administration that participates through subsidies. Three foundations support most land stewardship contracts in Catalonia, namely: Obra Social de Caixa Catalunya (126 agreements), Minyons i Guies de Catalunya (62 agreements) and Fundació Josep Carol (21 agreements) (Puig i Sabé and Masó i Aguado, 2009).

The first of these three protects through the established agreements almost 160,000 hectares (i.e. 5% of the Catalan territory) and in 2009 established a new contract modality in the Catalan Pyrenees involving a very direct relation between monetary payments and providers’ actions.

The contracts in question support private farmers to protect mountain and sub-alpine harvesting meadows with their associated fauna and flora and the conservation of an endangered regional cow breed. The agreements aim thus to protect key landscape elements, such as winter cereal cultivation, to avoid shrubs’ expansion in grazing areas, and to maintain dry stonewalls, trees and marshes (Parc Natural de l’Alt Pirineu, 2009). Nine farmers have joined the scheme to date, covering a total of 176.4 hectares, with the park

⁶ <http://obrasocial.caixacatalunya.com>

⁷ <http://www.custodiaterritori.org>

administration acting as an intermediary, facilitating contract design and supervising contracts' compliance through periodical visits. Payments vary according to the activities adopted on farm and if contract commitments are not fulfilled, payments are denied for the entire plot (see Table 2). However, the contract has been mostly fulfilled, with 100% accomplishment in grazing areas and 92% in harvesting meadows areas, and farmers showing considerable enthusiasm (Parc Natural de l'Alt Pirineu, 2009).

The High Pyrenees Natural Park PES experience is of a hybrid kind, because it is financed by a foundation. The relation between the provision of ecosystem services and the correspondent payment varies according to the kind of contract. The relation is direct in the case of the Pallars cow (it depends on the number of specimens), whereas it is indirect in the PES for the maintenance of harvesting meadows, because the payment amount depends on the number of protected hectares, and not on the ecosystem services they actually provide. The degree of control on the effective ecosystem service provision is high, since a technician appointed by the park administration regularly visits the farms to verify that the conditions stipulated in contracts are met.

3.3. Favouring the establishing of PES programmes in Catalonia.

Starting in the 1980s, some civil organizations got Section 3.1 and 3.2 showed that some initiatives with PES characteristics are already being developed in Catalonia's forest and rural areas, mainly financed by environmental foundations and the public administration. Additionality is generally high because funders choose to protect areas in danger of degradation (e.g. the Puigforniu forest). In fact, forest reserves and land stewardship contracts are in many cases established in areas that do not belong to the existing network of natural parks, and they often represent the only alternative for landowners to benefit from conservation (Catalan forests generally suffer from a very low economic profitability). In contrast, mature forests are endangered because of old trees' high economic profitability, due to their larger diameter (Sanitjas Olea, 2009). However, all experiences show a relatively weak relation between the provided ecosystem services and the payment because the latter often depend on a proxy variable (i.e. hectares of protected forest areas), with the exception of the Pallars cow scheme, where conditionality is higher because individual payments depend on the number of raised cattle.

One of the reasons explaining the non-existence of a "pure" PES case in Catalonia may be the fact that Spanish and Catalan environmental policy and legislative frameworks do not consider PES as an

instrument to foster ecosystem service conservation, as it was already proposed in Costa Rican and Mexican forest laws back in 1996 and 2003, respectively (Muñoz-Piña *et al.*, 2008; Pagiola *et al.*, 2007). In fact, even though the Spanish law on Natural Heritage and Biodiversity, explicitly mentions the need of encouraging the generation of positive externalities in the framework of protected areas and land stewardship agreements (art. 73), it leaves to the regional government the competence to regulate the mechanisms to reward positive externalities. In Catalonia the drafted law for Biodiversity and Natural Heritage Conservation and Management, which explicitly recognised the potential of PES for conservation, was not approved in the term of office of the legislature finalized in 2010. To include PES in the Catalan legislative framework seems therefore an urgent first step to guarantee the success and diffusion of the concept in the region (CADS, 2010).

Additionally, it is important to observe that in many developing countries PES programmes have partly evolved to complement a rather weak or ineffective environmental policy framework in order to create incentives for conservation inside and outside protected area networks and to further strengthen sustainable forest management programmes. In Catalonia, the management of most environmentally valuable landscapes is already subject to strictly enforced government regulations, through its inclusion in protected area regimes (e.g. national and natural parks, areas of natural interest) and through the provision of specific conservation subsidies. Consequently, the role that PES may play in Catalonia is not substituting environmental policy, but instead improving conservation of some particularly valuable environmental services, which are not protected enough by existing legislation (e.g. the PES programmes in the High Pyrenees Natural Park and in the Puigforniu forest).

There is much room left in Catalonia for the establishment of PES programmes with private, public and hybrid buyers, improving environmental policy at least in two ways. First, the PES concept may contribute to reconfigure some of the existing environmental policies, by increasing their efficiency: considering part of the existing environmental subsidies as PES may help to make an effort towards increasing conditionality and additionality. Second, the notion of PES may help involving citizens as well as private companies in environmental conservation, thereby increasing the resources available for conservation. Private companies may find PES appealing if they can improve their public image, improve the services or products they sell (e.g. the Vittel case mentioned above; ecotourism entrepreneurs) and if they can obtain

financial advantages through for example tax exemptions. Additionally, PES may constitute a support for environmental education, by showing the value of ecosystem services through the willingness to pay of their users, and can contribute to environmental awareness through formal and non-formal education programmes (e.g. workshops, seminars, courses, guided itineraries and other dissemination material).

We envision at least two possible PES cases worth exploring in terms of design and implementation. The first may involve payments for the contribution of silvo-pastoralism (extensive cattle breeding in forests) to forest fire prevention (Plana, 2004; Ventura, 2009; Plana and Tauli, 2009; Pascual, 2009; Balsells, 2009). Controlled cattle breeding reduces the combustible material in forests and consequently the risk of forest fire. One of the main difficulties in using silvo-pastoralism as an instrument for forest fire prevention is the low profitability of the sector, which could be improved through a PES scheme. In such case, payments would contribute to the provision of positive externalities (i.e. forest fire prevention) and would be potentially characterized by an indirect relation between ecosystem service provision and payment (for example relating payments to the number of hectares managed through silvo-pastoralism). The degree of control and targeting would depend on PES design that in turn would depend on the buyers and sellers involved and the financial mechanism and annual budget available. In any case, however, the scheme's level of additionality would be certainly high because silvo-pastoralism is not a profitable activity in Catalan forests and its unlikely to be carried out unless financial compensations accrue. As regards the funding framework, we think that there are at least three not mutually exclusive possibilities: 1) a public buyer, if the PES is financed through public funds; 2) a combination of private and hybrid buyers, if it is financed with voluntary contributions from NGOs, foundations, land stewardship entities and private citizens; and 3) exclusively with private buyers, if financing derives from eco-labelling of cattle breeding products (meat and dairy products).

The former of these three funding options may be regarded as somehow unrealistic, given the current context of public accounts restructuring and high annual deficit in Catalonia. Nonetheless, we believe that the Catalan government has room to increase the current level of environmental taxation in different legislative fronts, such as increasing the taxation of fossil fuel consumption, establishing additional taxes on greenhouse gas emissions or increasing taxation over specific forms of energy production and transport, among others (see Corbera *et al.*, 2009 for further detail). A share of such additional revenue could be

transferred to a public fund that could exclusively support innovative and additional PES projects through an auctioning system whilst supporting the transactions costs involved in monitoring projects and operationalizing the fund. The government could also promote the development of credit-based trading systems to support watershed and land-use management (as for the salinity credit trade scheme in Australia mentioned above) or to support biodiversity offsetting to buffer the impacts of infrastructure and urban developments.

Finally, the second type of PES that could be applied already in Catalonia without legislative reform could relate to the provision of watershed regulation services. Mineral water companies could channel payments to agricultural and/or forest landowners operating close to their springs, in exchange for the reduction of their negative externalities (e.g. pesticide and fertilizer use) and the consequent preservation of the quality of the water they sell, such as in the French Vittel case. In Catalonia there are 25 mineral water companies, with 1.5 billions litres of water sold each year and in turn representing €335 million in sales (i.e. 30% of the Spanish bottled water market)⁸. We of course acknowledge that the degree of conditionality, additionality, targeting and transaction costs of such programmes would depend exclusively on the scheme's design, as agreed among participating actors.

4. Conclusions

Payments for Ecosystem Services (PES) are a promising environmental policy instrument that allows mobilising additional resources for nature conservation and sustainable forest management. The PES concept can help to reconfigure some of the existing environmental subsidies for land management, thereby improving of their conditionality and additionality. Besides, PES initiatives can contribute to raise environmental awareness in at least two ways: first, they can highlight the importance of ecosystem services for human well-being by exposing buyers' willingness to pay for them; and secondly, their implementation can be complemented by targeted workshops for policy makers and civil society, guided itineraries and new educational materials for schools, actors in the region and the wider public.

In Catalonia, "pure" PES programmes do not yet exist because the concept is novel and there is not a supporting legislative and institutional framework. The explicit recognition of PES as a conservation tool in Catalonia's legislation is a necessary step for the development of a wider range of initiatives, in the same way as it is

⁸ <http://www.aiguesmineralsdecatalunya.org>

necessary to conduct fiscal and institutional reforms that allow allocating additional resources for land-use management and conservation. The PES-like experiences analysed in the paper are generally characterized by high additionality, relatively low conditionality and hybrid finance systems. In this regard, the financial sustainability and future upscaling of these schemes may be somewhat limited by the current financial crisis of the public administration and the restructuring of the banking sector and their related foundations.

To conclude, it seems evident that PES in Catalonia should not be seen as a substitute of any existing environmental policy tool but as a complement that can address some specific and well-defined problems, mostly at the local or regional scale. In particular, this paper has highlighted the need to incentivise silvopastoralism activities as a forest fire prevention strategy and to involve private water bottling companies in forest conservation and sustainable land-use management of critical watersheds.

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Table 1. Elements of a PES programme

Definition/description	
Elements	
<i>Ecosystem services</i>	The benefits obtained from ecosystems that contribute to human well-being.
<i>Incentive provision system</i>	Providers' payments, which can be generated through various mechanisms, depending on the institutional frameworks available or set-up. Payment can be monetary or in-kind. Its amount can be defined through negotiation among participating actors, competitive auctions and deliberative or opportunity cost ⁹ methods, among others.
<i>Conditionality</i>	Condition that is respected if providers are remunerated only insofar as the targeted ecosystem service is effectively provided.
<i>Targeting</i>	The degree to which the payment to providers depends on the quality or quantity of ecosystem services provided. The payment can be the same for all participants (low targeting) or may depend on characteristics of the ecosystem, such as for example the kind or amount of ecosystem service provided, the risk of ecosystem loss and the costs for suppliers (high targeting).
<i>Additionality</i>	Condition that is respected if the ecosystem services being provided would not have been provided without the correspondent incentives.
<i>Transaction costs</i>	The costs associated to scientific research, negotiation, contract design, payment and control.
Actor categories	
<i>Providers</i>	The private agents, local communities or public managers who manage resources and directly or indirectly are able to maintain or enhance the provision of ecosystem services.
<i>Buyers</i>	They can be: 1) private citizens and enterprises; 2) public administration bodies, acting as representatives of the interests of society as a whole; or 3) NGOs and foundations.
<i>Intermediaries</i>	NGOs, governmental agencies or private enterprises that carry out the negotiation among providers and buyers and contribute to the PES programme design.

⁹ The opportunity cost is the benefit that is given up by choosing an action over another one. For example, if an actor decides to conserve a forest area instead of turning it into a wheat crop, the opportunity cost associated to this decision is the income that would have been obtained from wheat cultivation in the same area.

Table 2. Payments in the PES programme in the Catalan Pyrenees

Payment for the Pallars cow	Payment for the harvesting meadows
100 €/year for maintenance of each Pallars cow	320 €/year per hectare of subalpine meadows (between 1,600 and 1,800 meters).
150 €/year for maintenance of each Pallars bull	€ 284 €/year per hectare of managed mountain meadow for horses.
250 €/year for each calf rearing	€ 240 €/year per hectare of managed mountain meadows for cattle.
	€ 196 €/year per hectare of managed mountain meadow for sheep.