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Payments for Ecosystem Services

From Theory to Practice – What Are the Prospects for Developing Countries?

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À Savoir

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Abstract

Payments for Ecosystem Services (PES) cannnot be ignored today, when considering environmental and developmental policies. However, there is a considerable lack of clarity regarding their definition, leading to a number of misconceptions, such as the belief that any environmental policy instrument involving a money transfer constitutes a PES instrument.

In order to bring more clarity to the subject, this analysis first defines the special features constituting a PES. It is an instrument which aims at protecting the environment by bringing about changes in producers' farming practices and banking on their doing so voluntarily by offering them payments. It differs from prescriptive or coercive approaches, such as regulatory instruments where producers are required to pay in order to offset any negative environmental impacts caused by their activities. The archetypal approach consists of a voluntary, contractual and bilateral agreement entered into by a group of ecosystem service (ES) beneficiaries and a group of producers. Although there are numerous examples of this approach, a great number of PES systems differ, especially when payments are not requested from ES users aware of such payments and even more so when payments arise from mandatory taxpayer contributions. These distinctions have led to defining and illustrating a 'mapping' that places the different types of PES in relation to each other on the one hand, and within the scope of environmental public policy instruments on the other.

The study shows that the attractiveness of PES systems lies in their ability to mobilize economic agents, associative intermediaries, public bodies and finances. Their main features are pragmatic – in certain circumstances, they are able to provide functional, sustainable and profitable arrangements to partners. However, conditions for their widespread use remain problematic: dependency with regard to the State's regalian or sovereign powers; potential difficulties in overcoming the pilot project stage; the risk of numerous adverse effects, etc. Such difficulties hinder the PES system's potential to establish conditions that can effect profound environmental policy changes in Developing Countries, (DCs).

In conclusion, this study underlines the importance of PES systems, viewed as monetary transfers which form part of an already effective transfer network constituting a given area's economy, but which are far from being always consistent. In that sense, PES systems could help review the coherence of monetary transfer policies targeting environmental objectives in the perspective of effective sustainable development.

Introduction

The acronym PES, Payment for Ecosystem Services, is currently an all-pervading concept found in environmental finance studies and projects, as well as in forums where environmental and development policies are framed. It is used and debated by companies, political entities, non-governmental agencies (NGOs) and researchers.

At the very outset and as its name indicates, a PES simply means paying for the use of the services rendered by ecosystems. Three cases based on this principle, and so often cited that they have acquired the status of "urban legends", spring to mind: the city of New York, which pays to ensure the quality of its watershed area and therefore its water resources; the Costa-Rican government, which rewards forest owners for the services provided by the forests; and lastly, the Vittel company, which contributes to the conversion of the agricultural holdings located in its mineral water catchment area.

Although seemingly precise and functional, the PES concept gives rise to a certain number of questions:

- What are the concept's origins and the reason behind its success?
- What is so new in what it offers that would justify the interest it attracts?
- How does it compare to all other available environmental policy tools? How does it differ from other payment-based tools, such as compensatory mechanisms, penalty regimes or the financing instruments of environmental administrations? What are its expected qualities?
- Apart from "urban legends", are there any other noteworthy PES examples that are being currently implemented? What are the different shapes PES systems can take? What are their variables and constants?
- And finally, can PES systems be implemented as environmental policy finance tools on a large-scale level? What are their limitations and their potentially adverse effects? How can they be avoided?

This book hopes to answer some of these questions. To that end, it draws upon a critical review of the literature devoted to the subject, as well as five case studies and a series of detailed discussions that were conducted from June to December 2010 by the Agence Française de Développement (AFD), the French Global Environment Facility (FGEF) and by a scientific committee created specially for this purpose.

It is to be noted that this book is solely devoted to the study of biodiversity and water policies; carbon storage PES schemes based on reforestation are not included in its scope.. However, it does not exclude PES systems aimed at preventing deforestation, as these can act as biodiversity conservation instruments.

The first part of the book provides an understanding of the PES instrument and analyzes its place in relation to the existing variety of environmental and developmental policy tools. The second part presents an overview of commonly encountered types of PES systems and provides illustrative examples. The third part presents and discusses the advantages, the potential and the limitations of the PES approach as an intervention model for public policies.

1. What are PES systems and what is expected of them?

The answer to this question is not as easy as it may seem. Behind this seemingly simple principle of paying in order to benefit from ES (ecosystem services), there lies a great deal of confusion: can all mechanisms that involve payments for ecosystem services be termed PES systems? If that is the case, then what distinguishes PES schemes from others and what is the reason for their success? If not, what is the place of PES systems as compared to all other environmental policy instruments? Is it really possible to provide a general model, which would work for all PES systems and yet allow them to be distinguished from other environmental policy instruments? Finally, what advantages do they have to offer?

1.1. The PES concept's origins and the reasons for its success

1.1.1. "Traditional" policies decried as being inadequate

Since the 1990s, nature conservation policies, based on the sustainable development concept, have tried to incorporate social and economical objectives into their ecological vision. That was the underlying principle of the "Integrated Development and Conservation Projects" and "Sustainable Ecosystem Management Projects" initiated in the early 1990s (Brandon *et al.,* 1998; Margoulis and Salafsky, 1997; Hughes and Flintan, 2001; Frost and Bond, 2008).

However, by the end of the 1990s, it became increasingly apparent that like traditional policies, Integrated Development and Conservation Projects (IDCP) proved that they too were unable to prevent biodiversity erosion by themselves (Balmford *et al.,* 2003).

First of all, the projects were said unable to bring about lasting changes in land use, whereas an essential condition for biodiversity conservation is the capacity to effect such changes (Brandon *et al., op. cit.;* Rice *et al.,* 1997). Secondly, public financing for biodiversity conservation has remained woefully inadequate to achieve such an objective (Pearce, 2007). Thirdly, regulatory and administrative policies are often decried as far removed from the local issues and from local users (Damania and Hatch, 2005).

Finally, the projects led to a build-up of taxes and standards that were difficult to enforce (Economic Commission for Europe, ECE 2006).

The shortcomings of public policies aimed at biodiversity conservation therefore gave rise to considerable criticism, bringing four basic requirements to the fore, designed to address the shortcomings stated above:

1. The need to implement measures that would impact on land use
2. The need to mobilize new funding sources to compensate for low public budgets
3. The need to implement instruments at a local level and on a pragmatic basis
4. To do all this without creating new regulatory instruments.

It is not the subject here to endorse these critiques and diagnoses, but to observe that PES systems are put forward to meet these challenges (Redford and Adams, 2009). Firstly, they were based on the growing importance of the ES notion and secondly, some well-known successful examples had added to their reputation of success; and finally, the principles on which their action was based seemed to successfully address the shortcomings of public environmental policies.

1.1.2. Ecosystem services become a dominant conservation paradigm

Towards the end of the 1990s, along with the rejection of "integrated" tools and policies, (Jeanneaux, Aznar *et al.,* 2010), there was a heightened interest in ES. The usefulness of ecosystems to society, especially for economic activities, was becoming increasingly recognized. According to the concept's proponents, their utility made it possible to highlight the value of ecosystems better, in several ways – by making their value apparent and managing them as natural, service-providing infrastructure.

The idea was not a new one (Blandin, 2009) – as early as in 1926, for instance, the services provided to fishermen in the United States by its East Coast estuaries *via* their role in fish reproduction had formed the subject of an economic assessment report (Viosca, quoted by Vileisis, 1997; Adour-Garonne Water Agency, 2009).

The ES concept, which emerged in the early 1980s (Westman, 1977; Ehrlich and Ehrlich, 1981), became a full-fledged theory and gained in popularity towards the end of the decade (Costanza and Daly, 1987). Finally, by the end of the 1990s, the magazine, "Nature", published a co-authored article, written by Costanza, on "the value the world's ecosystem services and natural capital", which the authors calculated on the basis of the sum of the ecosystem services it provided (Costanza *et al.,* 1997). The fact that a large number of economic activities depend closely on the functioning of ecosystems and biodiversity was brought forward (Gomez-Baggethun *et al.,* 2009).

Some authors believe, for example, that the "natural components" in cosmetic and perfumery products account for USD 2.8 billion per year. The world-wide market for phytosanitary products derived from genetic material accounts for a figure ranging between USD 0.6 and 3 billion per year (Landell-Mills and Porras, 2002).

Finally, in 2000, Kofi Annan, then the U.N Secretary General, commissioned a global assessment of the state of the world's ecosystems, involving more than 1,300 researchers from over 90 countries. By focusing on the notion of function and service, this step paved the way for the 2005 ES approach (Millennium Ecosystem Assessment, 2005).

The ES concept therefore refers mainly to the utilization of the services provided by nature and natural resources. The utilization of services derived from water cycle management, forestry, biodiversity and landscaping are generally distinguished from each other. The Millennium Ecosystem Assessment (*op. cit.*) provides a more formalized classification, which distinguishes between provisioning services, regulating services, cultural services and supporting services [1].

This approach therefore emphasizes the fact that the economy and society derive benefits from the functioning of preserved ecosystems. However, conservation comes at a price – efforts must be made to restore, maintain and safeguard ecosystems so that they remain functional. This in turn leads to the necessity of paying those involved in ES conservation through their practices.

In this regard, the promotion of PES schemes has been boosted by certain historic examples that testify to the fact that schemes prove successful whenever a service beneficiary pays the service provider.

1.1.3. Examples that left a strong impression

Historically speaking, the establishment of instruments designed to pay economic agents for contributing to ES are characterized by two prevalent trends (Fournier, 2009).

In the North: Payments for farming practices compatible with safe drinking water

American farm subsidy policies that were initiated in the 1920s, which include paying farmers for their contribution to the environment, are sometimes seen as the origin of such payments (FAO, 2007; Baylis *et al.,* 2008). The agro-environmental measures

[1] Refer to the Millennium Ecosystem Assessment official website: www.maweb.org

instituted by the European Union's Common Agri-cultural Policy (CAP) in the 1980s constitute another example of PES systems; their scope was subsequently widened to include air quality and biodiversity (Claassen *et al.,* 2008). In 1985, the Conservation Reserve Program (CRP) of the United States, which paid farmers to let their agricultural lands lie fallow in order to combat soil erosion and the Environmentally Sensitive Areas Scheme, introduced in Britain in 1987, for the protection of ecologically sensitive areas are often cited as examples, illustrative of the functioning of economic instruments used for environmental protection (Perrot-Maître and Davis, 2001; Dobbs and Pretty, 2008).

In the South: Payments for benefits provided by forests

In countries of the South, PES systems were initially introduced for forest conservation, as can be seen in the case of Costa Rica in 1997. PES systems emerged mainly in Latin America, following the acknowledgement of the failure and shortcomings of traditional policies centering on regulating protected areas. These well-known systems, often started by an NGO, emerged in countries such as Mexico, Bolivia, Peru, and Ecuador, but mainly in Costa Rica.

Moreover, as mentioned briefly in the introduction, PES systems acquired a reputation for success, partly due to three success stories, often cited and regarded as hallmarks of environmental policy: New York, Costa Rica and the Vittel Company.

Success stories or three hallmark case-studies

ES as a means to save on curative expenses: the case of New York

The catchment areas of the Catskills and Delaware supply 90% of the water consumed by the city of New York. According to many authors, in the early 1990s, economic developments within these catchment areas led to a decline in water quality and New York city was faced with the following options in order to address the problem: *(i)* setting-up a water treatment facility, the cost of which would have been between USD 6 to 8 billion, along with an annual maintenance cost of nearly USD 300 to 500 million dollars; *(ii)* paying in order to reduce the agricultural, forest and domestic pollution occurring in the catchment area and to preserve water that could be used and without requiring water treatment, at a total cost of USD 1.5 billion spread over a 10 year period (*i.e.* five to ten times less expenditure). This preventive solution, far less expensive than the first and yielding similar results, was finally chosen by the decision makers. The scheme put into place currently finances preventive anti-pollution measures (*e.g.*: management of waste water and livestock manure, setting up of mechanisms against sedimentation). It is funded by a tax, incorporated into the water bill, paid by New York consumers (Chichilnisky and Heal, 1998; Barraqué, 2009; Hoffman, 2010).

The example is often hailed for demonstrating the financial advantages accruing from ecosystem preservation, and that collectively better solutions can be found by accepting the principle that users (in this case, the "rich" water consumers of New York) should pay for the services provided by economic agents (the catchment area's farmers and polluting upstream towns) so as "not to be polluted".

The environment as a resource for economic development: Costa Rica, a prime example of successful PES systems

The Costa Rican national Forest Law mentions four ecosystem services (ES) provided by forest ecosystems that must be exploited in a sustainable manner: climate change mitigation, biodiversity conservation, protection of catchment areas and conservation of landscapes. Since 1997, the "Pagos por Servicios Ambientales" program has been making compensatory payments to more than 4,400 farmers and forest owners to improve reforestation, sustainable management and forest protection. The payments take the form of multi-annual contracts (often over 20 years). New tree plantations, the development of related activities, sustainable felling, etc. are remunerated. A national Forest Fund ("Fondo Nacional de Financiamiento Forestal", FONAFIFO) was created to support this mechanism. Its funding comes from a tax on fossil fuels sales, incomes from hydroelectricity sales, World Bank loans and Global Environment Facility (GEF) grants (Pagiola, 2005; Steed, 2007; Fournier, 2009). This case was widely publicized by the World Bank, (Stefano Pagiola, in particular) as being an innovative and successful example of biodiversity management. Although the State was at the helm of the mechanism, it is to be noted that the funding was not provided through the country's budget but by means of a tax, specially created for this purpose. Moreover, the funds were intended to pay forest landowners directly so that they adopt sustainable forest practices.

ES as precious economic capital: the Vittel success story

Maybe one of the oldest cases to be cited in literature, the Vittel case exemplifies PES systems. By the end of the 1980s, the mineral water produced by Vittel showed an increased content in nitrate and pesticide levels. The company launched an agricultural reconversion program on the 5000 ha catchment area feeding its springs. The objective was to attain a nitrates content level of 10 mg/liter (as against nearly 40 mg/liter), and to eliminate all traces of pesticides.

In pursuance of this program, Vittel purchased most of the farmland and usage rights of the land located in the area where the mineral water was collected. Vittel then offered the land, free of charge, to interested farmers, on the condition that they adopted responsible farming practices, based on the recommendations made by the

National French Agronomic Research Institute (INRA, "Institut National de la recherche agronomique"). The practices consisted of:

- The complete elimination of corn crops
- Composting of all animal waste
- Limiting livestock to 1 unit [2]/per ha of the cattle grazing area
- Prohibition of utilization of plant protection products
- Only reasonable nitrogen fertilization primarily with composted manure
- New alfalfa-based crop rotation
- Modernization of farm and cattle-breeding buildings.

Moreover, Vittel paid EUR 228 per hectare per year to each farmer for a 7 year period, through Agrivair, an intermediary company, specially created for this purpose. Agrivair also provided free services to farmers in the light of the relevant technical recommendations (technical advice, composting and spreading of animal waste, etc.). The contract's duration period was 18 or 30 years. The program was estimated to have cost Vittel the equivalent of EUR 0.15 centimes per liter of mineral water, against an expense of about EUR 24.25 million (Perrot-Maître, 2006; INRA, 1997). As in the case of New York, Vittel is often described as an example of a "cost-effective" solution. It is interesting to note that it is a private and almost bilateral initiative, with direct contract-based links between the company, purchasing practices that meet its interests, and farmers who "sell" it the practices concerned.

1.1.4. PES systems: a logical answer

Hence, the nature of PES systems is revealed through its history and examples. They are mechanisms by which economic agents are paid to adopt environmentally friendly practices that maintain, produce or restore ES. However, there are some dissenting voices that contest the reality of these success stories (Sagoff, 2002).

Nevertheless, the three case studies held as successful examples of PES systems were able to provide solutions in areas where "traditional" policies were said to have failed, addressing the four "expectations" mentioned previously:

1. By turning environmental preservation into a remunerative activity, economic agents and local communities get involved; and yet, they are the ones who can guarantee proper land use. This is fully in line with the expression that is so often used to express a really pragmatic idea: "if it pays, it stays".

[2] UGB: Livestock Unit.

2. Furthermore, a PES system helps raise funds (which were not allocated earlier for environmental preservation) by paying ES beneficiaries.
3. A PES establishes a contractual relationship between economic agents, who agree to pay for practices that ensure the maintenance or restoration of ES.
4. It fosters close contacts among all those involved in addressing a given environmental problem and, therefore, holds the potential for a higher success rate as compared to other mechanisms. It provides a faster link-up between problems, solutions and concerned parties. It promotes functional, practical solutions, adapted to each local situation: it offers the advantage of a "shorter loop" as opposed to the numerous stages and intermediaries that generally characterize traditional environmental preservation policies.
5. And finally, by virtue of their contractual nature, PES systems do not add further regulatory or administrative instruments and do not further complicate public environmental policies.

However, the three examples cited already show that different possible cases can be found. For instance, in the case of Vittel and New York, the service beneficiaries (*i.e.* the water consumers, public or private) pay, but in the case of Costa Rica, the State pays forest owners, and the resources stem from specific levies for this purpose, but which are not directly connected to the ES.

In view of this variability, let us examine in detail what constitutes a PES system and the basic premise of its supposed qualities.

1.2. What are the principles underlying a PES system?

1.2.1. How are PES systems viewed by economic theory?

As a solution to a problem related to the public good externalities...

For "welfare" economic theories, environmental issues are generally viewed as "external effect" problems. External effects occur whenever one person's activities affect the situation of another, without the former realizing the economic impact of his behavior. External effects can be negative: negative externalities occur whenever the affected person suffers a loss due to the actions of another agent and is left uncompensated. External effects can also be positive – they occur when an individual benefits from the actions of a third party, free of cost. Marshall (1920), who introduced the notion of external effects, showed that a company located in what would nowadays be called an employment area enjoys numerous advantages due to

the activities of other industries located in the same employment area, such as the easy availability of skilled labor in the proximity.

In the environmental sphere, the East African example may be quoted (examined in the course of this study) – that of Maasai cattle breeders, whose cattle breeding practices promote wildlife: by maintaining large open areas for their cattle to roam, they ensure large grazing areas, suitable for other migratory ungulates (Zebras and wildebeest). Such migrations are characteristic of these ecosystems. Moreover, they are associated with an array of species of flora and fauna. Therefore, coexistence and a synergetic relationship between breeding practices and wildlife benefit both wildlife observers as well as tourism companies who depend on them as a source of livelihood (this reasoning does not take into account the more conflictual relations between Maasai breeding practices and wildlife, especially the fact that the Maasai hunt lions).

Taking the principle further, ES can be viewed as a special "external effect" case, called "common pool externalities". This is the situation that occurs when an individual generates a positive externality, but remains unable to avail exclusively of its benefits and is unable to affect the use other individuals make of it (Kemkes *et al.,* 2009). To come back to the example of the Maasai plains: the land is easily accessible to all and it is difficult to prevent any individual from benefiting from them, including for purposes of wildlife observation. Positive externality, brought about in this instance by Maasai cattle breeding practices, is called "non-exclusive". On the other hand, wildlife can be observed without disturbing others (depending upon the number of observers). The use of this positive externality is called "non-rival".

"Non-exclusion" situations (or at least, with difficult exclusion) and those of (almost) "non-rivalry" characterize common goods and constitute their external effects (Cornes and Sandler, 1986).

...Which discourages efforts and investments

According to welfare economics, the problem is therefore directly proportional to the difficulty of excluding an agent and the absence of rivalry among agents (Samuelson, 1954; Daly and Farley, 2004). If two agents are unable to exclude each other from benefiting from a resource and there is an absence of rivalry for its use, then neither one of them will work towards safeguarding or investing in the resource for its maintenance. The efforts made by one agent will benefit the other, without the other agent having to participate or contribute to it. For instance, if a tour operator decides to curtail his activities in order not to disturb the wildlife so much, on land used by the Maasai community, the others would in no way be obliged

to reduce their own environmental impact and will not be prevented from benefiting from his efforts. Hence, since none of the economic agents involved would be interested in investing and making an effort on their behalf, the situation would compel each of them to overexploit the resource and not work enough towards its preservation. In order to face this problem, it therefore becomes necessary to create special conditions that would enable the economic agents working for environment preservation to actually benefit from the results of their efforts.

Organizing a PES system presupposes bringing in rivalry and/or exclusivity

In order that the economic agent willing to undertake the effort can be certain of being able to enjoy the service that he is funding, and that his actions are not cancelled or even worse, offset by the negative activities of other agents, it is necessary to introduce a form of exclusiveness and/or rivalry.

In some instances, it is practically impossible to do so. A typical example is the atmosphere: if Europe reduces its greenhouse gas emissions, it cannot claim exclusive benefits, and it cannot avoid others, unwilling to make such efforts, from benefiting equally. In the same way, a hunter who decides to reduce the amount of hunting he does cannot stop other hunters from enjoying the benefits. If there is free access to hunting grounds, hunting in the countryside can neither be exclusive nor rival.

In other situations, the difficulty is of a lesser degree: either exclusivity is less but rivalry remains possible, or vice versa. It is therefore difficult to claim exclusive use of groundwater (low exclusivity), but the water consumed by one person cannot be consumed by another (rivalry). On the other hand, if it is possible to restrict access to natural environments, a certain level of exclusivity is possible without there being any rivalry regarding consumption. It is possible to restrict, for instance, the number of entries to a nature reserve but viewing of landscapes by a visitor does not, in general, lead to any rivalry between economic agents (Salzman, 2005). This characterizes "club" goods. In this context, neo-institutionalists, notably Ostrom (1990), are studying the conditions for the sustainable management of natural resources that are jointly owned and, in particular, factors that make it possible to bring in exclusivity.

Lastly, in a situation where both exclusivity and rivalry are present, the good is deemed to be "private". In that case, the trading rules are easier to define. Hence, the measures to be introduced in order to resolve the external effect problem of a common good are all those that introduce the notions of exclusivity and rivalry, which in turn will define the trading rules between the concerned agents. Such measures are, for example,

entrance restrictions, contracts, checks etc.

Once these conditions have been put into place, a PES system constitutes a special type of trading between agents: those investing or adopting environmentally friendly practices to conserve natural resources are paid by other economic agents, and later by those benefiting from these efforts (Shogren, 2005). When this is done, the relationship between the agents resumes its "normal" economic course (motivated solely by individual interests); through the workings of the PES system, the relationship between economic agents is therefore "internalized" or factored into their economic reasoning.

Table 1 presents four types of situations indicative of various degrees of rivalry and exclusion. Situations involving "public goods" are the most difficult for PES systems to work in. On the other hand, a situation where private goods are managed is the most favorable for the introduction of a PES system. The two other situations require innovativeness, the setting-up of institutions and the implementation of special measures; they correspond to public goods and club goods, mentioned earlier.

This explains why the first PES systems to be introduced and the most commonly found relate to water and forest management services. In fact, water resources by their very nature are a source of rivalry: they are exhaustible resources, which can deteriorate badly to the point of being unusable. Access to forest resources can also be restricted, in order to create exclusivity conditions and thereby regulate the market.

Table 1 *Classification of difficulties in internalizing external effects depending on the types of goods*

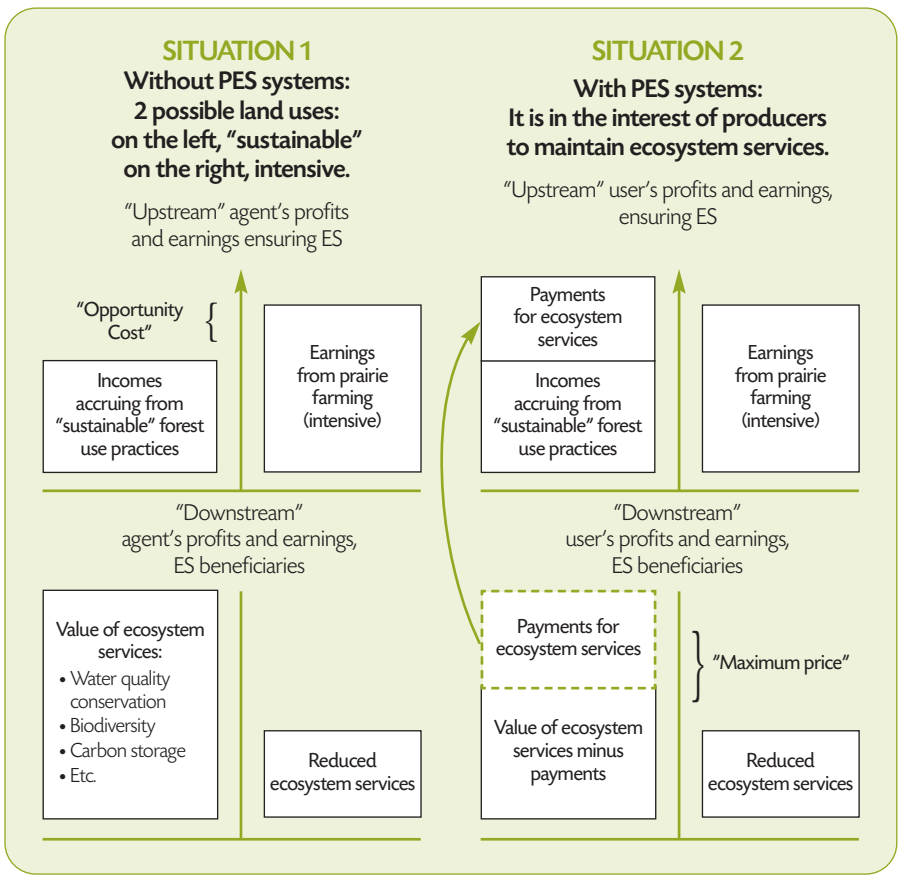
	Low rivalry	High rivalry
Lower possibility of exclusion	Public goods: Effect on climate, flood and water quality protection. Genetic heritage, landscape, esthetics, observation, cultural aspects, etc	Common property (community) goods: Forests and common land grazing areas, local water resources, etc.
Higher possibility of exclusion	Club goods: National reserve parks with restricted entry, etc.	Private goods: Harnessing flowing water, genetic patents, wood, forestry products, etc.

Source: Taken from Randall, 1993, and from Landell-Mills and Porras, 2002.

A PES system is a mutually beneficial transfer of wealth

A PES system can operate a transfer in conditions where exclusivity and/or rivalry are present. The transfer takes place between beneficiary agents "downstream" of service flows and "upstream" paid agents, and is able to ensure ecosystem management as well as provide services. The assessment of prices or services is supposedly based on the opportunity cost due to the conservation of the ecosystem providing such services (*cf.* Diagram 1). It means paying upstream agents to give up certain practices so as to benefit downstream agents (Pagiola and Platais, 2007). The maximum remuneration for services provided should not exceed the total value of the services for their beneficiaries.

Diagram 1 *ES payment diagram*



Source: Taken from Pagiola and Platais (2007).

In situation number 1, in the absence of a PES system, normal economic interests would compel upstream agents to choose , for instance, "intensive farming", shown on the right: conservation of prairie land under intensive agricultural use, yielding a higher short term income than if they opted for the choice shown on the left ("sustainability"). But in that case, downstream agents would lose out as their ES would shrink. It is therefore in their interest to pay upstream agents so that they can opt for the sustainable choice; that is situation 2 (PES). This creates a situation that benefits all: upstream agents benefiting from the earnings accruing from sustainable farming practices while being paid by downstream agents at the same time, the total of which supersedes their potential earnings from intensive agricultural farming. The downstream agents avail of a higher level of ES than they would have obtained in the case of intensive farming, as the amount they agree to pay is less than the loss of services they would have incurred (shift from left to right); they are thus in a better situation than they would have been in the case of intensive farming.

It is to be noted that the PES system is a "win-win" situation only when compared to that of intensive farming: the situation of downstream agents is better in the case of sustainable farming with no payment. It is then the right for the upstream agents to adopt different practices (economists call it "initial distribution of rights"), which forms the basis of the legitimacy of PES systems: if society considers that intensive practices are permissible and legitimate, the upstream agents hold the "right" not to give up more remunerative activities unless they are financially compensated to do so. Hence, the distribution of rights and legitimacy of the practices implemented are of utmost importance in order to determine the timeliness and the scope of PES systems. Finally, it must be noted that according to this reasoning, upstream agents do not themselves benefit from ES.

At this stage, PES systems seemed to be designed to counter the shortcomings of public bodies, especially financial shortcomings, in order to conserve biodiversity. Their objective is to develop a contractual and direct relationship between ES beneficiaries and the service-providing agents that condition the existence of such services. However, they require certain conditions to be put in place, such as the introduction of a certain exclusivity or/and rivalry and a minimum compensation of opportunity costs for the service providing agents.

It now remains to clearly state their specific characteristics, what defines and sets them apart from other environmental policy instruments.

1.2.2. What are the characteristics of PES systems?

How do PES systems differ from other policy instruments? Can any payment-based instrument for an ES be termed a PES system? There is evidently no "official" definition of PES systems and the issue can be viewed from many different angles. Based on the discussions conducted at the AFD, a "systematic key" is proposed below, which enables an understanding of the system's special features, in our view.

Two key notions have been used here to propose a clear distinction between PES systems and other economic instruments, while at the same time revealing their special characteristics:

- PES systems entail that the agent providing the service is not compelled to do so.
- And that changes in farming practices are brought about by incentive payments.

The ES agent providing the service is not compelled to do so...

As per the norms, the economic agent whose activities influence the life of another person shall be called the service "producer"[3]. This can occur when the agent's activities directly lead to the creation of the services, for instance a breeder using extensive farming practices which enhance the value of landscapes and introduce a more diverse fauna and flora. This is also the case whenever the agent's activities help in preventing or reducing deteriorating levels of ES; another such case is that of a farmer using water economically for irrigation purposes or a forest land owner practicing soft silviculture.

As opposed to many environmental policy instruments, PES systems are based on the producers' agreement and consent and not on any obligation. The vast array of environmental policy instruments reveal the existence of three situations which are characterized by regulatory instruments, economic instruments based upon a coercive approach ("polluter pays" principle) and economic instruments based on the producer's voluntary approach, without any coercive action. PES systems belong to the latter category [4].

[3] The term 'provider' is often used in the literature, which appears confusing in cases where the agent is paid to reduce pollution or end any illegal activity. The term 'producer' is less controversial and refers to the fact that economic agents, paid under the PES system, are mostly always producers in the economic sense of the term (forest land owners and agricultural farmers in particular).

[4] See, for example, Salomon (2002) for a review of public policy instruments.

- *Regulatory instruments.* In the case of regulatory or prescriptive policies, certain rules and regulations proscribing certain practices and/or behavior – such as: the hunting of certain animal species is regulated or forbidden, the release of a particular substance in a natural environment is restricted to below a certain concentration level, entry into certain areas is forbidden, tree felling is forbidden or restricted, etc. – are unilaterally imposed on a service producer by an authority endowed with regulatory powers.
- *Economic deterrence and coercion based instruments.* In case of economic instruments working on the principle of "the polluter pays", the producers' practices are targeted, in order to restrict these practices, and a payment is imposed: coercive means are always used with regard to producers (the payment is mandatory and the obligation is regulatory), but remain less direct and act through their economic deterrence effect. The amounts vary depending upon the producers, who may change or review their practices depending upon the price they have to pay.
- *Instruments based on producers' volunteering, without any coercive action.* In the case of PES systems, service producers are not compelled to produce the service. On the contrary, they are paid for it. An example would be that of a polluting company that gets public grants to carry out de-polluting measures, or a farmer paid to keep his land fallow under an agro-environmental program. The payment is made by the service beneficiaries or, in some cases, other economic agents standing in for them. In cases where the beneficiary is also the payer, then the PES system can be considered as a "beneficiaries pay" system. Such is the case when water consumers pay forest owners or catchment area farmers for adopting farming practices that ensure safe drinking water (see the case of New York, given above, or of Mexico, quoted below). However, in cases where economic instruments are funded by the State's budget, developmental grants or aid provided by international NGOs, payers do not necessarily benefit from the ES they are paying for. In the case of a PES system, irrespective of the funding sources used, ES producers are not under any regulatory obligations nor do they have to make any mandatory payments. So PES systems are far removed from compensations for residual effects that may arise from producers' activities and always stem from a compulsory mechanism imposed by law. In certain cases, under the PES program, payments are meant to persuade economic agents to stop committing illegal acts, thereby countering, to a certain extent, any failures of the regulatory approach. The Namibian wildlife conservancy case study (*cf.* annexed study no. 3), exemplifies such a situation, where wildlife poaching could only be reduced through payments for certain ES production activities related to the presence of big game.

Why should the service producer be paid?

It is to be noted that the principle of the polluter having to pay was, initially, far from being a moral principle; it was just one possible option among many others, to address the problems created by external effects (Godard, 2002).

In fact, three reasons justify the fact that the agent who produces the service is entitled to payment and that he alone does not have to bear the costs of producing the service or undertaking activities to protect it:

- *He is not solvent* and would be unable to bear the cost of maintaining the service concerned by himself (a frequent case in PED systems)
- *He is able to oppose, via* political action, the imposition of obligations and payments, and/or because society gives him some right to pollute or spoil the environment
- *Practices required for service production are not mandatory* and he is allowed to adopt other farm practices, even if they pose a threat to the maintenance of the services concerned.

...and changes in practices are obtained by means of an incentive payment

The PES is an "economic instrument" – *i.e.* a mechanism designed to affect the behavior and practices of an agent by means of a payment. The aim is to either maintain practices (for example, extensive farming practices) or to ensure that a change in practices is brought about (for example, by paying villagers to stop poaching activities or farmers to stop polluting the countryside; paying farmers to shift to organic farming, forest landowners to adopt different practices or cacao growers to grow their crop under forest cover, etc.). In the vast majority of cases, the incentive is aimed at economic agents who are also producers (agricultural farmers, forest landowners, sometimes other companies, etc.). In theory, consumers (of water, leisure activities, etc.) may also be paid for changing their practices. However, such cases are rare and we did not come across any. We will therefore consider only producers here.

The PES system works on the basic principle that a shift in practices is to be obtained by means of a payment. It differs from payments aimed at funding administrative, managerial and coercive systems, which can also affect ES, but indirectly (*e.g.*: nature or wildlife reserves, guards, administrations, inspection and control systems, etc.). So for example, paying a poacher to stop his poaching activities and instead to play a role in protecting wildlife means using an economic instrument of the PES type (see below, our case study on Namibia). On the other hand, the decision to pay forest guards to prevent poaching or funding an entire nature reserve means financially supporting a regulatory conservation policy, based on coercion. The payer may be

the beneficiary of a service (for example, when the admission fees to nature reserves finance its management); however, in that case, the payment does not constitute an economic instrument but, rather, a regulatory instrument, which shall not be examined here with the PES cases studied.

Another instance of a PES is paying a farmer to shift to more compatible ES farming practices (organic, water saving system, etc.). But funding a water police to control waste water discharge from farms does not constitute an example of a PES, despite the fact that the beneficiaries fund the service through their water bills. Another example: expenditure incurred by public bodies for maintaining or restoring the natural environment do not constitute a PES, even though the resources to do so may come from the ES beneficiaries of the said environment.

So in the case of PES schemes, what changes in practices does the payment "purchase"?

It may be said that it is always or almost always intended to bring about a change in practices. In most cases, it is not aimed at eliminating, excluding or forbidding an activity but at providing a payment in order to bring about a shift in production modalities or even in consumption: producing with fewer polluting agents or less water, foregoing slash and burn cultivation, cultivating under forest cover, organic farming, safeguarding wildlife through extensive farming, etc.

PES schemes can therefore be defined as an economic instrument designed to bring about a shift in the producer's practices by means of payment and without using any legal constraints or prescriptive norms.

This definition may seem somewhat restrictive[5] in view of the current burgeoning of references to PES systems to characterize projects in the environmental field. The aim is not to restrict the scope of the study here, but to distinguish – from among the enormous variety of environmental instruments – the ones that are designed to reinforce the action of existing instruments from other more innovative instruments, which will be examined and assessed here.

[5] Especially since it excludes mechanisms through which users pay for environmental protection activities, such as the administrative management of protected areas, anti-poaching measures, surveillance, etc.

Table 2 *Types of instruments and position of PES systems*

Situation of producer / nature of the instrument	The producer is compelled	The producer is induced
Regulatory and administrative, instruments etc.	Standards, rules, regulatory thresholds, environmental police, administration of parks and upkeep, etc.	Support policies to increase use of sustainable practices (for organic farming for instance) and raising awareness (against poaching activities or overexploitation of groundwater, for example).
Economic instruments (payment brings about a shift in practices)	Economic instruments: "polluter-payer" principle. Examples: general tax on polluting activities (TGAP-*Taxes générale sur les activités polluantes*); negotiable pollution permits; fee imposed on water retailers and calculated on the basis of pollution (and used to finance de-polluting processes of taxpayers); ecological compensations, carbon compensation and banking [6].	Economic incentive instruments. Category best corresponding to PES. Example: Vittel, New York, Costa Rica, agro-environmental measures, and all PES systems examined in this study.

Source: Authors.

1.3. How does a PES scheme work?

On the basis of the definition given above, here is a diagram showing the operation of a PES system.

An agent or a group of economic agents, generally called "the beneficiaries", derive benefits from an ES.

A "payer" or a group of payers, pays for the service concerned. As payers and beneficiaries can be the same or different, depending upon the situation, a distinction has been made between them in this study. Depending upon the payment's reason and source, the payer may belong to four groups or basic categories: taxpayers, consumers, donors and producers.

[6] Ecosystem measures are "sold" by operators to developer contractors, who purchase them in order to fulfill their environmental duties.

The payment can be either voluntary or mandatory; furthermore, the payers may be involved with a homogenous or heterogeneous group, depending upon whether they share a common interest with the group with regard to the ES concerned.

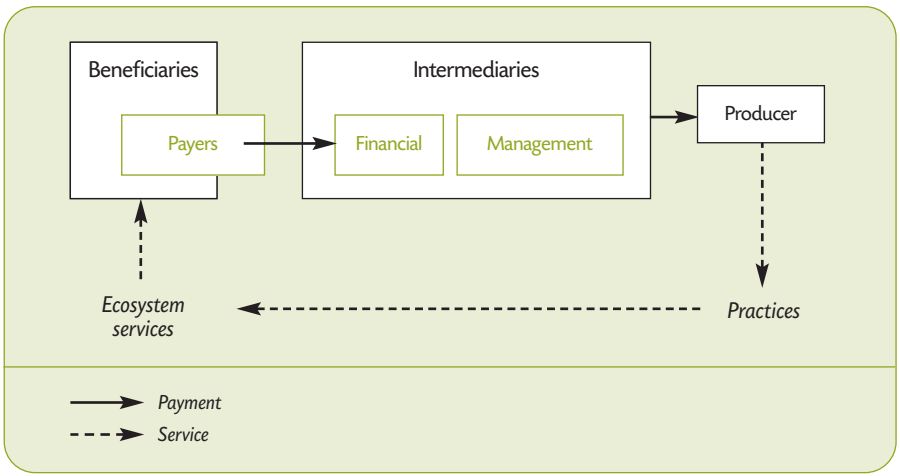
- Taxpayers pay for the use of an ES through subsidies, drawing upon the general budget, funded by their tax money, based on a mandatory levy. For this purpose, they may be associated with a group of heterogeneous payers.
- Consumers pay for an ES by purchasing it; the purchase may be a voluntary act (for example, the purchase of a certified organic product) or a mandatory one (for example, a mandatory levy on water bills to pay forest landowners for the watershed services they provide by maintaining the upstream catchment area). In this case, the group of payers may be associated with a homogenous payer group, bound by their purchase of the service.
- An ES can be paid for through donations. Donors are viewed here as a heterogeneous group of payers.
- Lastly, the final group comprises of one or many producers paying an economic agent to ensure the maintenance of an ecosystem service that they require for their livelihood (for example, Maasai cattle breeders paid by tour operators). In the last situation, the payer group may be viewed as a homogenous group.

The ecosystem service depends upon another economic agent's practices; the latter is termed the "service producer" and is sometimes called the "provider" (Kremen, 2005).

The payer pays the producer in order for the latter to adopt practices compatible with the maintenance of the ES.

Finally, "intermediaries" may also be involved in the scheme. These include all the institutions that have the funds and distribute them and/or create the conditions for the scheme to be able to function (Governments and public bodies, NGOs and associations, and in some cases, even companies, etc.). A distinction must be made between the "financial intermediaries" (collecting funds from various sources and allocating them to the service producers) and the "management intermediaries" (which take care of the implementation of the project or "facilitate" it, or even those who exert their influence to create, steer and technically support projects, etc.). In some cases, the same organization undertakes both functions (for example, an NGO that funds and manages a PES system); at other times, the functions are separate (for example, a public subsidy allotted to an organization, which is in-charge of managing the PES scheme). Diagram 2 presents these basic elements, to help understand and distinguish between various types of PES systems.

Diagram 2 *General diagram of a Payment for Ecosystem Services*



Source: Authors.

1.4. Typology of PES systems

1.4.1. An archetypal model: contractual PES schemes

Based on his experience in Bolivia and Vietnam, Wunder (2005) was the first author to propose criteria defining PES systems. A PES scheme is therefore a system that is:

- Voluntary (the payer must make a conscious decision and agree to make the payment)
- Aimed at availing of a clearly defined service
- Organized between at least one payer and a provider (the relationship is bilateral and direct)
- Accompanied by specific conditions: it is "conditional".

However, studies have shown and Wunder has admitted (2005 *op. cit.*) that such a configuration is extremely rare and criteria such as these are rarely to be found within one and the same scheme. In fact, some instruments depend upon mandatory levies. Therefore, they are not voluntary, as seen in the cases of Costa Rica and New York mentioned earlier. Some payments are made in favor of the State and have no bilateral or direct connection to the service. Other payments are designed to generally promote land use favoring the conservation of an ES, without clearly specifying it. Finally, many others pay producers without being bound by any specific conditions.

These four criteria may therefore be viewed as defining an archetypal PES model, corresponding to contractual instruments, which are called "market based" [7] (Vatn, 2009). The famous Vittel case meets all of the criteria of a PES system: it is voluntary, bilateral and involves a clearly determined and conditional service.

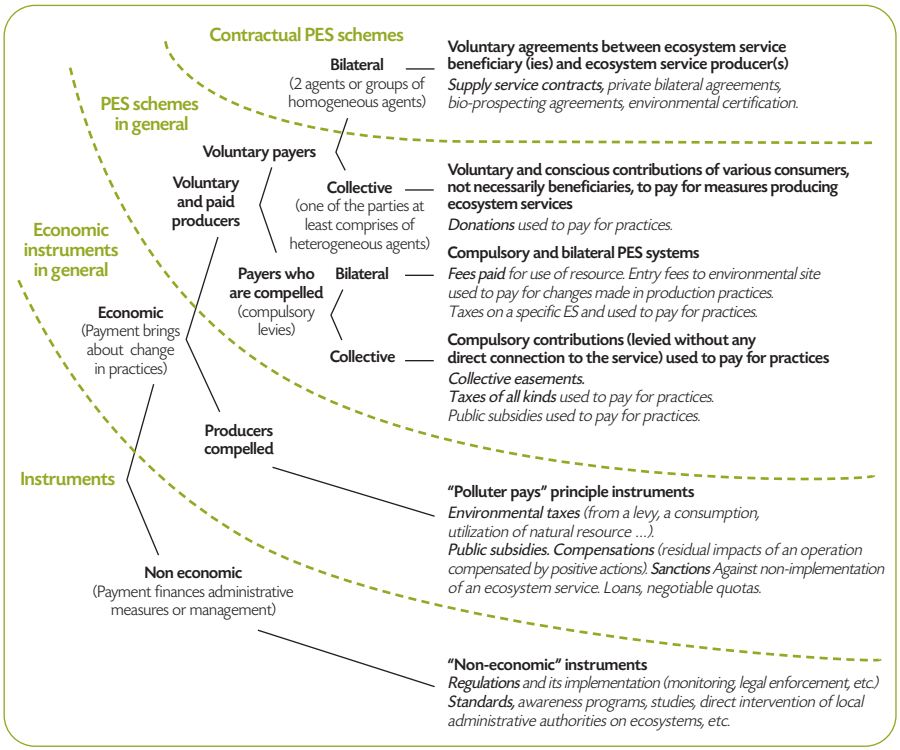
1.4.2. Around the archetypal model: different types and mapping of PES systems

We will therefore use Wunder's criteria not so much to define a PES system but to draw up a PES typology map, starting from administrative instruments and leading up to a contractual archetypal model.

All of the elements viewed so far (economic distinction or not, producer acting voluntarily or compelled to do so, heterogeneous or homogenous group) can be used to draw up a map, showing PES systems in relation to the large number of environmental public policy instruments. The map also compares various PES types in relation to each other. The presentation is designed to focus on PES systems and economic instruments. "Non-economic" instruments visually occupy a smaller space. However, it must be remembered that the latter category includes a potentially far larger and more numerous gamut of tools and instruments than is shown here, as it involves joint action on the whole, apart from economic instruments.

[7] If it is truly an exchange between a supplier and a demander, and the conditions for the trade determine the price and quantity, the term "market" does not always seem to fit in with the institutional and semi-public nature of many PES systems. Instead, we have called them "contractual" here.

Diagram 3 *General mapping of environmental public policy instruments, PES systems and variations*



Source: Authors.

1.5. What are the supposed advantages of PES systems?

As mentioned earlier, PES systems are playing a greater role in biodiversity management policies as they are situation-specific and theoretically present a certain number of supposed and expected advantages. They are briefly mentioned here: the following sections shall examine the reality of these advantages, especially the conditions required for PES systems to be able to effectively meet these expectations.

1.5.1. A context of targeted and complementary implementation

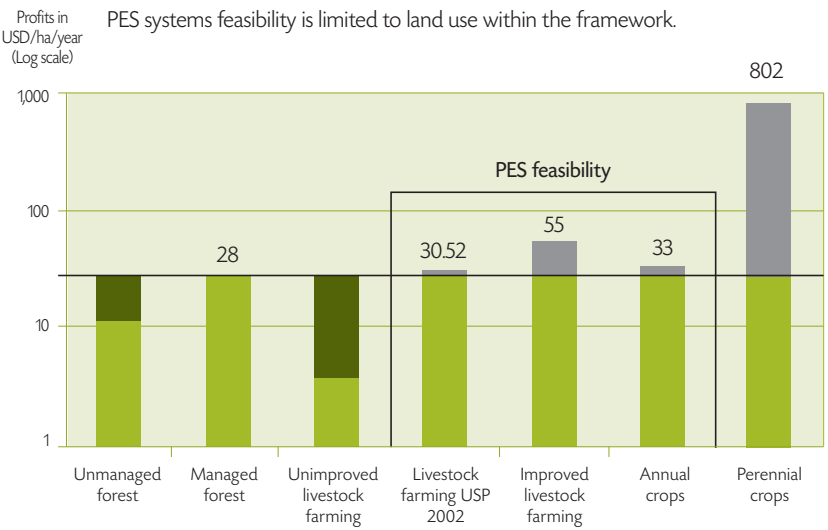
A PES scheme is designed to address a particular economic situation in which the changes envisaged must neither be too expensive nor too cheap. To induce an agent to

forego highly intensive and remunerative practices would, in fact, call for a substantial amount of financial resources, enough to cover the opportunity costs.

These schemes are therefore only possible on a restricted size and scale, unless abundant financial resources are at hand. In general, whenever economic pressures are strong, coercion and law enforcement are used as regulatory measures. On the other hand, whenever only a slight shift in practices is required, other means (information, awareness-building, etc.) are sufficient to bring about these changes.

PES systems therefore work as supplementary instruments to regulatory mechanisms and awareness-building tools. They are effective in situations where slight inducements do not work but which do not require strong, regulatory action. Their scope is limited to situations where adequate financial means are available to cover opportunity costs, acting as an acceptable incentive.

Graph 1 *Example of a PES feasibility analysis in terms of land use in Brazil, between perennial crops (outside the PES scope of application) and standard cattle rearing (not requiring an instrument)*



Source: Wunder (2005).

1.5.2. The advantages of a bilateral or direct relationship

One of the biggest advantages of a PES system lies in its "direct" nature – it binds the beneficiaries to the producers and does its best to limit the number of intermediaries, preventing wastage and the scattering of resources. These schemes also ensure the implementation of locally adapted measures as well as the involvement of the actual agents concerned and responsible. These are the supposed advantages of such focused interventions and the direct "loop" (Börner *et al.*, 2010). PES systems offer higher cost-efficiency, for instance, and produce more significant real effects, as they are designed to act in a very specific, targeted manner although their costs may exceed those of a "scattered" policy (Wünscher *et al.*, 2008).

1.5.3. The power of mobilizing additional resources

PES systems are reputed for mobilizing additional means which would otherwise be difficult to obtain in other ways. They enable an improved channeling of funds, increasing their effectiveness and prevent funds from being held up due to administrative delays. Hence, PES systems are viewed as innovative mechanisms, able to motivate agents that are usually least concerned or barely interested in environmental conservation. They can be used as valuable mechanisms that make it possible to leverage the provision of services while enhancing their value and to optimize the demand for services. (Wunder, 2008 *op. cit.*).

1.5.4. Lighter control mechanisms

The fact that PES systems are based on agents volunteering to adopt them promotes the effective implementation of measures. The need for control mechanisms is therefore reduced in PES systems; the only checks that need to be made are verifying that the binding agreements between the parties are being upheld. As a correlation, fewer sanctions and legal measures are required; instead, there is the threat of the payments being stopped in case of non-compliance with the contract.

1.5.5. Reinforced conditionality

The principle of exchange or trading between the provision of a service and payment for it, naturally leads to a higher standard of environmental requirements than is the case ordinarily with regulatory instruments or taxes imposed on the principle of the polluter pays. As the latter instruments are more generalized, centralized and removed from the actual field area concerned, they are less likely to successfully address specific local issues. On the other hand, the stakeholders in a PES system enter into

a clear, contractual agreement, with a specific objective to be attained and are likely to achieve more successful results than would have been the case with traditional instruments (Wunder, 2005 *op. cit.*).

1.5.6. Reduced transaction costs

As PES systems involve just a small number of directly affected agents, working towards resolving local issues, they make it possible to optimize resources and, in most cases, to prevent large-scale institutional and real estate changes. They hold the advantage of simplicity as compared to the traditional public policy instruments enforced at the national level.

1.5.7. A role in the fight against poverty

PES systems are often presented as exemplary because they seem to operate a transfer from the "rich" to the "poor": rural upstream catchment areas financed by New York City, Vittel region farmers converting to other farming practices, benefiting from the investments made by the multinational, Costa Rican forest landowners paid by the oil and hydro-electrical sector, etc.

As we have seen, PES systems are suitable in situations where the opportunity costs to be compensated for are not too high. However, while that may be the case, the activities concerned are not highly remunerative. It ensues that this instrument works well in situations where there are more underprivileged social groups coexisting with environmental problems.

From this standpoint, it appears that PES systems constitute an attractive model (Pagiola, 2007), ushering in certain expectations by bringing in new capital, creating new environmental activities or supporting areas with a lower population density that are still preserved. By providing a new source of activities and income to the "poor" farmers in areas that are still environmentally preserved, by converting them into "service producers" of a kind, PES systems are able to improve their economic situation. This characteristic of PES systems shall be examined further on in the document.

1.6. Conclusion

This first chapter has revealed the need to adopt a clear definition of the PES concept, in order to underline its special characteristics and its ambitions on the one hand, and to situate these systems in the complex world of public policy instruments on the other. Otherwise, the concept's success may lead to all payment-based environmental policy mechanisms being wrongly described as PES systems.

The definition proposed here presents PES systems as an economic tool by which a producer of ecosystem service(s) is paid to voluntarily undertake certain practices in order to maintain ecosystem service(s). By underlining the "non-coercive" factor and economic nature of the instrument, we discover its potential strengths, weaknesses and the possibility of numerous variations.

The success of the concept lies essentially in the fact that PES systems give rise to the hope of countering the recurring difficulties faced by environmental policies, with a re-allotment of roles by which public responsibilities fall under State competencies while initiatives, financing and the determination of the environmental objectives are awarded to civil society. This configuration appears attractive due to a considerable number of expected advantages, based mainly upon the contractual agreement model: specific selection of the objectives to be achieved thanks to a direct relationship, simplification and adaptability to local circumstances, reduction in administrative fees and costs, etc.

Apart from the three celebrated cases that serve as reference points in this study, examples of so-called PES schemes currently abound. There is abundant documentation in this regard. Chapter 2 presents a more detailed analysis, based upon the mapping proposed, and provides more reality-based content to the analysis that has just been presented. Chapter 2 lays the grounds for the critical analysis (Chapter 3) of PES systems, viewed as models for environmental and developmental public policies.

2. Illustrated overview of different types of PES

Providing a PES typology is no easy task as the typology is based on multiple criteria. Drawing upon the classification factors presented in Chapter 1, this chapter presents an overview of different types of PES encountered within the large range previously defined.

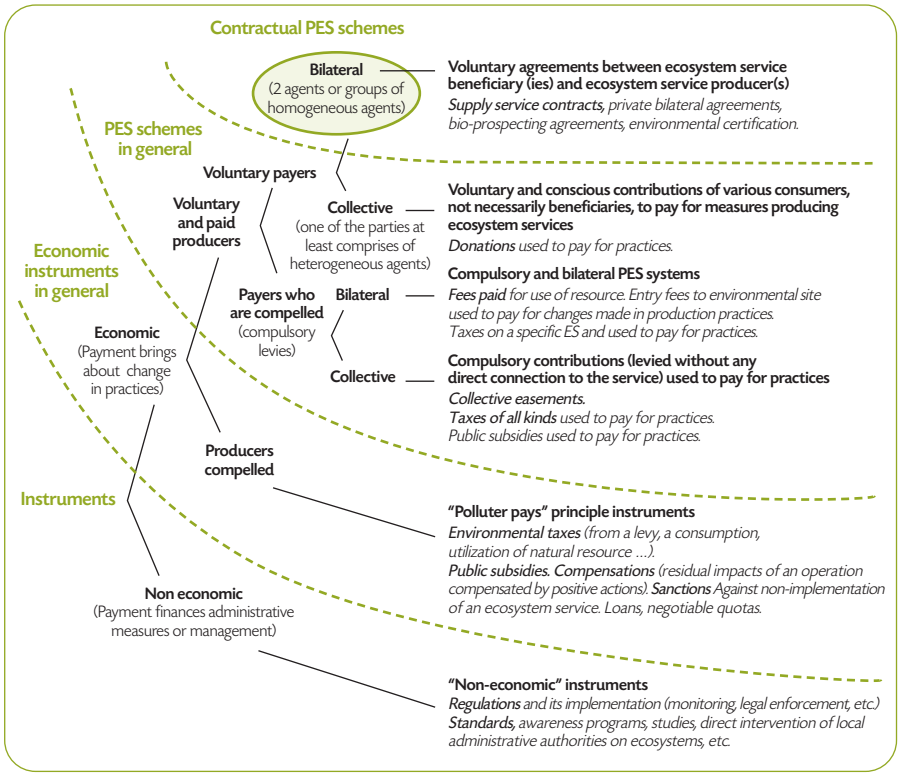
What are the concrete applications of the PES concept? What do they have in common? Can examples be as easily provided for each of the PES categories? What are their strengths and weaknesses? These are some of the main questions that this chapter seeks to answer. It aims at characterizing, describing and illustrating these different PES "models" in order to provide a better understanding of the subject and the scope of application of such systems.

Starting from the archetypal contractual model, this chapter successively presents each of the four PES sub-categories:

- Voluntary and bilateral PES (archetypal model)
- Voluntary and collective PES (financed by donations)
- Compulsory and bilateral PES (financed by fees paid or earmarked taxes)
- Compulsory and collective PES (financed by national government budgets).

2.1. "Voluntary and bilateral" PES systems

Diagram 4 *Position of "voluntary and bilateral" PES systems*



Source: Authors.

The archetypal PES model is a voluntary agreement, entered into freely by two parties, both of whose interests clearly lie in regulating the ES (ecosystem services) relationship between "downstream" agents and "upstream" agents. Three variations fall under this category, for which examples can be found:

- Private contracts binding two groups of economic agents
- Special case of "bio-prospection" agreements
- Environmental certification (which, on closer examination, also has the same characteristics of this model).

2.1.1. Private contracts and bilateral agreements

These are situations in which a user (or a group of users) of natural resources pays voluntarily for measures that ensure the provision of the ES he uses. The service "producer" enters voluntarily into this relationship based on the principle of exchange. He is not obliged to adopt ES friendly practices. In this sense, the economic relationship established between the two is relatively direct, even in cases where there is an intermediary between the ES user and the ES provider (which is often the case).

Contracts and private agreements bind two separate economic agents or groups of homogeneous agents (example: power-plant operator and a group of farmers; a group of travel agents and a community of livestock breeders; etc.). Such an initiative may be characterized as being private. State authorities are therefore no longer required to directly intervene in environmental policy, but – and this is significant – they have to provide the conditions for the proper functioning of contractual relations: property rights, justice and policing, law enforcement and sanctions, stable regulations, etc. As mentioned in the conclusion to the previous chapter, this could potentially constitute a relative "withdrawal" on the part of State authorities and of environmental protection public policies, leaving the door open for private actors. However, public actors also need to accept the idea. (Smith *et al.,* 2006).

Some easement mechanisms, when they provide for payments for production practices, may be called PES systems. The literature devoted to the study of PES systems takes them into account for that reason. They constitute a special type of bilateral agreement, which is a voluntary contract binding the owners ("licensors") and those wishing to protect or expand certain natural ecosystems (right "holders"). The licensing landowner is paid to carry-out land conservation measures as per the holder's requirements. More specifically, these measures may consist of land use restrictions or compulsory land management practices. This makes such measures an "easement", as such agreements are then connected to the property (the "immovable property"), and are passed on with it: *"the holder, licensor or any subsequent property owner is entrusted to fulfill the positive or negative duties related to the immovable property"* (MAP, 2009). Landowners who sell or gift an easement retain all of their other property rights, including the right to sell. Even though the literature devoted to studying PES systems clearly mentions this system, it must be noted that very few examples of bilateral and voluntary PES easement systems, in the true sense of the term, are to be found in reality (*i.e.* obligations attached to the land which bind private parties). We did not come across any, at least not in any developing country (DC). Even in the East African example (*cf.* Box 1), despite being termed "easements", contractual obligations are not attached to or passed on with the transfer of land.

This paragraph examines contracts in which the service "buyers" are households or companies, occasionally constituting a group. Whenever (as is often the case) State authorities or NGOs undertake an easement, the instrument falls under another PES category ("collective and compulsory", as long as the State finances the scheme, and "collective and voluntary" in cases where the payer is an NGO, funded through donations).

Illustrative examples

First of all, the example of the Vittel case presented in Chapter 1 can be mentioned. It corresponds to the archetypal PES model, which is defined as voluntary (the financial contributions used for payments are voluntary) and bilateral (both "parties" are homogeneous economic agents: on the one hand, a company and on the other, a farming community).

Wildlife conservation contract in East Africa (Conservation Easement)

Among the case studies undertaken for this study, one of the PES systems examined is a case of bilateral agreement in Eastern Africa (kept anonymous here at the request of some partners of the project). The project was launched by a tour operator, an hotelier, a conservation consultant and an elephant researcher. They all reached the same conclusion: *(i)* governmental policies for wildlife environmental protection are ineffective; poaching activities, in particular, were hardly curtailed; *(ii)* nature reserves, despite being well protected, were unable to ensure the proper functioning of ecosystems and did not allow for the zebra and wildebeest migrations that contribute to the ecosystem; *(iii)* the cultivation of lands bordering the park tended to increase due to farmers coming from other regions who were gradually replacing the Maasai cattle-breeders.

As a result, the group of tourism operators, acting through a local NGO serving as an intermediary, offered a simple business deal to a nearby village council: a yearly payment of EUR 2,500, on condition that the village protected its lands from any attempts to convert it for farming.

A five year contract was signed with the village, which remained the sole owner of the land (the land is collective property in in the country and cattle breeders do not hold individual ownership rights over grazing areas). The village accepted the agreement (it was signed by all the village council members) and the first yearly payment amount was used by the village council to go to court and retrieve their property rights over land that was being illegally farmed by a foreigner who had appropriated the land. Although the contract is viewed by all stakeholders as a conservation easement, it does not possess the legal attributes for one; the contract is not connected to the land.

This example is interesting as it illustrates the "archetypal" trading model: it is indeed a private initiative, even undertaken without the knowledge of local administrative authorities (the parties were apprehensive of misappropriation of funds and corruption if the latter were officially informed and became involved in the process). It was worked out as an ordinary business deal. All the parties involved claim that they were motivated purely by their own economic interests and not any altruistic reasons: in this case, biodiversity attracts the highest-end international tourism and for some regions, represents a major, if not essential, source of livelihood.

However, it is to be noted that other actors were also extensively involved: an elephant researcher, an NGO consultant, an NGO promoting local governance, etc. In truth, the villagers readily accepted the agreement because the NGOs offered a second agreement at their own expenses (mainly funded by donations from the United States) providing for the employment of four anti-poaching village scouts. Moreover, the system worked because the court judgment was awarded in their favor, and there was hardly any expenditure and no corruption (see full Case Study No. 2, annexed to the present).

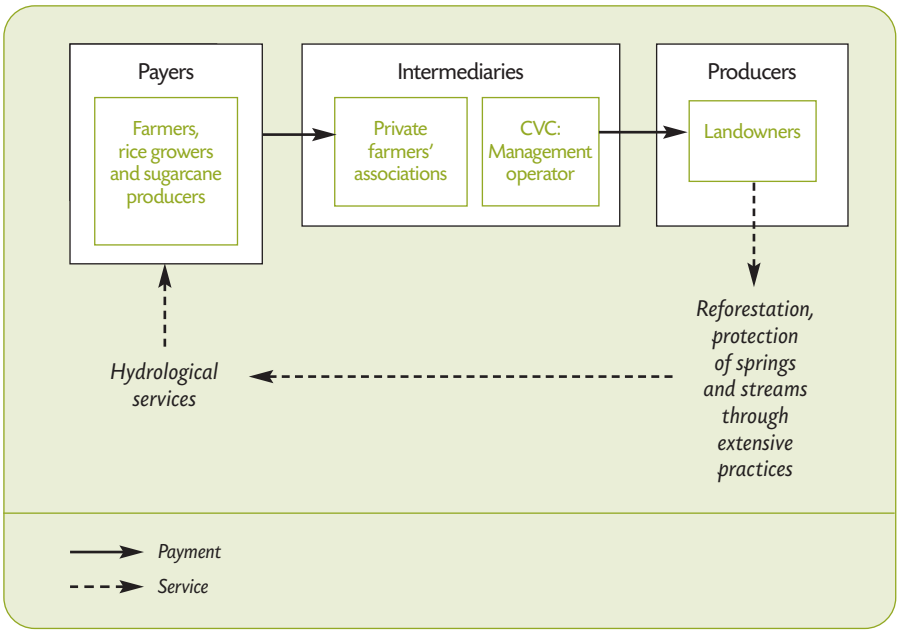
Protection of the natural resources of the Cauca Valley in Colombia

The Colombian government had created the Cauca Valley Corporation (CVC) in order to ensure the region's development and protect its natural resources. The primary aim of the CVC was to ensure equal water distribution among the various consumers in the valley and to manage the upper catchment areas. However, consumers and especially farmers were faced with increasingly acute water shortages, brought on by a high level of demographic growth and increased economic development.

The CVC did not have sufficient funds to address this situation. Therefore, rice growers and sugarcane producers' associations decided to levy an additional fee, the proceeds of which were used to promote extensive upstream watershed farming practices. The objective was to increase the minimum water flow level during the dry season and to reduce sediment deposition in the irrigation canals. They decided to work closely with CVC as they were not authorized (as private associations) to carry out watershed management plans. The additional proceeds collected are given to CVC by farmer associations. The money is used, with the help of landholders, to finance reforestation and anti-erosion schemes and to conclude upstream watershed resource protection agreements.

According to Conservation Finance Alliance (2008), the initiative proved successful and the program seems to have helped in stabilizing the watershed and increasing water flow.

Diagram 5 *Scheme implemented in the Cauca Valley*



Source: Authors.

Conservancies in Namibia

The Namibian Community-Based Natural Resource Management or CBNRM program (examined for this study) spearheads the government's national program for sustainable development. This program is based on granting exclusive rights to the use of natural resources to State-accredited "conservancies".

These conservancies, which take the form of associations, are invested with legal authority and financial autonomy, and operate within clearly defined geographic areas. They have a governing body and an equitable benefits distribution plan. They conduct their activities (trophy hunting, bush meat trading, green tourism and visual tourism[8]) by entering into contracts with specialized local operators.

The contract clearly states the terms and conditions as well as the duties of the parties, which are defined at the national as well as local levels. The services are paid for by the

[8] Tourism aimed at wildlife watching or viewing landscapes.

end users (trophy hunters, bush meat consumers or tourists) through the operator, who acts as an intermediary; the amount and terms vary, depending upon the service provided.

All the net income arising from these activities (including tourism activities) after payment to the operator, are handed over to the conservancy, which uses the money to fund community projects and/or redistributes it among community members, as per the utilization principles agreed upon at the time of the application for approval. Regulatory safety mechanisms set up by State authorities and internal control systems implemented by the conservancies ensure the proper execution of contracts. The contractual system includes cancellation clauses in case of non-compliance by the contracting parties.

Moreover, local communities retain their right to hunt bush-meat for their own consumption: they are also allowed to develop related activities, such as honey production, harvesting of plant fiber and gathering of aromatic and medicinal plants. These activities are also governed by sustainable resource management regulations.

Private and public interests are closely intertwined. In fact, government authorities oversee project-creating activities by accepting or rejecting local applications for setting up conservancies, determining hunting and levy quotas, as well as ensuring the ex-post monitoring of activities and even taking administrative actions against any non-compliant parties.

It is therefore a rather atypical method; state authorities oversee the "PES" mechanism without intervening directly in it, allowing private operators to run it, operating under the terms of a private contract and on a principle similar to that of a public service concession[9].

Features, strengths and weaknesses of private contracts and bilateral agreements

It must be stressed that even in examples which conform to the archetypal contract model, purely private actors (companies) and "non profit" actors, even partly state-controlled (NGOs) intervene in the process. They work closely together and are virtually indistinguishable.

Moreover, most of the examples corroborate the fact that this type of PES often occurs due to the ineffectiveness of government initiated environmental protection

[9] See the complete case study in Appendice No. 3, prepared and drafted by Hervé Léthier (EMC2i).

measures (for example, curtailment of poaching activities or the corruption that plagues public systems) but that its effectiveness depends on the State's sovereign functions, especially law enforcement and monitoring the implementation of standards and regulations.

Bilateral agreements and easement measures are often viewed as being effective and sustainable in literature (FAO, 2007). Since the service users make payments directly, they can oversee the proper use of funds. However, some NGOs remain doubtful regarding the use or generalized use of voluntary bilateral methods as environment regulatory measures. (Monnery, 2009). They fear that this kind of scheme will lead the industrial sector to assume a larger role and position in such mechanisms. According to them, voluntary agreements would allow industrialists to "hoodwink" and evade tougher environmental measures. Companies would rather undertake minimal environmental efforts voluntarily, to avoid having to implement stronger regulatory measures. This criticism of potential "Greenwashing" actions has been levied against many private companies involved in operating and marketing natural products or services.

Some authors also raise ethical questions as this scheme allows a private beneficiary to take over a service provided by nature which, they claim, should benefit all (Fournier, 2009; Monnery, 2009).

Regarding easement mechanisms, they have their own limitations, mainly in developing countries (DCs), due to the difficulty in identifying the legal property owners. According to the United Nations Food and Agriculture Organization (FAO, 2007), 84% of forests worldwide are public property. However, in many developing countries, public property is more a legal fact than a reality: local communities hold customary property rights or at least land-related usage rights. In spite of that, the scope of easements in the literal and legal sense of the term is reduced and as a result, all sorts of agreements are entered into, which are devoid of any real rights and remain non-transmissible, as illustrated by the East African example.

2.1.2. Bio-prospecting agreements

Bio-prospecting consists of the search for new chemical components, genetic material, micro-organisms and other products from natural resources that hold potential economic value. It can lead to a contract under which bio-prospecting companies pay the supplier to obtain exclusive property rights over useful components extracted from an ecosystem's bio-diversity environment. If one of the components leads to the manufacturing of a medicine or a breakthrough cosmetic product discovery, the service supplier, under the terms of the agreement, is entitled to receive a share of the profits (OECD, 2009; WWF, 2009).

Combinatorial chemistry is developing and it brings with it the possibility of producing new synthetic components quickly and less expensively. However, natural products still play a crucial role in the discovery of medicines and other commercial products. Synthetic components are not always as diverse and innovative as natural genetic material. Moreover, the development of such products depends upon the discovery of new natural structures. In reality, more than 50% of medicines are derived from genetic material today. Lastly, there is an increasing demand for products of "natural" origin by consumers (OECD, 2009).

Mostly, economic agents who sign such contracts are private companies, as is the case with pharmaceutical and biotechnology companies (seeds, horticulture, cosmetics, etc.). Research institutes rarely enter into such contracts. These contracts therefore remain confidential and it is difficult to obtain information regarding their terms and conditions.

Payment depends upon multiple factors, such as the amount of genetic material in the final product (degree of derivation), contribution towards development, information provided by samples and the possible market share of the end product. For example, whenever a raw material is directly used, the Biotics [10] company pays back 3-5% of its earnings. If the natural product is converted into a derived chemical, the payment rate falls to 2-3% and if the natural product ends ups as a synthesized product, the rate is only 0.5-1% (Landell-Mills and Porras, 2002).

Hence, it appears that the transaction does not depend on implementing a good practice but is rather based on biodiversity. It does not therefore conform to the definition of a PES scheme provided in Chapter 1. However, the service producer is not only an owner "selling" access to and for the collection of fauna and flora samples. Payments are also made to maintain and support extensive farming practices, such as forestry. In a way, the agreement makes available certain environmental elements that were produced by certain practices implemented in the past, and provides a financial incentive to maintain them.

Illustrative examples

Creation of INBio, a unique intermediary in Costa Rica

Bio-prospecting agreements are voluntary and bilateral PES when the purchase of bio-prospecting rights produces a financial incentive for the sustainable management of natural areas. In the Costa Rica case – the main example at hand – this is only

[10] British genetic resource brokerage firm.

partly true: the service is marketed by governmental organizations and the payments are mostly used to finance public environmental research and budgets. A portion of these funds may be allotted for paying for changes in practices but this does not constitute the primary purpose.

However, it is the most cited example of PES systems. This is probably due to the fact that the payers are private economic agents (cosmetic or pharmaceutical firms) and that the system is well organized, with clearly determined services that are marketed by an institution.

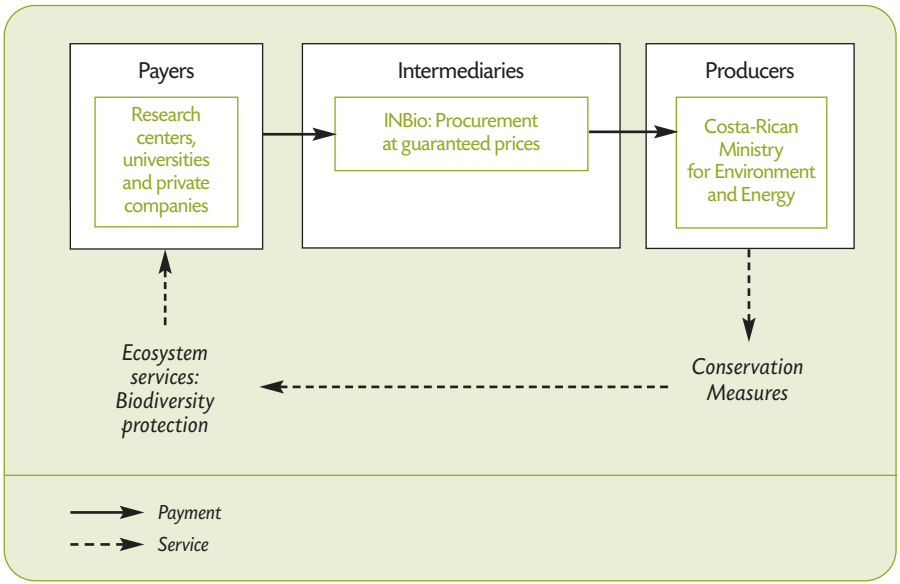
Costa Rica – which possesses 5% of the world's biodiversity and where conservation areas occupy 25% of its national territory – is a world leader in the field of bio-prospecting. Abundant natural resources and a clear legal and political policy, providing guarantees to investors and lower intermediary costs, account for this achievement.

The National Biodiversity Institute (INBio) was created in 1989 as a non-profit body by private founding members (Landell-Mills and Porras, 2002).

All bio-prospecting agreements in the country have to inevitably pass through INBio. A contract between INBio and the Costa Rican Ministry for Environment and Energy allows the former to prospect for biological resources in the government's protected areas, working in collaboration with research centers, universities and private companies. In return, the agreement requires that the Environment Ministry be entitled to 10% of the research budget and 50% of potential earnings, which would be reinvested in conservation programs. 70% of INBio's annual operating budget comes from grants and contracts entered into with research institutions and private companies. The first contract to be signed was in 1991 with Merk and Co. In 2006, INBio signed an agreement with Diversa. The company pays USD 6,000 per year to INBio to manufacture two products derived from natural resources: DiscoveryPoint is a fluorescent protein, originating naturally from a sea organism in the Caribbean Sea, and Cottonase, a raw textile material processing enzyme. INBio has also set up research partnerships with Novartis, Michigan University, Harvard and the Massachusetts Institute of Technology. Along with payments, non-monetary benefits are also provided: technology transfer, training, equipment etc.

According to the literature, INBio's good implementation is due to a clear regulatory framework and high quality services. For instance, INBio's employees are highly qualified in taxonomic collection and labeling.

Diagram 6 *System set up by INBio*



Source: Authors.

Strengths and weaknesses of bio-prospecting agreements

The signing in 1991 of the first international contract on biodiversity between Merck, one of the biggest international pharmaceutical groups and InBio was greeted with a great deal of enthusiasm. Since then, other companies (Diversa Sandoz, etc.) have followed in their footsteps. However, very few of these initiatives have actually proven successful. They have not led to any spectacular discoveries which could have led to earnings by developing countries (DCs) and many forerunner bio-prospecting companies gave up their efforts after a few years. Various reasons have been proffered to explain this situation.

A great many observers claim that research organizations in industrialized nations commit "bio-piracy", *i.e.* the misappropriation of promising samples, to the detriment of supplier nations that they fail to pay. Industry onlookers feel that bio-prospecting activities could prove to be a profitable venture, with positive effects on conservation, if users of natural products were forced to pay a fair price for the resources they use. One solution would be to promote research and development activities in the very countries in which the natural resources are found.

Another explanation is that economic returns are not substantial enough to compensate for conservation opportunity costs. This may seem ironical considering that sales of pharmaceutical and agricultural products yield tens of billions of dollars each year and that a substantial amount of these products are derived from natural resources. According to the OECD, some biodiversity elements are not "useful" from the research and development point of view, as they can be obtained at a lower cost from freely accessible resources or produced in numerous places without exclusiveness (OECD, 2009).

Moreover, the sheer size of bio-prospecting companies and the lack of transparency in their negotiations tend to make bio-prospecting companies overbearing in their dealings with service providers. Bio-prospecting companies however claim that raw genetic material yields little and requires a huge amount of research and developmental studies before producing any economic returns. Greater transparency in dealings between bio-prospecting companies and suppliers would perhaps resolve this issue.

Lastly, companies are reluctant to pay. The abundance of ecological resources and the difficulty for owners to regulate use of natural resources are behind this reluctance to pay (Pearce *et. al,* 1999). Despite that, increasing competition between bio-prospecting companies has been witnessed in recent years, especially whenever prospecting rights are clearly determined (*i.e.* their exclusiveness can be verified, see Chapter 1), safeguarded and supported in a simplified regulatory environment.

As a result of the negotiations at the Convention on Biodiversity which took place in Nagoya, Japan in October 2010, a ratification process is underway for the signing of an international convention (Access and Benefits Sharing) that aims at fighting against bio-piracy. Under this non-retroactive convention, companies seeking to use genetic resources or traditional knowledge for research or commercial purposes would have to obtain the prior consent of the country and indigenous communities concerned. They would also have to undertake to share any monetary and non-monetary advantages, including intellectual property rights (Science, November 2010).

2.1.3. Environmental certification

Environmental certification is a mechanism enabling consumers to purchase products that meet certain environmental standards. Environmental compliance is guaranteed by eco-labeling. Buyers are willing to pay a higher price than the current market price. They pay not only for the product but for its production and marketing methods, *i.e.* the related practices. One of the special features is that the supplier's payments

are incorporated into the price paid for a product sold, such as certified wood or organic farming based products.

This market is rapidly growing and is estimated to be worth USD 60 billion per year, *i.e.* it accounts for 2% of worldwide trade (Mulder, 2008).

Certification is often conducted by private, voluntary agents, although they may receive incentives and support from intermediary organizations. The latter, either private or public organizations, play a key role in implementing the mechanism, as they act as certification bodies or as traders.

The certification of forestry products, for example, is largely privately managed; on the other hand, organic farm product certifications come under the purview of the government and governmental regulations (UNEP, 2004; Wertz-Kanounnikoff, 2006 and Fournier, 2009). However, it remains a voluntary and bilateral mechanism: a group of homogeneous economic agents (buyers of the product) openly and willingly pay another group of voluntary, homogeneous agents (the producers), so that the latter adopt biodiversity-friendly practices.

Illustrative examples

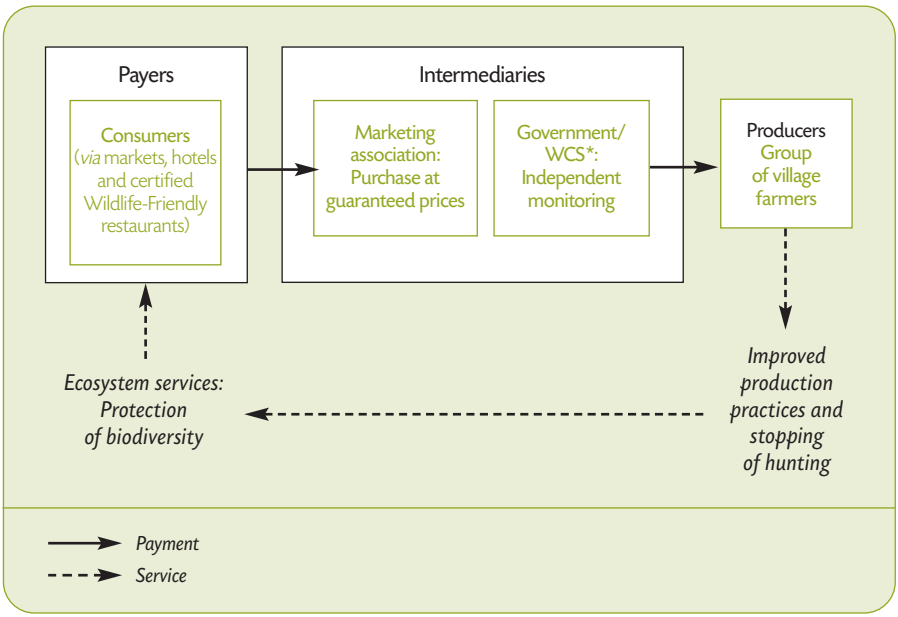
Community based agro-environmental payment program: the case of Cambodia

A community-based, agro-environmental payment program was started in 2007 in Cambodia in order to safeguard the highly endangered local biodiversity (Clements *et al,* 2009). Under this program, rice growers acting voluntarily, agreed to adopt improved production practices and to stop hunting.

They can then to sell their produce through a village committee to a marketing association specially created for this purpose. The latter sells its rice directly certified Wildlife-Friendly[11] in the local open market, as well as to tourist hotels. Bypassing the usual market intermediaries ensures that the farmers obtain preferential prices. The association also offers the initial outlay and imparts training to farmers so that they can learn the new farming techniques. The program is implemented through oral or written contracts between the farmers and the committee.

[11] The certification is an assurance that the consumption of the product (in this case, rice) promotes nature and is wild-life friendly.

Diagram 7 *Cambodian community-based agro-environmental program*



*Source: Authors. * Wildlife Conservation Society.*

The payment amount is based on the consumer's willingness to pay and not on the opportunity costs assessed for farmers. The latter receive on an average USD 0.25 per kilogram of rice and a share of the profits, which can go up to 200% of the standard price offered by traditional intermediaries. The annual average payment is USD 160 but the amount varies widely between farmers.

To counteract this program, "traditional" intermediaries increased their purchase price for rice. However, this attempt to hold back certified producers did not incite many farmers to pull out of the system. Most farmers continue to sell their products on the certified market, passing through the village committee which acts as an intermediary. Farmers have revealed that they prefer selling "to their own people" rather than to outside intermediaries as they "trusted their own village committee", as there was greater transparency in their dealings and as they had "control over their own future". The village committee and the marketing association ensure that farmers comply with the regulations. Only 8% of beneficiary farmers have failed to comply with the regulations.

In all, the villages have received 55 to 65% of the total rice sales proceeds (the remaining amount corresponds to transportation, processing, marketing and certification costs). Many families wish to join the program but only 38 families grow the appropriate variety of rice. According to Clements *et al.* (2009), this figure is likely to rise fast in the years to come as more farmers adopt standardized practices. However, the program is too recent for its success rate to be measured, in terms of species protection.

Salmon certification in the USA: a mechanism adopted nationwide

A certification system was created in 1996 to protect the habitat of the Pacific salmon, found in north-western United States (Smith *et al,* 2006). The program was launched by Salmon-Safe, a non-profit organization. Erosion and runoff from loamy farmed hills have reduced the capacity of salmon to swim and thrive. Salmon-Safe certifies farms and urban land in watershed areas located in California, Oregon, Idaho and Washington, which are environmentally safe and are, more specifically, salmon habitat friendly. In 2006 Salmon-Safe had certified more than 20,000 hectares of land.

Certification requirements include the planting of trees along riverside areas, continued land coverage to reduce runoff and using organic weed and pest control methods. Additional costs are met by bonus payments that participatory producers receive for their products. Promotion and public awareness campaigns help in marketing these products. In this instance, the buyers are consumers living in the north-western United States who choose certified Salmon-Safe products and are willing to pay a higher than normal price.

The service providers are farmers and wine producers. Salmon-Safe supervises the certification system and promotes price increases through public awareness and marketing campaigns.

Several other certification systems for fishery products have seen the light of day, such as the Marine Stewardship Council (MSC), which awards international certifications (FAO, 2010).

Forest certification mechanisms at the international level: The Forest Stewardship Council and the Program for the endorsement of Forest Certifications

In the 1990s, several programs providing certifications for forests and commercial forestry products came into existence. Among them, the two most important were the Forest Stewardship Council (FSC) and the Program for the Endorsement of Forest Certification (PEFC).

The FSC, a non-profit international organization created in 1993, plays a key role in the forest product market. It has created a certification system that promotes sustainable forest management and protection of threatened species. Certification is awarded to forest landowners and to companies engaged in processing forestry products. The certification procedures apply to eleven sustainable management principles that must be complied with. The certification is valid for a period of five years, with at least one annual check; this annual control can lead to a withdrawal, suspension or further improvements to be made. The FSC has become one of the major voluntary certification programs for sustainable forestry, currently covering nearly 30 million hectares, spread over 56 countries [12].

The PEFC itself was founded in 1999. European forest landowners acting with forestry professionals, nature protection associations, consumers and state authorities decided to coordinate the main initiatives regarding sustainable forest management.

It aimed at establishing a sustainable forest management certification system that took national and local specificities into account. The PEFC, which started off as a European initiative, became an international system in 2001 as numerous other countries across the world joined it. Apart from commitments towards forest maintenance and management, forest landowners must also ensure good forestry practices by companies collecting wood on their property. The system currently covers 190 million hectares – *i.e.* about 6% of the forests used throughout the world. Certifying bodies independent of the PEFC [13] are responsible for conducting checks and assessments.

The two labels compete against each other – in fact they are waging a fierce battle. For instance, both logos cannot be displayed on a product even if the forest from where the product originated has been awarded both certifications.

Well-known ecological networks (such as the World Wildlife Fund, WWF) tend to support the FSC certification system, which is viewed as more reliable and exacting. The FSC and the PEFC have different monitoring requirements. While PEFC certification compliance is based on sampling, the FSC forest certification requires annual land audits of at least 20% of the certified forests; an audit of the landholding's entire area is conducted in the course of the certificate's validity period of five years.

[12] To know more about the FSC visit : www.fsc.org
[13] To know more about the PEFC, visit: www.pefc.org

Strengths and weaknesses of certification

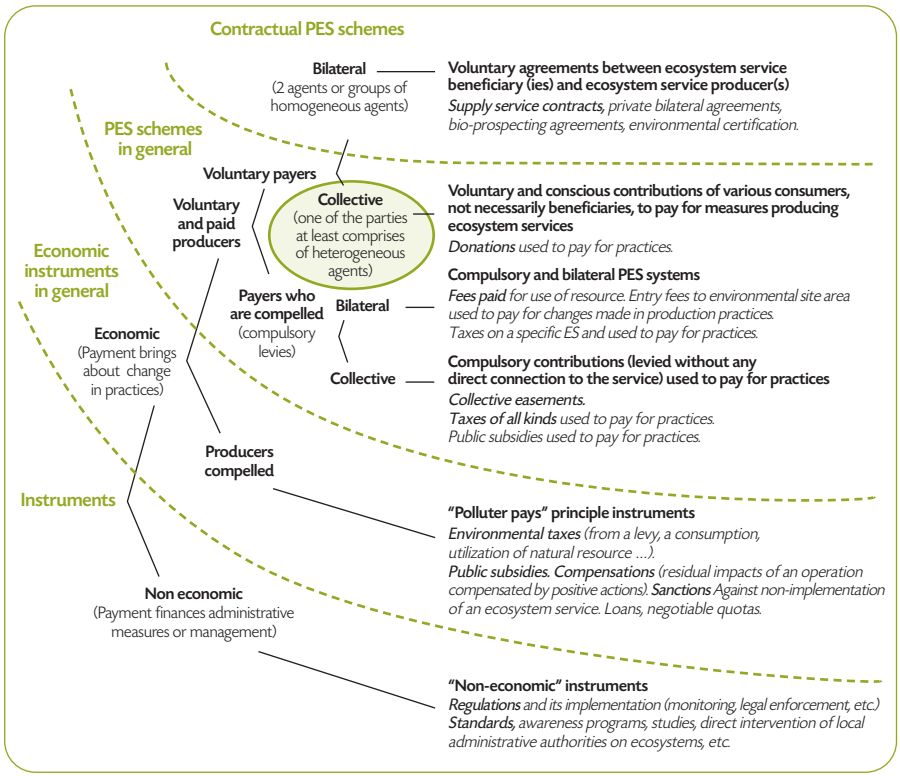
The heavy transactions costs associated with the certification process constitute a deterrent to the certification process.

According to the FAO, the main condition for certification to be considered is the existence of consumer demand for products meeting higher environmental standards and their willingness to pay a higher price for such requirements. The enforcement of truly stringent standards – a necessary condition for environmental results – would lead to certifications being awarded only for "luxury goods", due to the considerable price increase. In other words, the certification process would be caught in a contradiction between the aim of market penetration and the cost of environmental requirements.

More generally speaking, some producers would not gain access to certified markets as they require substantial changes (this is an argument that is often used with regard to conversion to organic farming). Lastly, as was the case for the previous mechanisms, the system is based on sovereign State functions through the enforcement of laws and regulations that guarantee labels and contracts (Smith *et al.,* 2006; FAO, 2007).

2.2. "Voluntary and collective" PES systems

Diagram 8 *Position of "voluntary and collective" PES systems*



Source: Authors.

This section deals with situations where payments are made voluntarily but the beneficiaries and/or payers are heterogeneous and are therefore generally represented by a collective body. Hence, the relationship is not as direct and bilateral as in the case of a contract binding two homogeneous parties. This is often the case, for example, when the payments come from an NGO's own resources: the payers, *i.e.* the donors are voluntary (their contribution is not compulsory), but the desire to contribute to the system potentially varies from one donor to another.

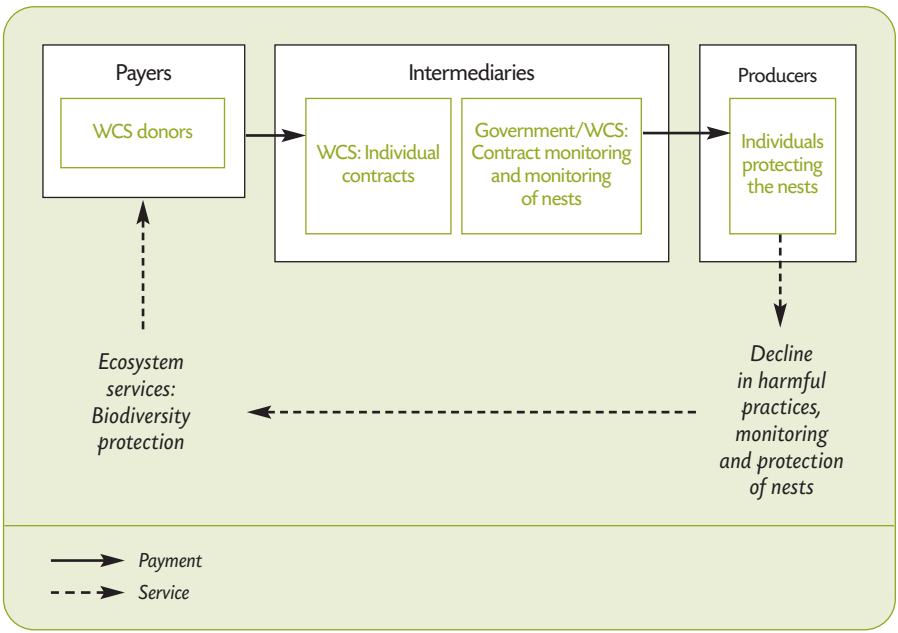
2.2.1. Illustrative examples

Protection of bird nests in Cambodia

The northern plains of Cambodia are home to numerous bird species, which are increasingly endangered as the local people collect eggs and chicks for trading purposes. A bird nest protection program aimed at saving birds from extinction (Clements *et al.,* 2009) was therefore initiated in 2002, in four villages of the Kulen Promtep Wildlife Sanctuary. It is conducted by the Wildlife Conservation Society, WCS, an international NGO, which raises funds through donations.

Under the program, rewards of up to USD 5 are offered to local people for reporting a nest. The villagers can also monitor and protect these nests until the fledglings are ready to leave it. The program encourages them to refrain from harmful practices such as egg consumption, cutting down of nesting trees, etc. They receive $ 1 dollar per day for this work. If the service provided is successfully achieved (*i.e.* the chicks leave the nest), the payment is doubled. The payment amount was determined after consulting with the villagers. Contracts are signed individually. WCS monitoring staff conduct weekly monitoring visits.

Diagram 9 *System put in place by WCS*



Source: Authors, from Clements et al*, 2009.*

The total cost of the program for WCS is around USD 25,000 per year and the average cost per nest protected ranges from $ 65 to $120. The average cost has declined as the number of monitored nests has increased and monitoring costs can be shared by adjacent sites. 71 to 78% of the expenditure has been directly allocated to the local population, while monitoring costs account for the rest. The average payment per family is $ 100 per year. Some villagers have specialized in protecting the nests, switching species depending on the nesting season. This enables them to obtain aid through most of the year, with incomes up to $ 400 per year, a significant source of income as compared to the other income sources available.

Between 2002 and 2008, more than 1,200 nests of threatened species have been protected. Many species' populations have actually increased. However, in the case of other species, the numbers have remained constant. This indicates other major threats apart from hunting: habitat destruction, the direct effect of deforestation and the intensification of agricultural practices.

Following the success of this program, it was extended in 2004 to the neighboring Preah Vihear Forest Reserve (Clements *et al.,* 2009).

"Conservation pacts": development of a new tool in Madagascar

"Conservation pacts" are agreements made with village communities through the Critical Ecosystem Partnership Fund (CEPF). The communities undertake conservation measures in specific forest areas (forest patrolling activities, in particular) and impress upon local communities the need to stop destructive forestry practices (as seen in the Namibian case). The project also aims at supporting the socio-economical development of local communities through support measures or by supporting local initiatives.

These agreements have been implemented in low altitude rainforests where there is intense pressure, or in protected areas bordering the Ankeniheny-Zahamena Corridor (CAZ) and the Fandriana-Vondrozo Forest Corridor (COFAV). Initial results appear to be promising: thanks to their "security patrolling", local people have been successful in safeguarding the endemic lemur species, delimiting slash-and-burn forest cultivation areas and preventing excessive collecting [14].

[14] For more information regarding these projects, visit the Critical Ecosystem Partnership Fund site : www.cepf.net

Pronatura's community contracts in northern Mexico

The Cuatro-Cienagas Valley in the state of Coahuila in northern Mexico is world-renowned for its biological richness. In this desert area, numerous springs and underground water flow at various places, forming natural ponds and lakes (more than 400 freshwater pools are found in this desert). These rare conditions have given rise to forms of biological life that are fairly unique in the world. In 1994, the area was declared a protected area. It is home to various local communities. Pronatura, one of the leading environmental NGOs in Mexico, works closely with these communities and has entered into contracts with them in order to preserve biodiversity. One of the contracts, signed in 2009 and carried-out by Pronatura, stipulates, for example, that the Antiguos Mineros ejido (landowner community) would receive MXN 2 M (pesos), *i.e.* USD 177,000, in two installments, to improve farming practices on a surface area of 4,500 ha, over a ten-year period (*i.e.* MXN 44/ha/ year; USD 3.8/ha/year). The community undertook to adopt a series of environmentally-friendly practices. A community reserve park was created with special conservation areas (1,300 ha) and areas meant for responsible, integrated farming (3,200 ha). The project is funded by donations from an American organization working for the conservation of wetland areas[15].

A case of payments for hydrological services: Los Negros in Bolivia

In Bolivia, the Los Negros valley, bordering Amboró National Park, covers an area of nearly 26,900 ha and 4,000 ha of rainforest. A distance of 35 kilometers separates the two most largely populated towns: Santa Rosa village, situated upstream (481 inhabitants) and the town of Los Negros (2,970 inhabitants), located downstream. The valley is home to an extraordinarily rich fauna and flora.

In 2003, a local NGO, the Fundacion Natura Bolivia, decided to implement a PES system – the first of its kind in Bolivia – in order to preserve the Los Negros watershed's threatened forest. The negotiation process was fairly swift, due to the small number of inhabitants in Santa Rosa village (located upstream of the watershed area). Moreover, according to Asquith and Wunder (2008), the local population understood that proper forest management and water quality go hand in hand. Lastly, Santa Rosa and Los Negros are located relatively close to each other, which helped in coordinating efforts.

This PES system provides for payments for two different ES (ecological services): the US Fish and Wildlife Service, an American funding agency, that finances forest protection programs for rare migratory bird species and Pampa Grande, a town

[15] Refer to the full case study in Appendix No. 1.

located downstream, that contributes to the system by drawing upon its general budget, so that its farmers, practicing irrigated farming, can avail of continuous water supply during the dry season, and irrigate 1,000 ha of agricultural land. The scheme associates two PES systems that are financed in different ways: one of the systems is financed by donor funds (voluntary contributions), whereas the other depends upon subsidies and therefore, on compulsory levies. As the amount accruing from donor funds is higher than the amounts raised through subsidies, it is used here to illustrate this category.

All upstream watershed landowners were asked to take part in the program. The service providers could choose the portion of their lands they wished to place under the program, as well as the duration of their contract. In August 2007, 46 farmers took part in the program, covering a total land area of 2,774 ha, of which nearly 1,335 ha comprised of tropical forests. The duration of the contracts ranged from 1-10 years. Payments were made in kind once yearly and unbroken contracts could be renewed.

Tree felling, hunting and forest land clearing, which constitute a permanent threat to the valley, are forbidden by the terms of the contract. The program's uniqueness lies in the fact that payments in kind are made to support sustainable forestry practices. During the negotiation stage (November 2003-January 2004), it was decided that one beehive per year would be distributed for 10 ha of protected forest area, equivalent to USD 3/ha/year. The payment was given in addition to training in beekeeping. The payment beneficiaries were themselves opposed to the idea of a monetary payment, so as not to be *"tempted to immediately spend the money instead of investing it in something productive"*. Beehives were distributed to the contracted farmers, who were also imparted beekeeping training, in return for ensuring forest protection. Awareness-building programs were also conducted in order to educate local communities living downstream of the watershed about the effects of upstream deforestation on their water supply.

In view of the reluctance of irrigation-practicing farmers to pay, the municipality paid around USD 4,500 on their behalf (a USD 2,000 grant in 2004 and a second grant of USD 2,500 in 2007). In addition, the Fundacion Natura Bolivia gave USD 40,000 to plan and implement the initiative (purchase of car, running costs, salary of staff and cost of office equipment) and annual transaction costs worth USD 3,000 were donated by the US Fish and Wildlife Service. Landowners are subject to annual monitoring undertaken by the foundation. Monitoring costs are USD 20 per day. Since the inception of the program, only one breach of the program has been reported. The foundation does not have the right to ask owners to return their beehive as it

corresponds to the previous year's payment and would amount to expropriation. However, it can refuse to renew the contract and, therefore, not supply any additional beehives. The author believes that the greatest difficulty faced by this PES system was implementing trust building measures between buyers and service providers, fixing clear objectives and the addition of paid practices.

However, at present, this program has not yielded any significant results in terms of environmental impact or, at the most, slightly positive results (Asquith, 2007; Asquith, 2008).

2.2.2. Strengths and weaknesses of "voluntary and collective" PES systems

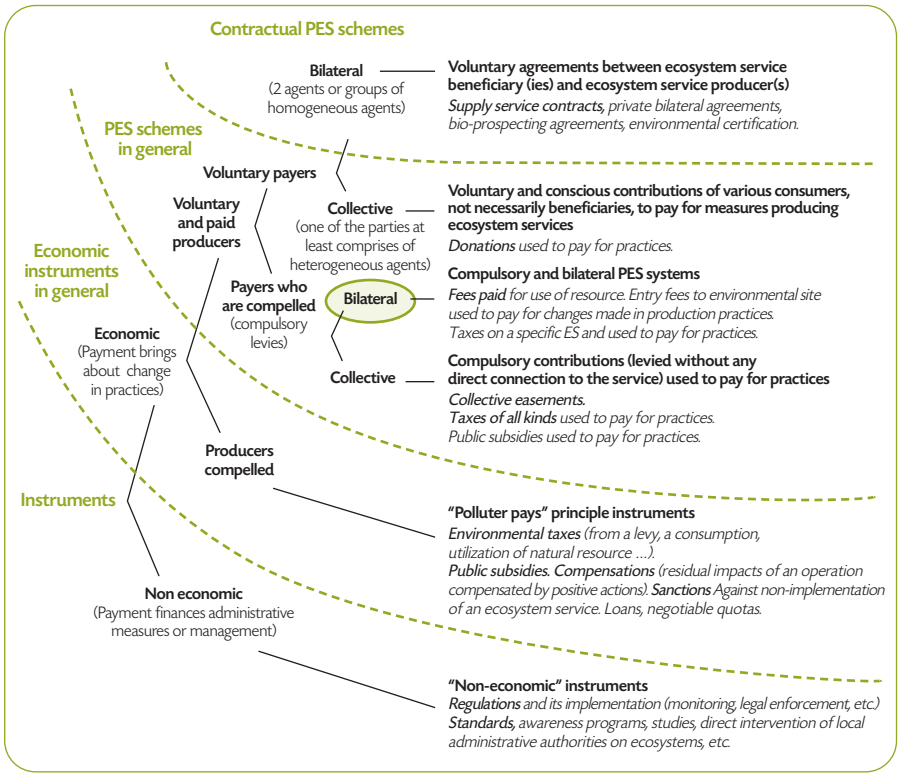
One of the strengths of these systems is that the organizations that raise donations and carry out PES schemes are generally already well established in the concerned areas. Hence, they are able to implement suitable local initiatives to tackle ecosystem challenges. Moreover, their proximity helps in building trust with the ecosystem service "producers", contributing to their willingness to join the program. And finally, based on the ecosystem services argument, these intermediaries are able to raise additional funds from new payers.

The weakness of these systems is that they are based on donor funds, which are a non-assured source of income. It would be worthwhile to consider associating this type of mechanism with trust funds (explained at the end of this chapter), as this would ensure guarantees and regular income.

Apart from that, donor funds mainly pass through NGOs. Project effectiveness depends therefore on the quality of the intermediaries. In theory, this leads to an increased transaction cost as compared to other systems offering more direct payments, as seen in the previous section.

2.3. "Compulsory and bilateral" PES systems

Diagram 10 *Position of "compulsory and bilateral" PES systems*



Source: Authors.

This refers to systems where an exchange takes place between two categories of economic agents, each one being relatively homogeneous: generally, on the one hand is a group comprising of resource users and, on the other, a group of producers. However, in this case, as opposed to the two previous categories, the payment is not made voluntarily but is compulsory. The payer does not willingly make the payment nor is even necessarily aware of making it. As shown in the illustrations, this scenario mainly occurs in cases of water management today. For instance, it could be a tax or usage fee for water consumption, imposed by the public water authorities, the proceeds of which pay for upstream watershed protection measures.

Another example can be entry fees to a tourism site. In that case, the payment constitutes a tax to enjoy a scenic view or biodiversity. This will be called a PES system only if the entry fee or at least a part of it is meant for paying ES providers, so that they carry out ES viability and sustainability measures. These payments can be made directly to the landowners (for example, in case of a protected area) or through the intermediary of a travel agent.

2.3.1. Illustrative examples

Taxation of electric power generation companies and hydro-electrical power plants in Colombia

Colombia imposes taxes amounting to 3% on the earnings of electricity generating companies and hydro-electrical power plants, in order to generate income dedicated to watershed protection in areas where forest ecosystems provide ES. In addition, the promoters of development projects located in hydrographic watersheds are required to pay fees that account for 1% of their outlay, which are allotted to watershed protection projects. These projects include the signing of contracts with upstream watershed farmers, binding them to bringing about improvements in their farming practices (Mayrand and Paquin, 2004).

The State of Mexico preserves the hydrological services of its forests

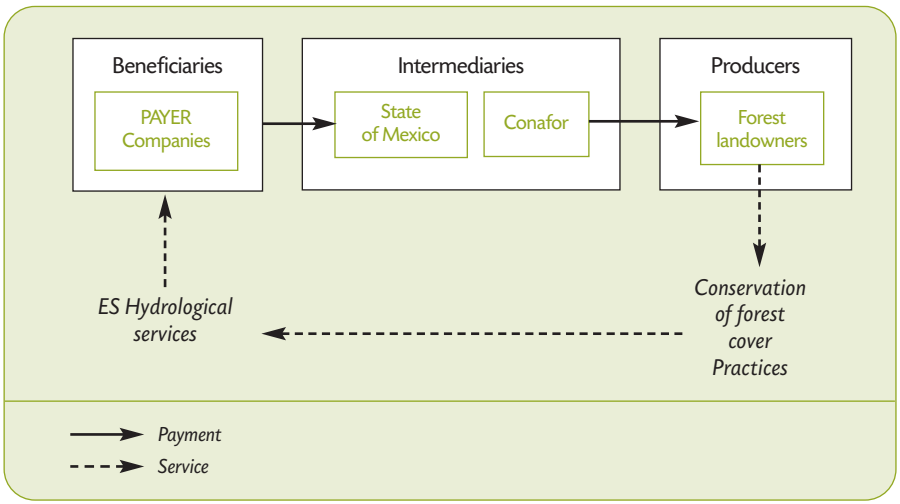
The government of the State of Mexico has instituted its own PES hydrological system, to preserve its forest cover (the State of Mexico's forest area is spread over nearly 900,000 ha, *i.e.* nearly 40% of the national forest cover). It is primarily aimed at ensuring water supply for the State's citizens [16]. The rules that need to be implemented are published (conditions, commitments, selection procedure, etc.)[17]. Under this program, owners receive MXN 1,500/ha/year (USD 133) to preserve the forest cover.

To ensure the scheme's funding, the Mexican government has imposed a compulsory levy on the State's water supply companies. They have to contribute towards financing the PES program by returning 3.5% of their sales revenue to the State.

[16] For more information, visit the Secretariat for Agricultural Development's website: http://www.edomex.gob.mx/portal/page/portal/probosque/restauracion/estudios-de-manejo/psah

[17] Document available on the following website: http://www.edomex.gob.mx/legistelfon/doc/pdf/gct/2009/dic242.PDF

Diagram 11 *Mechanism implemented in Mexico*



Source: Authors.

Indonesia's PES system for water management [18] *on Lombok Island*

This case study concerns Lombok Island, which has a surface area of 5,435 km², and forms part of the Indonesian province of Nusa Tenggara Barat, to the east of the Indonesian archipelago. The forests located on the Rinjani volcano and nearby play a crucial role in the hydric regulation of land in the island's north and in limiting erosion on the volcano's slopes.

Due to increased land clearing and cultivation, extensive deterioration of water flows along with forest deterioration have been observed. Between 1992 and 2002, 43% of the springs around the volcano dried up and nearly 30% of the woodlands on the volcano's slopes have disappeared.

From 2004 to 2007, under the aegis of the United States Agency for International Development (USAID), negotiations aimed at enforcing corrective measures took place. The formula that was initially adopted was based on voluntary fund-raising but it was decided in the end to impose a compulsory levy upon all water users.

[18] This study, conducted and written by Romain Pirard, Institute for Sustainable Development and International Relations (IDDRI, Institut du Développement Durable et des Relations Internationales), is partly based on Pirard's 2010 study.

The agreement creates a multi-stakeholder agency, called the Multi Party Institution (IMP). The institution is responsible for managing the financial resources and entering into agreements with the producers using the volcano's land. Most of the stakeholders, in particular the residents of Mataram as they were the main payers, insisted upon the creation of the agency: local or provincial authorities were not to be entrusted with exclusive fund management responsibilities. Mataram's residents did not trust the State or the territorial authorities in managing their funds in view of the high level of corruption and the State's poor record in managing public money.

Fund-raising started at the end of 2009 and the amounts raised so far correspond remarkably to the estimations that the IMP had anticipated. However, things did not move as fast when it came to payments for landowners and upstream farmers: no PES contract has been signed as yet in the target area. For several years, thanks to the financial support of developmental agencies and/or the Indonesian government acting through various programs, pilot activities were undertaken to restore the degraded lands. However, despite new funding, no contract has been finalized as yet; (according to interviews with the local population) this is mainly attributed to the lack of capacities and of human resources assigned for the contract negotiation and formalization process. Hence, the situation is not due to any lack of motivation or will on the part of the service providers – in this case, the rural population (Pirard, 2010)[19].

Regional tax mechanism on specific uses: usage fee and private payment plan in Heredia, Costa Rica

The Heredia Public Service Company (Empresa de Servisios Públicos de Heredia, ESPH) is a water utility company located in Costa Rica's Heredia region, in which citizens are also shareholders.

The increasingly intensive use of land upstream of the watershed led to the need to preserve the water supply in the region by protecting the catchment area. In order to do so, water users in the town of Heredia are required to pay a tax, incorporated into their monthly water bill. This is transferred to the public (Braulio Carrillo National Park) and private owners. Half of the money collected, USD 0.1/m^3, is invested in forest conservation programs and in reforesting three Costa Rican central valley catchment areas (Rio Segundo, Rio Tibas and Rio Ciruelas). The other half of the funds is invested in renovating or building infrastructure, as well as in research activities.

Landowners receive a payment of about USD 110/ha/year to maintain the forest cover in the areas close to the ESPH catchment area. This amount represents the opportunity

[19] Refer to Appendix No. 4 for the full case study.

cost – in other words, the difference between the intensive forestry practices that the landowners agree to forego and the income derived from sustainable forestry practices. Moreover, Florida Ice & Farm, a soft drink and mineral water company, finances 55% of each contract in the Río Segundo basin.

For its part, the Environment Ministry also receives budgetary aid of USD 30/ha/year for the maintenance and reforestation of the national park; this cannot be viewed as an economic instrument, but rather the financing of an administrative measure. Some mechanisms are therefore mixed in nature: partly based on the principles governing economic instruments and partly based on administrative measures. The ESPH and the National Forestry Financing Fund (Fondo Nacional de Financiamiento Foresta – FONAFIFO) act as intermediaries (Smith *et al.,* 2006).

2.3.2 Strengths and weaknesses of "compulsory and bilateral" PES systems

The advantages and strengths of bilateral systems, based on compulsory contributions, essentially lie in the assurance of a stable and regular income. However, the other side of the coin is that the relationship is not necessarily as effective: it is easier, in such a situation, to raise funds rather than enter into contracts with producers. The number of intermediaries required and the semi-public nature of the instrument can strain the relationship between beneficiaries and producers, weigh down the mechanism and lead to the risk of a dilution of means. In other words, by moving away from the archetypal trading and direct contract model, the mechanisms lose out on both advantages and defects. The relationship becomes less direct, the "short loop" becomes longer and the initiative is diluted; on the other hand, organization can be done at a larger scale, resource production becomes easier and collective interests are safeguarded relatively more through State interventions.

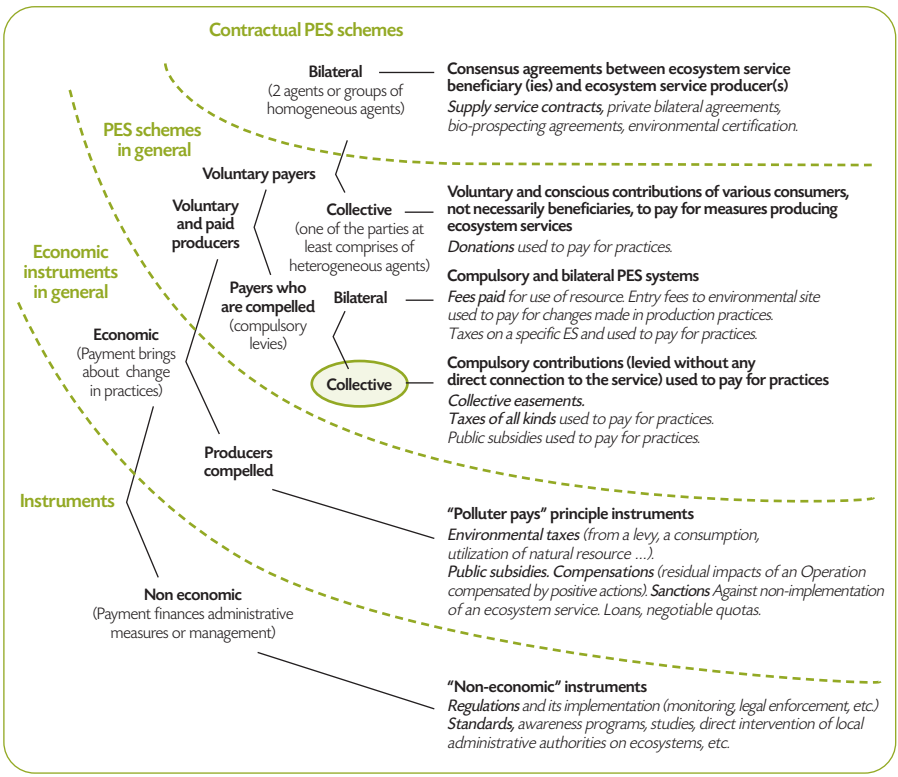
In theory, the idea of using entry fees works well, especially in contexts where the objective is to preserve landscapes, wildlife, etc., through a tax levy on tourist entries (inside a park for example). However, illustrations of this type that are mentioned in literature do not generally constitute PES systems. Although the financial resources are raised from users (tourists), they are not often used to pay for modified practices, nor do they serve as an incentive ecosystem service producers. Rather, they are used to finance regulatory and coercive mechanisms (park management, security, monitoring, restricted access, etc.) or maintenance work undertaken by the administration (restoration of sites, etc.).

However, this mechanism is often viewed in the literature as being the best potential choice for the transfer of payments made by those enjoying the landscape to producers. The authors point out that the entry fee is generally kept (too) low, so as not to discourage visitors and to reduce the temptation to enter the site illegally (Richards and Jenkins, 2007). Also, exceptional natural sites are often classified as national heritage sites, which must be accessible to all and not be subject to any user tax.

Lastly, according to Richard (2007), one of the possible harmful effects of these systems is that they tend to encourage operators to maximize profits made through tourism taxation by maximizing the number of entries. As a result, this leads to overcrowding, which is detrimental to conservation.

2.4. "Compulsory and collective" PES systems

Diagram 12 *Position of "compulsory and collective" PES systems*



Source: Authors.

Moving a little further away from the trading archetype, we now present economic incentive instruments that are no longer financed by a group of resource users but by a heterogeneous, collective group of taxpayers. In such cases, the payers are not necessarily the beneficiaries – or to be more precise, the relationship between the payment and the benefit accruing from the service provided is optional.

Obviously, not all compulsory levies constitute a PES mechanism. In order to fall under that category, the financial resources must be used to pay voluntary ecosystem producers and serve as an incentive for implementation of service-friendly environmental practices. Instruments of this type are some of the earliest examples of PES systems, and are used, especially in the northern hemisphere, for the large-scale financing of environmental conservation-friendly agricultural practices.

2.4.1. "Collective" conservation easements

Unlike in the case of "bilateral" conservation easements, we shall now examine easement agreements that no longer bind two economic agents or groups of homogeneous agents, but at least one heterogeneous collective body, generally a public, semi-public or associative body: the State or a public establishment.

According to available literature, numerous examples of this type – rather than the aforementioned archetype – are found, mainly in North America and in countries where Anglo-Saxon law prevails (Anderson and Weinhold, 2008). Easements can be instituted in other countries, but they more often tend to take the form of extendable contracts (Gullison *et al.* 2001). Hence, they do not have the same legal weight or stability over time as is the case with conservation easements invented by Anglo-Saxon law.

2.4.2. Illustrative examples of collective conservation easements

The Wetlands Reserve Program in the United States of America

Under the Wetlands Reserve Program, the United States Department of Agriculture (USDA) seeks to restore the ecological functions of wetlands that have deteriorated or disappeared. In order to achieve these objectives, it buys long term easements (at least 10 years) from farmers. It shares expenditure with the farmers who agree to restore the wetlands within their farmland area (MAP, 2009). The restoration of wildlife habitat in wetlands is of the highest priority. Payments are made by the USDA. If the conservation easement is for a duration of 30 years, the payment provided is 75% of the amount for a permanent easement. Moreover, USDA's cost share in restoration expenses is 75% of the final cost. Lastly, the farmer has the right to sign a cost-sharing agreement with the Department of Agriculture for restoration purposes, but without committing to any conservation easement on the property.

Conservation easements in Michigan, USA

Michigan's open fields add to the state's scenic beauty. To preserve it, Michigan has introduced conservation easement programs. Landowners voluntarily agree to conserve their land by reducing their use of farmland and open spaces. Conservation easements remain in place in perpetuity and they cannot be sold or transferred to any other entity. They forbid or limit the development of any activities that could reduce the farming area's value. Under this conservation easement scheme, the general public is not granted access to the property unless the owner agrees.

Environmental conservation easements are viewed as ecological donations and can lead to tax deductions for the landowners. Also, by reducing the value of their land, landowners can benefit from a property tax reduction as well.

2.4.3. Earmarked taxes

The term "taxes" implies a compulsory levy paid by a taxpayer, which is theoretically intended to be used to finance a service provided by a public entity. These levies are instituted by a central or local public body. They can be called PES systems only when the proceeds of these levies are assigned towards paying voluntary ES providers, with a view to modifying their practices in return for the payment.

Some of the taxpayers mobilized may be users of the ES targeted, but the system does not cater directly to the users. As a reminder, if the tax is levied solely upon usage of an ES and is aimed specifically at these users, then it is also a compulsory but bilateral (and not collective) PES system (users are associated with a homogeneous group of economic agents).

Illustrative example of an earmarked tax

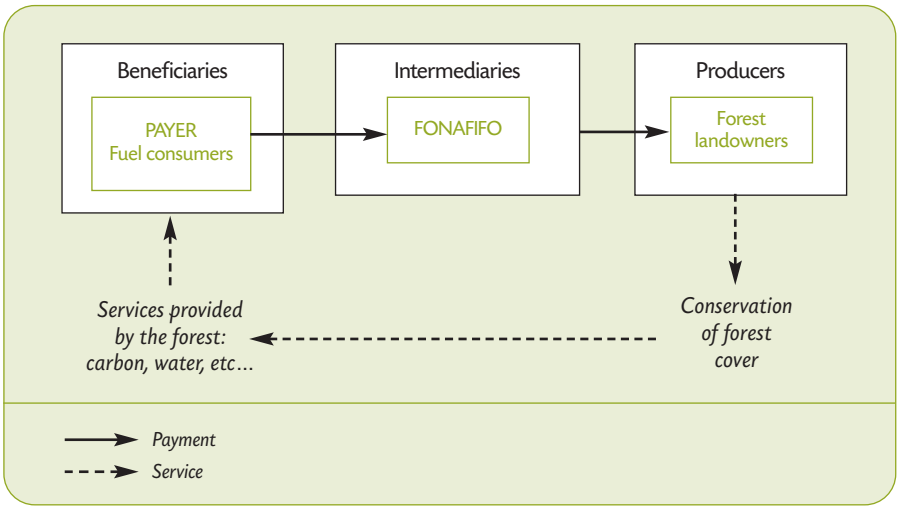
National earmarked tax mechanism: Costa Rica's "Ecotax"

Costa Rica has long recognized that the ecosystem services offered by its forests hold an enormous financial potential. Hence, in 1991, the Fundo Nacional de Financiamento Forestal (FONAFIFO) was established by the Ministry of Environment and Energy to promote forest ecosystem services. In the late 1990s, FONAFIFO established an ES payment program with its own management structure and governing board. Through this program, small natural forest landowners and forest plantation owners receive direct payments for the ES they provide.

The main source of funding for this program is a fuel tax, also referred to as an "ecotax". The tax, passed as part of the new Forest Law in 1996, triggered a major policy debate involving the Constitutional Court, as fiscal policy in Costa Rica, as in most other countries, opposes the earmarking of taxes or levies for specific purposes (FAO, 2007).

This program is unique in terms of the population, the diversity of actors and the surface area involved. Between 1997 and 2008, 8,345 contracts were signed, involving a surface area of 670,000 ha – *i.e.* 13% of the national territory. However, 67% of the beneficiaries claimed that they would have preserved the forest even in the absence of any PES schemes and 43% claimed to have undertaken forest protection measures even before receiving any financial support (Legrand *et al.,* 2010).

Diagram 13 *Ecotax system implemented in Costa Rica*



Source: Authors

Strengths and weaknesses of earmarked taxes

Earmarked taxes can provide a stable and continuous flow of revenues for PES schemes since their revenues are specifically allotted to fund conservation activities. In addition, they may be less vulnerable to government budget reallocations than non-earmarked taxes and public subsidies arising from the State's budget. However, they can also make PES schemes financially dependent on a resource whose governing principle and production conditions are totally unrelated to ES and to the state of the environment.

Generally speaking, the strengths and weaknesses of these instruments are characteristic of their public nature. Their strength is derived from the assurance provided by large-scale State interventions and the legitimacy that goes with them. The weakness of PES schemes deemed "public" lies precisely in the reasons why they are not promoted

very often by the literature: they do not offer the advantages of proximity and the "short loop" between the problems, the actors involved and the solutions. They are also subject to the political uncertainties of public policy, notably corruption, political instability, the lack of concern for long-term environmental issues and the misappropriation of funds (despite the taxes being earmarked).

2.4.4. Public subsidies

One of the most common PES schemes is the public subsidy of producer's practices that promote the maintenance, restoration or improvement of ES. In such a case, the payers are State authorities and, therefore, a public subsidy based PES scheme involves contributions from a country's entire society.

Illustrative examples of public subsidies

The European agro-environmental measures

The agro-environmental measures under the European Common Agricultural Policy (CAP) are aimed at the improvement of surface and ground water quality, biodiversity conservation and the maintenance or restoration of the beauty of landscapes. This is a PES scheme where the farmers are the paid economic agents (the producers), the States (notably through their contribution to the European budget) are the payers and, *in fine,* along with all the taxpayers. The farmers agree, for instance, to plant grass strips, convert their farmlands into grazing land, restore hedges and reduce use of plant safety products or fertilizers. A contract is drawn up between an official body and farmers, acting voluntarily. The latter will then receive payments, which are intended to cover the additional expenditure incurred due to these obligations and the loss in earnings due, for example, to decreased production. Agro-environmental measures are based on the principle that the practices that are paid for are more difficult to implement than normal good farming practices (defined by legal obligations and regulatory environmental measures).

According to the mid-term assessment, in 2003, the average payment in Europe was EUR 89/ha/year (payments ranging from EUR 30 to 240), and EUR 186/ha/year for organic farming (payments ranging from EUR 40 to 440). According to the same assessment, agro-environmental measures have improved land and water quality, despite the fact that it was difficult to quantify all the results obtained. Farmers' interest varied from one region and one farm holding to another. It depended on factors such as the farmholding's structure, its size, the age of the owners and their qualification level (CES, 2006; Smith *et al.* 2008).

Similar programs have been introduced in a certain number of countries.

- In England, farmers who adopt measures to reduce the amount of nitrates leaching into vulnerable groundwater receive subsidies from the Ministry of Agriculture (Sakuyama, 2006).
- In Switzerland, in order to prevent surface and groundwater nitrate pollution, a national payment scheme has been established. Farmers located in catchment areas where drinking water quality is below the standards undertake changes in their farming practices that go well beyond good farming practices. In return, they receive a compensatory payment ranging from EUR 130 to 1,250/ha/year (CES, 2006).

The "BushTender" program in Australia

The Ministry of Natural Resources and Environment (MNRE) of the State of Victoria in Australia has initiated a pilot program called "BushTender", aimed at improving the management of native vegetation on private land. In return for State payments, landholders agree to fencing and managing native vegetation for a period of three years. The first contract under this program was signed in 2002 in the north-eastern part of the state of Victoria. The program is inspired by the Conservation Reserve Program, established in the United States (*cf.* Section 1.1.3.). Its innovativeness lies in the fact that it is based on a strong assessment method and operates on the basis of a reverse auction mechanism to set conservation payment amounts.

Interested landholders contact the MNRE, which sends over a field team. Training is offered to the farmer so that he may be able to recognize native vegetation and implement proper conservation measures. Based on two value scores, the field team assesses the native vegetation's quality. The first is the "Biodiversity Significance Score", which indicates the site's conservation value, based on the presence and population of rare species. The second one is the "Habitat Services" score, which measures the extent of biodiversity improvement measures offered by the landholder, such as fencing or weeding. Landholders are only informed about the second score and not the first, to allow for the process of competitive bidding.

Interested landholders can submit several bids and specify, in a management plan drawn up with the field team, the type of vegetation and the conservation measures they are ready to undertake. Conservation management measures range from excluding cattle, maintaining big trees or control measures against rabbits and weeding. In all, 98 farmers submitted 148 bids for 186 sites. 97 bids (offering the best value for money) were accepted, *i.e.* nearly 3,200 hectares of native vegetation for a total cost of about AUD 400,000.

Random monitoring visits are conducted. The program's initial results appear to be satisfactory. According to Wunder *et al.* (2008), 24 new rare or endangered plant species have been discovered. The most unexpected outcome of the program has been that it has been implemented at a lower than expected cost. This is perhaps due to the high level of competitiveness among the farmers taking part in the bidding process, or it may be due to the fact that landholders realized the non-commercial value of native vegetation and wished to freely incorporate some of the conservation costs incurred (Wunder, 2008).

China's "Grain for Green" program

In China, the "Grain for Green" scheme was launched in 1999 by the government, following a series of devastating floods in 1998 and 1999 (Fournier, 2009; Liu *et al.* 2007; Bennett, 2008). The program aimed at combating erosion and floods by increasing the forest cover on sloping farmland in the upper reaches of the Yang Tsé and Yellow River basins by the year 2010. In the area, nearly 4.3 million hectares of farmland were located on steep slopes (>25°).

The program financed the conversion of farmland into forest or terraced grazing land. The government hoped to convert 15 million hectares of arable land and to modify the farming practices of more than 50 million rural households. Two secondary aims were incorporated into the scheme. In addition to the environmental aims, the other aims were: *(i)* poverty reduction and *(ii)* the promotion of local economic development. The program launched a pilot study in three provinces (Sichuan, Shanxi and Gansu) in 1999. It was extended to include 17 provinces in 2000, and in 2002 to 25 provinces, covering a total of 15 million beneficiary farmers. By the end of 2006, nearly 9 million hectares of farmland had been converted. The sheer scale of the project makes it the largest land conversion program in the world, aimed at ending, the centuries-old practice of terrace farming. The program focused on western China, as this is an environmentally vulnerable region and accounts for of 80% of the area suffering from erosion.

Under the farmland conversion program, in order to maintain farmers' incomes, the Chinese government offered subsidies in kind (grains, seedlings, fruit trees or pine trees), as well as monetary assistance. Compensatory payments granted varied, depending upon the regions; they were higher in provinces located in the upper reaches of the Yang Tsé River than in the upper reaches of the Yellow River. Subsidies in kind ranged from 1,500 to 2,250 kg of grains per hectare and per year. In addition, farmers received a compensatory grant of CNY 300 (Yuans), *i.e.* EUR 32, per hectare and per year, to cover various expenditure, as well as free seedlings at the time the

farmland conversion took place. Lastly, farmers were also entitled to tax exemptions on the converted farmland.

If the land was converted into sustainable forest land, the contract's duration was for a period of eight years. The period was of five years in cases where the farmland was converted into a commercial-purpose woodland area, and two years in case of conversion to grazing land. According to the Chinese forestry administration, more than 75% of the land was converted into sustainable forests. At the end of the conversion period (and the end of financial assistance), farmers could renew their commitment to the program for another 2 to 8 years. Financial assistance, however, was lower in case of renewal.

By the end of 2005, the total cost of the program was CNY 90 billion (EUR 9.7 billion). The total planned outlay was CNY 220 billion by the end of 2010 (EUR 24 billion).

According to Liu *et al.* (2007), this program has resulted in substantial ecological gains: increase in forest cover, reduction of surface water runoff, reduction in soil erosion, reduction of river sediments, improvement in land fertility and reduction in desertification. Other benefits were expected, such as habitat restoration, notably the giant panda's habitat. Many studies have shown that if the program were to stop, it was likely that forests and grasslands would reconvert into cropped land.

However, the scheme had some drawbacks: annual subsidy levels remained almost constant, in spite of the rise in the market price of agricultural products over the years. The program also added to the financial burden of many local state authorities as tax exemptions on converted farmland represented a significant loss of tax revenue for local governments. The central government provided only partial subsidies to local administrations and required that other expenditure for implementing the program (for example, monitoring activities and the transportation of grains) be borne by the local authorities themselves. In order to offset the substantial expenditure involved, the Chinese State wanted other beneficiaries to share in the cost of the payments: hydro electrical power plants, insurance companies, downstream inhabitants of the Yangtze River and Yellow River basins, and even other countries benefiting from a reduction in sandstorms due to the increased forest cover (Korea, the United States and Japan, for example).

Strengths and weaknesses of public subsidies

Public schemes have, by their very nature, far reaching effects and State involvement confers them legitimacy in the eyes of various stakeholders. However, government PES systems are subject to changes in government or in strategic reforms: payments

can be suspended or stopped at any time. However, they can acquire a permanent status when they are enforced through laws, decrees or constitutional instruments.

Governments may also grant temporary subsidies to support the development of an ES market. However, this approach may lead to problems associated with subsidy-related political economics. For example, according to Mayrand and Paquin (2004), under the pilot project scheme carried out in six watersheds in Mexico, the Mexican government compensated land users for favorable practices, in the hope that the beneficiaries would agree to continue with the funding once the pilot project ended. But this approach leads to users hoping to receive permanent funding from the government and it is difficult to ascertain whether the beneficiaries would undertake the project themselves or whether they would pressure the government into continuing to finance the project even upon the completion of the pilot project.

Moreover, these schemes are also less flexible in terms of targeting the economic agents paid. Due to their large-scale nature, they tend to favor payments to polluters, which is easier to do, rather than supporting the implementation of good practices, (environmental restoration, etc.). In the same way, subsidies become less effective whenever they try to cover several ES (Wunder, 2005).

Lastly, subsidies are sometimes criticized for their effect on the beneficiary's freedom: by making them dependent on this financial windfall, they do not encourage any real change in practices (Wunder, 2006*b*).

2.5. Combined instruments

PES systems can also combine several categories reviewed and presented in the mapping done (*cf.* Chapter 1).

Combination of all types of instruments in the Saltillo Basin, Mexico

The NGO, Profauna, works for the preservation of the Saltillo watershed in northern Mexico, particularly for the conservation of Zapalinamé Forest, which contributes to the restoration of part of the basin's water resources. To do so, it compensates local voluntary forest owner communities (*"ejidos"*), so that they implement practices that promote the restoration or/and maintenance of the forest cover. The latter is supposed to guarantee the watershed's hydrological functioning and the conservation of local biodiversity. So-called "PES" contracts are drawn up between the NGO and the ejidos for periods of 1-15 years. The funds used by the NGO to pay for these contracts come from diverse sources, thereby combining several of the various tools that have been reviewed so far:

- Part of the money used for these contracts comes from voluntary donations by users of Saltillo's water. On the proposed map, these are marked as "voluntary and bilateral" PES systems
- Another part comes from donations from the Mexican Nature Conservation Fund (FMCN), itself funded by the Gonzalo Rio Arronte Foundation (FGRA) for this project. On the proposed map, they are referred to as "voluntary and collective" PES systems
- A part comes from a mandatory tax imposed by the Mexican government on drinking water distribution companies. On the proposed map, they are referred to as "compulsory and bilateral" PES systems
- Finally, part of it comes from subsidies from the Saltillo municipal corporation, and another part from Mexican government subsidies. On the proposed map, they are referred to as "compulsory and collective" PES systems.

This example has been the subject of an in-depth case study within the framework of the present study[20].

Conservation trust funds, a potential funding method for PES systems

Conservation Trust Funds (CTFs) are a special tool used to raise funds. Their capital generally consists of funding from varied sources – both private and public. When the funds (capital and/or interests) are used for compensation paid as incentives to producers for implementing practices that promote the maintenance of an ES, CTFs too enter into the domain of PES systems. Most often, the uses and types of instruments are mixed: a CTF provides some funding, along with other funds (public and private) to be invested in a conservation project, which may also include an economic instrument (compensation as an incentive to forest owners) as well as a non-economic instrument (funding from a poaching management and control organization, for instance).

Three categories of CTFs may be distinguished:

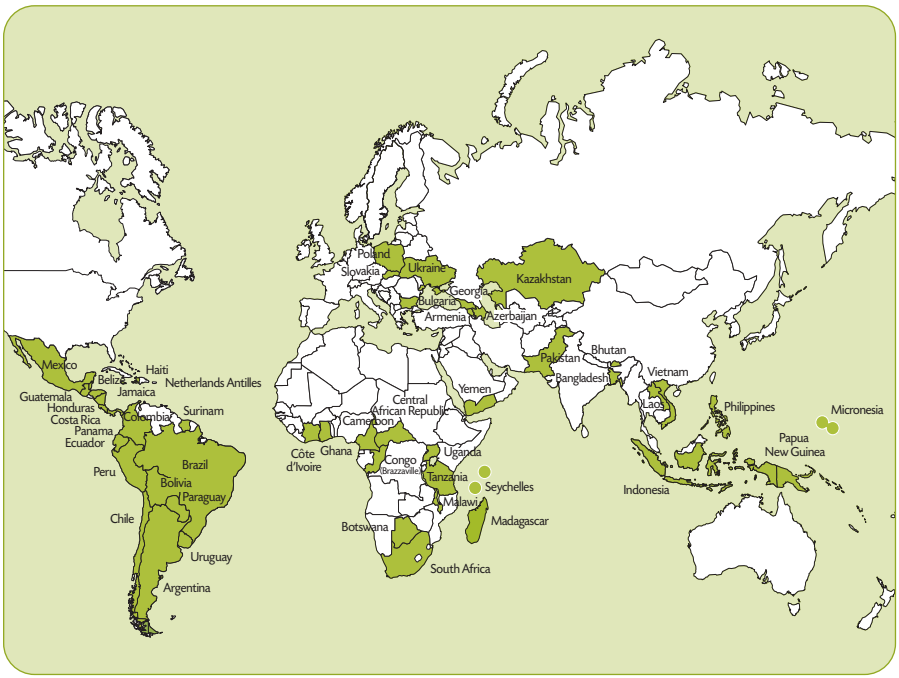
- Endowment funds, in which the capital is invested in perpetuity in international financial markets and only the product of the interests on such investments is devoted to subsidies and to funding the concerned activities.
- Amortization funds, in which the income and part of the capital are spent every year, until the capital is exhausted in a given year.
- Renewable funds, in which the funds are regularly re-constituted.

[20] Study available in Appendix 1.

In 2008, there were about 55 CTFs for a global-level mobilized capital of USD 810 million (of which 74% in Latin America and the Caribbean, 10% in Asia, 9% in Africa and 7% in Europe). 45% of the capital comes from American donors, 19% from the GEF, and 7% from the German government. The average performance of the investment portfolio amounted to 10.57% from 2003-2006 (Preston, 2009).

Since the mid-1990s, CTFs have been set up in more than 50 countries; the majority of them were set up in Latin America (*cf.* Map 1). Hence, the Environmental Fund Network in Latin America and the Caribbean (RedLAC) brings over 20 trust funds together. More recent funds, in Africa and Asia, have shown an interest in the creation of similar networks. A recent forum, organized in 2010 by the AFD and the French Global Environment Fund (FGEF), confirmed the desire to set up an environmental trust fund network for Africa, like the RedLAC.

Map 1 *Countries with a CTF (marked in green on the map)*



Source: Conservation Finance Alliance (2008).

According to Conservation Finance Alliance, there are four indispensable prerequisites for the success of CTFs:

- The problem to be solved should be based on a likely commitment of at least 10 to 15 years
- The authorities should actively support the creation of a mechanism associating the private and public sector, without it being directly subject to State control
- It should be possible to mobilize a critical mass of intervening parties, stemming from different sectors of society, which should also be capable of working together for the purpose of conserving biodiversity and sustainable development
- The main elements of a legal, financial and institutional architecture (especially banking, audit and contracting services) should have been set up and able to inspire public trust.

New opportunities for raising funds to the benefit of CTFs for conservation purposes are emerging. The GEF and bilateral aid agencies remain the main donors, but partnerships with private companies and charity organizations are taking up a growing role in funding conservation. In most cases, the funds raised by such partnerships are used to finance individual projects and programs, rather than to contribute to the capital of any funds.

Box 1 *Illustration of a CTF: Establishment of the Fondo de Protección del Agua (FONAG), in Ecuador*

Water conservation trust funds are particularly attractive, as they can be structured in such a way as to provide stable financing for several decades. The Ecuadorian fund, FONAG, is one such example (Mayrand, 2004; Landell-Mills and Porras, 2002; Smith, 2006).

Quito's water comes from a catchment area located within the Condor biological reserve. The Ecosystem Services (ES) provided here are the conservation of watersheds in order to improve the quality of drinking water in the city of Quito. FONAG, an endowment fund, was set up in 2000 in response to the need for better management of the catchment area. It was established by a local NGO, the Fundación Antisana, and The Nature Conservancy (TNC), after the Environment Ministry had asked for a management plan to be drafted for two reserves in the watershed area. The starting capital came from donations from TNC and a contribution by the Municipal Drinking Water and Sanitation Enterprise of Quito (EMAAP-Q). It has not been spent, which guarantees the long-term viability of the PES system. Apart from the starting capital, FONAG is regularly replenished by its donors. The more modest contributions of a power supply company, a brewery and the Swiss Development and Cooperation Agency must also be noted. This example clearly shows the interconnections between different types of PES systems: they bring together voluntary collective contributions (TNC and the Swiss Development and Cooperation Agency), private and bilateral agreements (power supply company and brewery), and also mandatory collective contributions (contributions by the municipality).

The paid employees are the watershed managers, whose role involves reforestation, the surveillance of protected areas, the implementation of sustainable agriculture, the development of ecotourism and training. The funded activities therefore combine incentive payments with a surveillance component.

This is an open, participatory fund: each contributor is a member of the Board of Directors and receives a share of the votes according to its contribution. This method is aimed at guaranteeing the long-term viability of the mechanism, designed to operate for 80 years. In 2006, its endowment amounted to USD 3.5 million, but was to rise to USD 7.4 million by end 2010.

The program is considered a success today, due to the strong support of the Mayor of Quito, as well as the two main water consumers in the area: the water and power supply companies.

2.6. Conclusion

In order to correspond with our definitions and chosen field, the various examples selected are all mechanisms aimed at payments for practices that promote the maintenance of an ES. In the overview proposed, this characteristic is always present (even in the case of bio-prospection, although it may be indirect, as mentioned earlier).

The variability therefore comes in more with regard to the economic source of payments, the "operative event" that triggers them: purchases and consumption, donations, taxes, or maybe access to the sites, etc. These typologies then cover very different operative rationales. Apart from the contractual archetype, none can claim all the qualities expected of a PES, as listed in Chapter 1: the advantages of a bilateral or direct relationship are lost in the case of the many compulsive and collective PES systems, as the payers are no longer aware of the payment and the systems are administratively managed at a large scale. The capacity of raising additional resources does emerge, but yet again not in the case of collective and obligatory PES systems since in these cases, the payments come from the general government budget, without generating any increase in it. Control can clearly be seen, through these examples, as lighter, particularly as it is limited to checking the implementation of the practices agreed upon in the contract (*cf.* Chapter 3).

In the same way, most often, the PES systems mentioned in this overview actually seem relatively precise and specific with regard to the conditions required in exchange for the payments. However, that is much less the case with large-scale PES systems – *i.e.* collectives.

Almost all PES systems are organized at the initiative or with the participation of NGOs, associations, etc. There are very few cases in which economic agents themselves enter directly into a relationship and govern any environmental disputes they may have without intermediaries. Even examples of archetype PES systems testify to this characteristic. Hence, on this point, the instrument does not seem to correspond to the purely private initiative model, and much less to a spontaneous market system.

Finally, the examples examined confirm – with a few exceptions – that PES systems are primarily addressed at "less rich" producers. That is true particularly in the case of bilateral PES systems, and a little less for collective PES systems, as due to their public nature and homogenous payments, these tend to select their recipients less accurately. For the others, it must nonetheless be noted that targeting the "less rich" among the producers does not signify any natural synergy between social

and environmental objectives, particularly because the poorest are not necessarily producers (you often have to be an owner producer to be eligible for PES payments).

In short, therefore, the variety of PES systems (even within a restricted field such as we have defined) testifies to the constant presence of a certain working logic (in particular, volunteering by producers), but also to unequal capacities to fulfill the ambitions or expectations they give rise to.

On these bases, can PES systems offer a model that can be generalized and perhaps make it possible to renew collective action frameworks with regard to the environment and development? That is the subject broached in Chapter 3.

3. Critical review of PES systems: strengths, weaknesses and assessment criteria

What kind of review can be drawn from the examination of the variety of PES systems? This question will be broached in two ways: first, through a critical review of the application of this instrument in various public policy contexts, depending on whether they concern developing or industrialized countries, according to the scale of the mechanism, the nature of the actors involved, the types of ecosystem services envisaged and, finally according to the duration of the contract and nature of payment.

Following that, a critical analysis will examine the PES instrument's capacity to establish a generalized model for collective ecological action, based on existing literature and inputs from this study's scientific committee[21].

3.1. Critical review

The number of PES systems used for biodiversity or water is relatively high: there are more than around 300 cases of PES systems (Mayrand and Paquin, 2004; OECD, 2010).

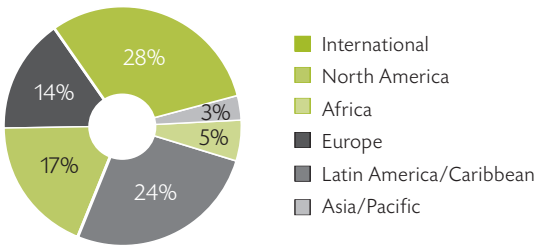
3.1.1. PES systems from North to South

A study published in 2002 by the International Institute for Environment and Development already identified 287 PES mechanisms spread across the planet. The inventory was limited to PES mechanisms concerning forests, but even so, most water and biodiversity PES mechanisms were included, as they most often aimed at conserving or replenishing forests, whether the objective was soil cover or ecological habitats, as demonstrated by the examples given in Chapter 2. Graph 2 shows the geographic distribution of these PES systems.

[21] It must be recalled that the Scientific Committee's members are Christophe Désprès (Vetagro-sup), Matthew Hatchwell (WCS), Philippe Méral (IRD) and Romain Pirard (IDDRI).

Graph 2

Geographic distribution of cases of forest PES systems (of a total of 287 in 2002)



Source: Landell-Mills and Porras (2002).

This distribution can be divided further into three main types:

- *PES mechanisms implemented in DCs* (Latin America, Caribbean, Asia, Pacific and Africa): 41%
- *PES systems implemented in industrialized countries:* 31%
- *"International" PES mechanisms,* whose scale is beyond that of a country and/or that put payers and producers of different countries together: 28%.

International PES mechanisms are most often managed by international agencies or NGOs. They most often address issues like carbon sequestration, the conservation of genetic resources and biodiversity. In fact, national governments sometimes claim that they are less inclined to fund such services, considering them "world public goods" that must be taken care of by the international community (Landell-Mills and Porras, 2002).

Within DCs, Latin America is a region where the establishment of PES is fairly long-standing and familiar to many actors. This region is considered a pioneer in the matter, in particular with the National Costa Rican PES, which has been described in Chapter 1.

Asia (particularly South-East Asia) emerges as an area where such mechanisms are developing. But their development is more difficult in Africa. That is likely due to the weakness of legal and institutional frameworks on the one hand, and on the other, the limited availability of technical and economic information for implementing such mechanisms (Bond, 2009; OECD, 2009).

Apart from major, already long-standing policies of the agro-environmental type, European countries too seem relatively less represented (Fournier, 2009). A similar

observation may more clearly be made for PES mechanisms specifically aimed at biodiversity: of fifty or so projects surveyed in 34 countries, 5 belong to industrialized countries and 3 are located in Europe (Fournier, *op. cit.*).

The objectives to be achieved and the modalities of intervention differ depending on the geographic origin of a PES (Wertz-Kanounnikoff, 2006): in industrialized countries, PES programs are most often aimed at providing a curative response to environmental degradation (reducing damages to the environment by restructuring activities or reducing ecologically damaging practices); in DCs, they are most often aimed at conservation, the protection of ecosystems and the prevention of damaging practices.

The PES systems in DCs are most often public sector in nature, particularly in Latin America (they are organized by governmental bodies). More "commercial" mechanisms that call for private sector interventions are more strongly represented in industrialized countries.

The difficulties faced by PES promoters in DCs are most often due to ownership systems. On the one hand, owners – *i.e.* the contracting parties – are difficult to identify and their rights may be quite weakly asserted. That may incite opportunistic operators to take the ES payments in their place – and even to dispossess them. On the other hand, when ownership systems are community-based, the transaction has to be done with collectives, which can take more time; however, the two African examples from our own case studies show that community mechanisms can also be really efficient, in the sense that the mechanism is deployed at a larger scale. One last factor – the weakness of legal systems – makes the continuation of timely payments over time rather uncertain.

For these reasons, the quality of the civil status, land registry and legal system have been identified as decisive conditions for the establishment and success of PES mechanisms in DCs (FAO, 2007).

3.1.2. What scale for PES mechanisms?

The scale of a PES may correspond to operative boundaries (*e.g.* a catchment area) or administrative limits (commune, region or even country). Their sizes are potentially very variable, from very small watersheds for a given service to international programs.

Local PES mechanisms seem largely more widespread today than PES systems of a national or international scale. According to Mayrand (2004 *op. cit.*), of 28 PES mechanisms in the western hemisphere, identified with the help of published and

non-published literature, 21 were local in nature, 3 national (Costa Rica, USA and El Salvador) and 4 international (TNC, Regional Integral Silvopastoral Ecosystem Management Project, Conservation International and Fonafifo). In fact, from the 1980s to 2000, most mechanisms remained extremely local in nature. It was only since the 2000s that PES systems were extended to the national level in some countries (Costa Rica, China, Mexico) or even the international level (Asquith and Wunder, 2008; Asquith *et al.,* 2008; WWF, 2009).

These scales may be correlated to the type of funding source: the State for international and national PES mechanisms, and direct users of the concerned resource for national and local PES. The latter are often aimed at water services (water protection). To the extent that these are generally established informally and outside the regulatory framework, they remain relatively circumscribed to their perimeter.

Logically, government-funded programs cover vast areas, most often by scaling-up after restricted pilot phase. In the USA, for instance, the US Conservation Reserve Program covers up to 14.5 millions hectares (see Chapter 2); in Mexico, over 3 million hectares are covered by the system set up and in China, 9 million ha.

However, the size of public PES mechanisms is likely to vary depending on the political arbitration establishing their annual budgetary endowments, except if their funding base is secured by mechanisms of the trust fund type (UNEP, 2004; Boisset, 2008; Wunder, 2008).

The scale of application also depends on the type of ES targeted. Programs that emphasize hydrological services, the prevention of erosion, and environmental qualities are therefore often established at a local or regional scale and more rarely at national level (such as in Mexico). On the other hand, to the extent that their beneficiaries are inhabitants of the planet as such, carbon sequestration is the subject of large-scale mechanisms.

Such international PES systems are most often developed by the International Union for the Conservation of Nature (IUCN) and the United Nations Environment Program (UNEP). However, due to their vast perimeter, it is difficult for them to target areas of environmental value that are the most threatened and to differentiate payments according to the specific contribution of each type of terrain. This type of instrument is then more like a general subsidy. With almost fixed amounts, which do not reflect variations in the quality or quantity of the services offered, the economic relations between buyers and suppliers is weakened and there is a high risk of paying for activities that would have taken place even without any specific intervention (zero additionality).

Moreover, some authors stress the fact that large-scale PES systems are generally not local pilot experiments that have been gradually expanded, but on the contrary, they are designed directly at the international level. They therefore do not allow for uncertainties to be taken into account nor for errors to be corrected, as in the case of the expansion of a small, pilot experiment (Asquith and Wunder, 2008; Fournier, 2009; OECD, 2009).

In any case, PES systems are not spared the problems often raised due to discrepancies between the temporal and spatial scales of biodiversity, and of management mechanisms (OECD, 2009; Fournier, 2009).

3.1.3. Public, private and associational actors: complex relations

PES mechanisms take several different forms, varying in particular with regard to the level of participation of the contracting parties: producers paid for their practices, payers and intermediaries.

"Producers": a trend towards enlargement

The large majority of PES programs are aimed at private landowners or land users enjoying land use rights. However, in some cases, governments are the owners and PES programs can also partly or wholly target public land, as in the case of certain protected areas. In other cases, local authorities have joint ownership rights or, at least, joint land use and management rights; they can then position themselves as ES producers. The distribution of payments and duties among community members then often becomes problematic (Engel *et al.,* 2008).

Gautier (2009) considers that the "biggest" actors (forest industries, major agricultural producers, etc.) more and more frequently take advantage of the payment of financial compensation by ES beneficiaries. In fact, they enjoy an advantage due to their size, which enables them to organize large-scale mechanisms, at reduced transaction costs (proportionally with regard to the payments themselves, their administration cost is comparatively low). To counter this effect, "small" actors and intermediaries seek to negotiate collective contracts, thereby sharing the burden of administrative costs over larger volumes.

Payment by third parties: a lesser evil?

As we have seen earlier, the payers are not always the service's beneficiaries, though they sometimes take their place, wholly or partly (for example, when payers belong to an NGO pursuing global objectives). Two categories of PES may be distinguished on the basis of this criterion:

- *PES systems that are directly funded by the beneficiaries;* the payers are then the effective users and beneficiaries of an ES. They may be hydroelectricity generation companies, domestic use water consumers, pharmaceutical industries, *etc.* These programs often have to do with a single service and are established at a limited scale. One such case is, for instance, a PES mechanism in which an Ecuadorian hydroelectric power generating company pays land users in order to preserve the quantity of water in the watershed area upstream of its unit (Mayrand and Paquin, 2004). Pagiola and Platais (2007) underlined that this type of program often proves effective due to its targeting, and because it involves and interests the best-informed actors with regard to the value of the service, and that the latter can keep an eye on their interests (Bond, 2009; Engel *et al.,* 2008 *op. cit.;* Smith, 2006).
- *PES funded by third parties acting on account of the beneficiaries;* these may be government bodies, international institutions and NGOs. In this case, since the funding parties are not the service's direct beneficiaries, information is not as strategic for them as in the preceding case, which calls the efficiency of the programs concerned into question (Blackman and Woodward, 2010). Conversely, it is sometimes pointed out that the State-funded PES prove more profitable than those funded directly by the beneficiaries of an ES, due to the economies of scale that lead to reductions in transaction costs (Corbera, *et al.,* 2007; Engel *et al.,* 2008 *op. cit.;* Pirard *et al.,* 2009).

Public schemes may involve a municipality, a local administration or the State, which acts as the main and maybe sole buyer. The State's involvement then offers the advantage of legitimacy that gives the system strength. It may often involve national plans and generally cover several services at the same time, whereas those funded by users most often focus on a single type of ecological service. That is the case, for example, with Costa Rica: the mechanism is aimed at forestry practices in general, and several ES: biodiversity, the preservation of water resources, etc. (see previous chapters). Sometimes the reverse is true, as can be seen in the case of Los Negros, Bolivia. One of the weak points of public programs is that they are considered more vulnerable to changes in public policies and to electoral strategies (Bond, 2009; OECD, 2008).

In the case of private mechanisms, companies, NGOs, cooperatives or individuals are the buyers. Their advantages may be direct (see the example of East African tour operators), or indirect, in terms of image (EEC, 2006; Wunder, 2006b and 2008; Koellner *et al.,* 2008).

When buyers are individuals, the objective is supposedly achieved more quickly, since the procedures and operations are simpler. Conversely, contracts involving a large number of stakeholders or associations are believed to suffer some inertia, but that may be compensated by a better understanding of the stakes involved in the protection of the resource, and a better consideration of long-term objectives. Finally, as in the case of suppliers, a smaller number of better organized beneficiaries would, in theory, help in achieving proportionally lower transaction costs – a benefit that would compensate for the disadvantage presented by their lower political legitimacy (Clements *et al.,* 2009; Mayrand, 2004).

Intermediaries: a prerequisite?

Intermediate operators are often considered as indispensable catalysts for the establishment and management of PES systems. They organize the negotiation process, help in defining contractual terms and conditions, in overcoming institutional lacunae (ownership rights, etc.) and in facilitating financial transactions (Smith *et al.,* 2006; Leimona, 2009).

Their role may be fundamental if they secure the payers and convince them about the links between their profits and Ecosystem Services. They then increase the beneficiaries' motivation to pay.

However, several authors consider that direct negotiations, without intermediaries, provide for better efficiency. In Costa Rica, for instance, the hydroelectricity generation company, Esperanza, pays a forest reserve directly for the preservation of water resources. It is a simple and far from costly contract due to its bilateral nature. Land use is agreed upon and the risk of changes in the future is limited. On the other hand, the East African example demonstrates the importance of intermediaries, who have made it possible to approach the Maasai community and add a second flow of payments and services to the tour operators' business deal (anti-poaching guards).

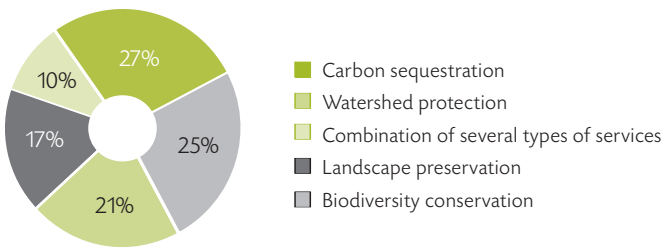
Examples of direct negotiations between environmental service buyers and sellers are rare. In most cases, most upstream land users, and downstream beneficiaries, make the intervention of one or several intermediaries necessary (Smith, 2006).

3.1.4. Are PES mechanisms adapted to all types of ES?

Four types of ES are generally targeted by PES mechanisms today: biodiversity conservation, water resource protection, environmental preservation and carbon sequestration; moreover, some mechanisms cover a series of services (see above). The distribution of services of these types in the Landell-Mills and Porras *(op. cit.)* sample seems relatively balanced.

Graph 3

Distribution of PES cases according to types of services



Source: Landell-Mills and Porras (2002).

Biodiversity protection: mixed results

Despite its recent expansion, this field is still at an experimental stage, to a large extent. The development of PES concerning biodiversity seems to have been impeded by several parameters (Karsenty, 2010; Daniels *et al.,* 2010). Firstly, one of the specificities of such PES programs is due to the fact that ES are often misunderstood and are mainly based on "non-use". To the extent that the relations between biodiversity, ecosystems and human well-being are still not fully understood, payers compensate an ES while accepting that it would not lead to any direct changes in their well-being, but rather for altruistic reasons (Monnery, 2010). Moreover, the benefits related to biodiversity protection are uncertain and would only be registered in the very long term. Beneficiaries of services of this type are rarely specifically identified. Hence, apart from the cosmetic and pharmaceutical sectors, the actors in the field are most often members of associations or else governments, and call upon a number of intermediaries. Finally, the value of biodiversity conservation services is difficult to define, and more so to quantify. That would lead to their under-estimation and even to them being overlooked, whereas directly or indirectly, they are a factor underlying all other ES.

For all that, the recent interest shown in biodiversity PES programs has led to a major innovation in the design of payment mechanisms. Initially costly and complex, these mechanisms today call far more upon intermediary operators such as trust funds, mutual funds and eco-certification. As risks and costs fall, the craze for such tools is likely to increase (Landell-Mills and Porras, 2002).

However, with regard to bioprospection in particular, the initial enthusiasm seems to have met with some disappointment recently. These projects did not generate the kind of spectacular discoveries for which DCs may have been rewarded and therefore, several pioneering companies in the bioprospection field have forsaken such endeavors over time (OECD, 2009).

PES systems for hydrological service – The most widespread

Several PES systems target hydrological services of diverse types: protection of water quality, regulation of water flow and, in particular, flood prevention or the preservation of aquatic habitats. These systems have the specificity of being used today both in DCs and in industrialized countries. The study by Landell-Mills and Porras (2002) identified 61 cases of PES systems for hydrological services, spread across 22 countries (*cf.* Graph 4). As in the case of most PES systems, catchment area or watershed initiatives are developing in Latin America (Costa Rica, Ecuador, Guatemala, Mexico and the Dominican Republic) and in Asia, but there are still very few in Africa, apart from a few recent projects in South Africa, Kenya, Uganda and Tanzania (WWF, 2009).

Graph 4

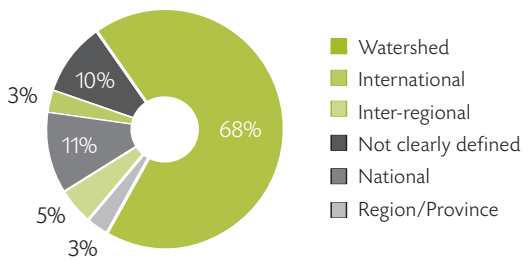
Geographic distribution of PES systems for the conservation of water resources

Source: Landell-Mills and Porras (2002).

The agreements on hydrological services are generally local in scope and most of the transactions take place at the watershed level itself. In some cases, they are managed by the State (in 11% of the cases in the Landell-Mills and Porras sample). Graph 5 illustrates their distribution. Finally, among the 61 cases identified, only one offers an international arrangement (between Argentina and Bolivia).

Graph 5

Extent of PES systems for the conservation of water resources



Source: Landell-Mills and Porras (2002).

Carbon sequestration

Since 2002, carbon PES systems have witnessed some development within the framework of the Kyoto Protocol and "clean development" mechanisms. The latter are global in scope and most of the transactions involve international buyers.

Communities receive funds from NGOs, governments or international organizations, on the basis of a contract establishing conditions for the conservation of forests, reforestation or "sustainable forest practices". Programs of this type are frequent on the American continent, have been set up in Costa Rica and in the USA and are being developed, among others, in Colombia, Mexico and Nicaragua (Bond, 2007).

In Mexico, for instance in Oaxaca state, the NGO Pronatura has set up a voluntary carbon market system. Volunteering companies purchase carbon credits from communities that manage their forests in order to optimize storage. The issue here is no longer that of the surface area of conserved forests, but of the carbon-equivalent tons stored by a forest. In the system set up, companies purchase a carbon-equivalent ton at a price of USD 36 (MXN 445, a price far higher than on the international market). Communities sign 21-year contracts with Pronatura, which helps them in managing their forest. The companies pay for their certificate every year, depending on the amount of storage achieved.

The CO_2 capture and sequestration service provided has not been examined in depth in this study. However, it concerns the other services indirectly when plantations or forest conservation measures also contribute to the conservation of water resources, the protection of ecosystems, the fight against erosion and the prevention of soil salinization (Mayrand and Paquin, 2004; Meignien, 2010).

Preservation of the landscape – Among the rarest

This type of PES system is less developed currently. Services related to the beauty of a landscape are mainly associated with the aesthetic or cultural value given to certain natural sites. Among others, they include the protection of natural heritage sites, coral reefs, cultural sanctuaries or even traditional means of subsistence. Payments are carried out either through the sharing of entry fees paid by tourists, or the establishment of taxes paid by tourism companies. Most PES systems of this type can be found in Latin America and the Caribbean, followed by the Asia/Pacific region. Industrialized countries barely have any such systems.

The ecotourism industry is perhaps one of the main users of landscape conservation services. National and international tourists are increasingly emerging as a primary source of funding (see the case studies undertaken in Namibia and East Africa for the present study). The agreement to pay can partly be seen in the high transportation costs, in the additional costs related to additional entry fees and the higher than average lodging and boarding rates (Monnery, 2009; FAO, 2007). Their potential economic power makes them attractive to DCs.

However, these mechanisms generally fall outside the definition that we have proposed for PES systems. It is true that the payment sources are generally the beneficiaries of the landscape preservation measures. However, it seems that most of the time, the funds are not used to incite producers to conserve or change practices. Such PES systems are more often used to fund the administrative and technical management of natural areas that ensures that the landscapes remain pristine: parks, guards, etc. Hence, the aim is not to pay a service "producer" to compensate for the opportunity costs associated with the desired practices, but to act through supervision and by imposing constraints. Hence, there is no logic of the "purchase" of services, which is one of the specificities of PES systems (without any prejudice to their superiority). From that point of view, the instrument used should rather be considered and assessed within the framework of the category of regulatory or normative instruments. The innovation introduced by "landscape" PES systems essentially stems from the fact that their funding is partly provided by their users; but considering that as something new is debatable...

The situation is far different in the probably rarer cases where the funding is used to compensate producers so that their practices produce, maintain and restore landscapes. For instance, some agro-environmental measures include such an objective (maintenance of hedges, etc.). In the same way, assistance for mountain agriculture or management agreements with extensive cattle-breeders are sometimes established with the aim of maintaining "open" spaces. In this regard, the case of conservation easements in East Africa may be mentioned (see Chapter 2). The payers (tour-operators and tourists, who are, in fact, called "visionary") are actually users of a whole series of services including spectacular wildlife and its associated environment; moreover, the payments are aimed at consolidating the presence of extensive cattle-breeders, whose practices increase open lands as well as the migratory conditions of ungulates. The remuneration improves the cattle-breeders' economic condition, so that they can resist arable farming projects. However, in most cases, "landscape" services are provided and maintained by regulatory provisions, protection systems, prohibition and control.

Bundled services – Easier to manage?

When different services are provided and sold together in the same territory, they are called bundled services. The services may be sold as unified groups of services (in that case, it is impossible to separate the services) or as "baskets" of services (in which case specific services may be purchased from a "basket" of different services that land users "sell" to buyers). According to the literature, these unified groups are easier to manage – they help reduce transaction costs (as the same management costs are spread over a larger trading volume). Nonetheless, by their very nature, there is a risk that they may be less effective in meeting environmental goals, as it is impossible to target payments at specific services. The "basket" of services approach therefore helps maximize returns, but it is more complex to manage and costlier as well (Monnery, 2009).

3.1.5. Long or short-term PES systems – theoretical debates

Defining a clear and precise contract is often mentioned as an indispensable condition to avoid payers being exploited by "suppliers", and vice-versa. But the duration of payments is a crucial issue and one that is often debated.

According to the FAO, the duration should be long enough to observe a significant improvement or the protection of the environment over the period. In some cases, the ES are generated only several years after a supplier has put the required changes into practice. The gap between the resilience of living beings and the economic time

period mentioned earlier can once again be seen here. This observation seems all the more true for biodiversity related PES systems.

However, according to the literature, the modalities of a contract drawn up on a long-term basis could very soon prove obsolete, and all the more so if the farmers are involved in the transaction, due to market and yield fluctuations (FAO, 2007).

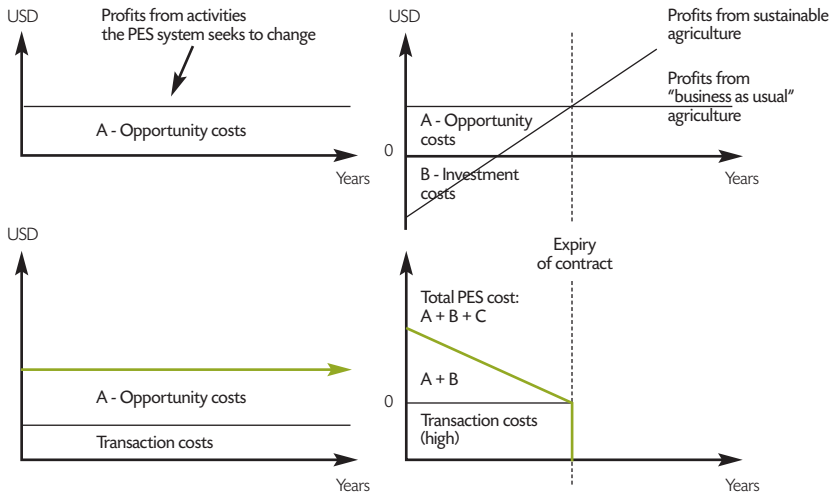
In fact, the duration of the basic contract of PES programs varies between one and five years. Some exceptions can be observed, particularly in Ecuador where the first 5-year contracts have been extended to perpetuity. For watershed PES systems, the 5-year duration is often recommended by the authors. On the other hand, the preservation of biodiversity needs to be done over the long term for it to be effective. The use of trust funds can then prove relevant (Asquith, 2008; Bond, 2009).

In theoretical terms, Pirard *et al.* (2009) conceive of the advantages of a limited term PES program as compared to a long-term PES as shown in Graph 6. Their reasoning seems valid for PES systems based on the principle of funding the necessary capital for bringing about a change in practices, most often by restructuring the producer's practices (so-called "asset-building" PES mechanisms in the literature, as opposed to PES systems that fund the continuous change in practices, which are then called "use-restricting" PES systems). They believe that after a given time, the restructured production activity would become profitable by itself, and that payments would no longer prove necessary. They compare this situation with a hypothetical case of payments for practices with no fixed time period, which by its very nature gets extended without any time limit. The "asset building" strategy has been used in particular within the framework of sylvopastoral projects in Colombia, Costa Rica and Nicaragua.

The comparative advantage of the cases broached depends on their location and the slope of the various straight lines, and therefore, on the relative level of transaction costs, opportunity costs and discount rates (*cf.* Graph 6).

Graph 6

Theoretical comparison of two PES mechanisms, one short-term, the other long-term



Source: Authors, based on Pirard et al. *(2009).*

However, in practice, it is very difficult to reach a situation that makes it possible to stop payments. When contracts expire, some previous non-sustainable activities are re-started. Moreover, short-duration payments may create a feeling of financial insecurity among those paid. In some cases, short-term payments are aimed at achieving immediate results, without claiming any sustainability. They then make it possible to remove or mitigate a threat for some time, limited to the payment duration (FAO, 2007; Pirard, 2009; OECD, 2008).

More generally, it does not seem desirable to establish *a priori* preferences or assessment criteria, and to disqualify all recurring PES mechanisms. In fact, despite their disadvantages, it must be noted that recurring payments are better adapted to preventive actions, which make it possible to sustain and maintain practices favoring biodiversity (see above for examples concerning extensive cattle-breeding, rubber and sustainable forestry, ecotourism, etc.). Payments for re-structuring, for a limited time period, are better adapted to curative actions, where the biodiversity has already been damaged and where producers have to be paid for them to restore it, or even to simply stop the

pressure they put on biodiversity. In conclusion, Corbera (2008), on his part, believes that what is the most important is to enable the rules established to change over time.

3.1.6 Conclusion

This critical review testifies to the fact that PES systems do not constitute a stable or unified model of action. While the principle behind them, as described in Chapter 1, remains stable and establishes their "selling point", experience shows that they meet the variety of needs and are more or less well adapted to different public policy contexts.

Hence, they cannot provide a solution to the institutional shortcomings of certain less advanced countries, they may lead to the concentration of producers, or be diluted through a chain of intermediaries. They seem better adapted to hydrological services and carbon sequestration rather than biodiversity and landscape protection. Their contractual modalities may lead to pernicious or contrary effects, and must be chosen while bearing several precautions in mind so as to be well-adapted to different economic and social conditions. In these conditions, apart from the historical success stories and several local successes to which these analyses testify, can one expect PES systems to one day become the predominant method for public action? And if so, what would be the potential effects?

3.2. Discussion: issues involved if PES mechanisms become an action model for the environment and development

PES mechanisms may be considered as a pragmatic response to a certain number of problems faced by traditional environmental policies, which we have referred to in the introduction: inadequate action with regard to land occupancy, low government budgets, complex instruments not in proximity with actors and territories and the multiplication of regulatory and normative instruments.

It is difficult to say today whether the media coverage and critical success of the corresponding instrument has had any significant mass effect, in terms of implementation on the ground. It is true that there are already hundreds of PES systems, but their share as compared to the totality of environmental actions and budgets is not easy to estimate. It is possible that at least part of their success is in fact the impact of their being in fashion, which would at the same time lead to a fairly uncontrolled development of initiatives, and present old concepts in a new guise.

It nonetheless remains that PES systems do correspond to a series of three principles of action, which may together be considered as an innovation in environmental policies: *(i)* the "beneficiaries" have to contribute, *(ii)* direct relations are organized between economic agents faced with an "external effect", and *(iii)* the instrument is entirely based on incentives and volunteering by producers. While these characteristics are likely to explain the current passion for this instrument, they also call for discussion and a retrospective examination. That is the purpose of this section, which is based on the concerned information available in the literature, contributions by members of the study's scientific research council (which met on 16 November 2010), and the personal communications of Laurent Mermet (Professor, AgroParisTech). Can PES mechanisms constitute a model for collective action in the biodiversity field? This section will firstly examine the questions raised with regard to the reliability of such a hypothesis, then the relations between the social and environmental challenges of PES systems and the resulting biodiversity risks.

3.2.1. Is the widespread use of PES systems "feasible"?

It would call for a change of scale in implementation

PES systems today are most often "pilot" projects. Their widespread use would therefore presuppose the extension of this status and a change in scale (Fisher *et al.,* 2009). However, two factors may cast doubts on their potential (Pirard *et al.,* 2010):

- Pilot projects are extremely attractive, which would no longer be the case if such systems are generalized; hence, some of the favorable factors contributing to the positive appraisals and assessments of a pilot project would not necessarily be present if the system is generalized.
- The participants in a pilot project tend to overvalue achievements, thereby skewing the assessment on the basis of which the project is scaled up. Most assessments do not take institutional transaction costs into account in particular, such as those necessary to build the beneficiaries faith and to guarantee "exclusive contracting" rights for the area (Le Roy, 1996; Wunder and Vargas, 2005).

It would call for an almost infinite solvent demand

Given that PES systems should be based on payments from beneficiaries, their extension presupposes that the latter's demand will be sustained, on the one hand, and on the other, that the latter would keep willing to pay for ES (Adger *et al.,* 2001 *op. cit.,* Paavola, 2005 *op. cit.*). But in certain cases, signs of a fall in the demand may be observed among certain private actors. In particular, that is the case in the pharmaceutical and cosmetic fields, where companies often limit payment amounts by playing with the

balance of power which is in their favor due to their concentration, the abundance of attractive areas and the weaker organization of producers (Pearce *et al.,* 1999; Ten Kate and Laird, 1999). Costa Rica may be an exception, especially because it has managed to establish clear rights and high biological quality services, and to impose a single window forcing the interested companies to broach government bodies for all their ES purchases.

Moreover, the beneficiaries' agreement to pay relies especially on their awareness with regard to environmental issues. Hence, poverty, on the one hand, and low levels of environmental education and sensitization, on the other, could prove to be restrictive factors in some DCs. Given these conditions, the widespread use of PES systems would then have to be based on *(i)* external funding coming from non-local beneficiaries, for instance, through the intervention of international NGOs mobilizing contributions from the North; *(ii)* the association of different types of environmental and social objectives within the same PES, even at the risk of "diluting" the initial objective (Kemkes *et al., op. cit.*); and *(iii)* awareness-building activities (Daily and Elison, 2002).

There too, these conditions would probably be more easily met for carbon PES systems (organized market and institutions in the process of being established) or those for water (for the same reasons), but not for tourism, which should come up against the end of the elasticity of demand.

It would call for the strengthening of the regalian State

As the examples and analyses in the preceding chapters have shown and as almost all authors underline, the success of a PES system calls for a certain minimum quality in fundamental societal institutions, often designated under the rather too vague concept of "good governance", which more precisely refers to the regalian role of States (Bond, 2009; Clements *et al.,* 2009): strong ownership laws, an effective justice system that offers the possibility of guarantees for contracts, controlled access to protected areas and the ability to punish violations of environmental regulations (in the absence of which the practices to be paid for are no longer additional, voluntary actions are difficult to initiate and their effect is easily cancelled out by non-compliance with the rules; Ferraro and Kiss, 2002). In fact, as has been referred to in Chapter 1, the widespread use of contractual PES mechanisms would not call for additional State budget interventions in environmental policies, but would presuppose the strengthening of its regalian roles and resources, symmetrically to this relative withdrawal (Gatzweiler, 2006).

More generally speaking, in the literature, the most frequent stumbling block for PES is considered to stem from their institutional development conditions, especially the following restrictive factors (Börner *et al.,* 2010):

- Weakness of institutions, ownership laws and regimes
- Scientific uncertainty about the link between biodiversity, ES and the practices to be encouraged
- Insufficient authority for control and punishment
- Costs of cooperation with numerous actors (Grieg-Gan and Bann, 2003)
- In the specific case of PES funded by tourism, income distribution that is sometimes disputed for being inequitable.

It could come up against an increase in the opportunity costs to be compensated

Should PES systems come into widespread use, two factors could increase the producers' opportunity costs for "foregoing" intensive activities and changing their practices for them to be more favorable to the environment (Karsenty, 2007 *op. cit.*):

- Middle and long term forecasts suggest that agricultural prices would increase in the future; hence, compensating for opportunity costs could prove to be increasingly costly and, therefore, potentially limited (Karsenty, 2010 *op. cit.*)
- It may be considered that a PES means at least partially converting a producer's business by reducing his economic production in favor of ecological production. Theoretically, if such actions were to increase and become widespread, they would likely lead to a change in the relative rarity of both ES and consumer goods. In fact, by substituting ES for consumer goods, the former would become more widely available and, hence, their value would fall, whereas the reverse would hold true for commodities (rarer, their value would increase). As may be imagined, in that case, paying for production by the former to the detriment of the latter would become increasingly difficult (Karsenty *et al.,* 2010; Pirard, *op. cit.*).

Some pernicious effects would be difficult to avoid

It must be noted that some PES mechanisms may aim at providing compensation for stopping illegal practices. This is obviously a problem, but the solutions are nonetheless far from simple. In fact, in some cases, the application of the law is too weak to count on its coercive effect. That is the case with putting an end to poaching, in particular, which is sometimes highly defective and out of reach in the short term. But it is also sometimes the case for water sourcing, pollution, slash-and-burn and slaughter, etc.

Indeed, the problem is not just found in the countries of the South: in France, it is well-known that environmental regulations only rarely lead to the effective execution of sentences, for instance. Given these conditions, economic incentives for stopping such practices may prove to be far more effective, in a way that would not be possible for restrictive measures.

However, the problem of precedents then arises: on the one hand, they call compliance with laws into question; on the other – and that is potentially even more problematic – they may incite any economic agent to ask to be compensated, like the others, merely to agree to apply the law.

Along the same lines, providing compensation for stopping polluting practices ("curative" PES mechanisms) is also problematic. For instance, it could involve compensation for the reduction of the spread of products that are toxic for water, or deforestation, *etc.* This objective is in contrast with compensation for supporting practices that produce a service ("preventive" PES systems): planting trees to reduce erosion, the use of pastures in order to keep landscapes open, the establishment of beehives to ensure pollination, *etc.* However, limiting PES systems to preventive objectives cannot be envisaged, as too often, the issues to be addressed are curative in nature (limitation of pollution, of destructive or unfavorable practices, *etc.*). When practices are not under control, as is (normally) the case in protected areas, pollution-directed measures are therefore indispensable, and curative PES mechanisms are unavoidable (Sierra and Russman, 2006).

However, as in the case of illicit practices, these instruments raise the problem of the displacement of the power balance and of the justification for such services, due to the creation of new precedents and references: if every reduction in pollution has to be paid for, it may incite people to exert pressure to get compensation for such reductions (in other words, it may incite them to create a problem so as to get a compensation for then resolving it). In this context, it is important to distinguish between preventive compensation (to support an endangered practice) and curative payments (compensating for the cessation of non-sustainable practices).

So as we can see, for both institutional and economic reasons, the widespread use of several PES cases as a general model of action to safeguard biodiversity may incite some skepticism. In any case, major factors of resistance can be expected if PES mechanisms are transformed into a predominant mode of action. It is true that the principle of PES systems is already present within the framework of large-scale environmental policies (the CAP agro-environmental measures or the Costa Rican system). But these

examples of large-scale action apply more to relatively developed countries. Moreover, their environmental effectiveness is debatable. Widespread use is therefore not easily compatible with environmental effectiveness.

3.2.2. PES systems: both a social and environmental instrument?

PES systems are supposed to give priority to the least intensive producers and, hence, the most disadvantaged social groups. "Social" issues therefore often seem unavoidable for the development of PES mechanisms. Furthermore, examples from literature show that they are often subject to political pressure in order to incorporate social criteria. On the one hand, the aim is to treat producers "equally" and, on the other, to incorporate the objective of "fighting poverty" along with environmental objectives. However, associating social and environmental objectives presupposes the adoption of different criteria and modalities, which are not necessarily in synergy: those necessary in order to achieve environmental results, on the one hand, and those necessary for fighting poverty, on the other.

Poverty alleviation and environmental priorities are not always synergetic

Indeed, in some cases, superimposing social and environmental objectives is not easy on the ground (Adger *et al.,* 2001; Pascual *et al.,* 2009; Cao *et al.,* 2010). It is often difficult to make payments dependent on environmental results and to ensure that payments cover only practices that are additional to the law. For these reasons, PES designers generally prefer promoting differentiated payments depending on environmental situations and ecological allotment criteria. However, these criteria are sometimes indifferent to the poverty of the producers who are eligible for these payments (location of plots of land, for instance, or type of farm; Leimona, 2009). In other words, whereas the geographical areas targeted by PES mechanisms are by their very nature rather poor, within these areas, environmental priorities are not necessarily aimed at the farms or plots that would be selected to respond to social objectives.

Indeed, the impact of PES systems on poverty remains problematic (Sommerville *et al.,* 2010). It seems essentially related to the fund flows transferred to a given area, more than a direct impact on the income of the producers signing such contracts (Landell-Mills and Porras, 2002). Furthermore, field experiences suggests that the impact on poverty depends above all on the development of human resources, through the institutional capacity-building required by the implementation of the arrangements: structuring of communities, strengthening rights, training and qualification of actors participating in the operations, *etc.*

"Wealthy contract-holders" tend to grab the rent

PES mechanisms, initially developed for poor and rural populations, are increasingly often being applied to the wealthiest concessionaires-holding contracts on the use of the public domain. That is the case, in particular, when the producers of the services paid for are not the traditional users of the resource, but public or private sector organizations that use the resource directly (contract-holders), or present themselves as intermediaries (carbon market investors, for example) (Zbinden and Lee 2005; Ferraro, 2008). The risk then is that the efforts that should be made to change development trajectories will be set aside, to the benefit of mass financial support to already wealthy professional providers, using the pretext of effectiveness (Pirard *et al.,* 2009).

3.2.3. Will biodiversity be a "free riding objective"?

The various limitations and difficulties with the widespread use of PES systems are not necessarily impossible to overcome. The many examples that have been mentioned testify to the fact that a real dynamic of action may result from their financial mobilization powers, their managerial pragmatism, and their capacity to adapt, through the different forms they have. However, the success stories observed leads us to fear that they may be achieved in geographical sectors where favorable conditions can be found, and for issues that are already economically promising (water and carbon, in particular). As for biodiversity issues themselves, within the framework of the difficult reconciliation of economic, social and environmental criteria, it seems that the latter are more easily left by the wayside.

Pragmatic efficiency rather that guaranteed results

Both the theoretical principles underlying the conception of PES schemes and the general survey described in Chapter 2 have shown that the purpose of PES schemes is generally not formulated in terms of ecological indicators. In fact, most of the time, a link is established – approximately – between a production practice and an environmental state sought. For instance, it is considered that a given forestry practice guarantees plant cover and thereby the cessation of erosion or groundwater replenishment (Mexican, Chinese and Indonesian examples). In such cases it is the practice and not the state of the environmental condition that is the subject of the PES scheme. Chapter 2 also testifies to this – most of the contractual commitments provided for by PES mechanisms concern practices: extensive cattle-raising, forest use without slash and burn, cultivation without pesticides or fertilizers, cessation of poaching, etc. An objective of this type is easier to incorporate in a contract and guarantee than an ecological objective, based on complex, difficult to measure indicators.

In other words, a PES scheme is based on the identification of one or several factor(s) favorable(s) to environmental quality, but does not guarantee the achievement of the final objectives set (Blignaux *et al.,* 2010; Wendland *et al.,* 2010). In fact, our case studies are not subject to a precise environmental follow-up (except in the case of New York); on the other hand, all of them include guarantees that are easily verifiable in terms of the action taken with regard to practices.

This characteristic may be seen both as a strength and a weakness:

- It is a strength in the sense that the implementation of a PES mechanism does not call for a very detailed level of ecological information, nor the definition of a complex system of monitoring and evaluation indicators. Unlike what sometimes hinders regulatory policies, it is not necessary to have scientifically demonstrated the factors in question, since the instrument is voluntary and is used to achieve intermediary objectives. It works like a mechanism that encourages whatever is "moving in the right direction", without waiting to have all the resources necessary to fully solve the problem
- It is a weakness because the successful implementation of a PES scheme in no way guarantees the achievement of the concerned environmental objectives. There is therefore a considerable risk that mechanisms whose implementation may lead to the social satisfaction of only some aspects (friendly consultation, dialogue between economic agents, activities for intermediaries, distribution of income, *etc.*) at the expense of environmental criteria that, as an alibi, are considered at best as secondary – mere by-products.

The risk of "free riding objectives"

PES schemes funded by governments often include secondary objectives, such as development, poverty reduction, or job creation. Preserving biodiversity then becomes an implicit objective that may be considered a free riding objective.

Several authors have observed more generally that water or carbon sequestration PES schemes are favored compared to those that aim at biodiversity preservation. Hence, Fournier *(op. cit.)* recalls that the Costa Rican example is a mechanism funded by and for carbon, to which biodiversity has been added as a secondary objective. For the former, it seems easier to identify the sources of the ecological service (place and practices in question). Furthermore, organizations too are available for them (international markets and agreements for carbon, municipal enterprises and watershed organizations in charge of water management). Finally, the beneficiaries have a greater level of solvency.

There may also be political competition between social and environmental objectives. Hence, Bennett and Xu (quoted by Karsenty *et al., op. cit.*) refer to a Chinese example in which the authorities did not dare stop a PES scheme despite its zero added value, since it benefited particularly poor population groups.

An example: the Mexican PSAH

Implemented since 2003, the national Mexican hydrological PES program (PSAH, see case study N°.1 annexed) has witnessed considerable developments. Initially, the program's primary objective was to focus on areas with the highest deforestation risks and where the aquifers were particularly over-exploited. Then, with an equal level of risk for these two parameters, the third priority was the marginalization level of the population.

It very quickly emerged that under these conditions, only a few of the country's states were concerned. The non-priority states then put pressure to also be able to be ensured their share of the resources devoted to this program. A minimum budget system for each state was then established, deviating from the environmental objective, but offering greater "equity".

Moreover, the PES proposals that had been accepted each year since 2003 within this program were examined through a study and the National Ecological Institute (INE) analyzed the criteria selected. In 2008, 13.5% of the projects funded were located in an area with over-exploited groundwater resources and 47% of the projects were located in a high or very high deforestation risk area. The other half of the landowners paid were therefore not characterized by practices that were unfavorable to the ecosystem. On the other hand, 20% of the projects concerned marginal population groups (although it seems that among these groups, the poorest were barely represented). However, according to the INE, *"this program's primary aim is to fight against environmental degradation which is of great concern to the country. It is not a program whose N°. 1 objective is poverty alleviation. If one wants to fight against poverty, there are other more effective means available"* [22].

Within the framework of the annual discussions on the definition of the program's rules, in the light of these results, the INE proposed a review of project allocation modalities. In addition, the study made it possible to show that it was necessary to strengthen communication in areas in which high environmental stakes were involved in order for the landowners in these areas to participate more actively in the program.

[22] Extract of a meeting held during the case study.

4. General Conclusion

This conclusion takes up the contributions made during a discussion held with the study's scientific committee, in the form of a series of criteria for the *a priori* assessment of PES projects, to be incorporated in the reflections of development assistance actors in their project development and selection processes. It also attempts to summarize the way different factors drawn from literature have made it possible to find responses to the questions raised in the introduction.

4.1. An *a priori* assessment grid of PES schemes

4.1.1. In what cases should interventions be made – through capitalization and restructuring, or through the restriction of use? [23]

The environmental problems raised by subsistence activities that seem non-sustainable (slash-and-burn, for instance) must be distinguished from the impacts of commercial, sale and even land income activities. The former are related to economic insecurity and low social and economic capital. The activities of PES schemes may then consist of increasing the income of economic agents to avoid their consumption of natural resources. In this case, the preferred action is of the type related to the restriction of practices. In other words, it is related more to the problems raised by poverty and subsistence or even survival practices. On the other hand, commercial activities (cash crops, *etc.*) are more capitalistic. In their case, payment through asset building becomes preferable to income support.

4.1.2 In what cases should payments be limited in time?

Setting a time limit to payments is subject to controversy, as we have seen. On the one hand, sustained payments offer the risk of creating a sort of regular income and dependence on aid; on the other, they can help finance support for certain practices and prevent threats as long as they are continued.

When PES schemes are used to finance changes in practices that are not themselves profitable (or are less profitable than the alternative competitive soil uses) and are

[23] Sub-sections 4.1.1. and 4.1.4. of this section are taken from Philippe Méral's contributions in the scientific committee. Sub-section 4.1.3 is inspired by Romain Pirard's proposals and the last two contributions by Christophe Després. We would like to reiterate our gratitude for their contribution. Any errors or approximations are obviously the authors' responsibility.

easily reversible (example of territorial agro-environmental measures that pay for fertilization practices without structural changes), then limiting payments in time may not be the best way. Relatively sustained funding should be envisaged, like some other development activities concerning other issues (health, education, agricultural development, etc.).

4.1.3. What scale is best adapted for achieving the objective?

Carbon issues call for large-scale PES programs, as the beneficiaries are on a global scale and the resources and intermediaries are substantial. Water PES schemes, on the other hand, are generally based on a consensus and social engineering, as well as fairly easily identifiable bilateral relations; they call for a more restricted, local scale. For biodiversity, the preferred scale should be that of the protected area itself, or more specifically, the territory in which intermediaries likely to implement the management plans are active and present. Finally, for mixed-purpose PES schemes, the funding potential is the decisive factor and both the geographic scale and type of instrument preferable depend on it.

4.1.4. What political conditions need to be checked?

The political conditions of the country concerned need to be assessed depending on the nature of the PES scheme: justice system and contract guarantees for the most contractual PES schemes, functioning of taxes for para-fiscal PES schemes, and environmental legislation for use-restricting PES systems (Farley and Costanza, 2010).

4.1.5. Incorporation in past development trajectories as a pre-condition for success

Incorporation in past development trajectories is a decisive criterion for the success of PES schemes (Muradian *et al.,* 2009) – in particular, the fact of being based on previous practices, past arrangements that have structured existing problems and minds, and the use of existing institutions (for instance, for the organization of marketing systems).

4.2. General Assessment

ES payments have become unavoidable concepts in the environmental and development policy spheres today. Their contours may, however, seem somewhat vague and their very principle needs to be carefully examined. Several amalgamations are possible, since ES are themselves omnipresent in the drafting and discussion of policies and, moreover, since many instruments provide for monetary transfers: if everything is a PES, then what useful aspects can this concept offer?

Our analysis has therefore led us to put forward some specificities that we feel are fundamental in the approach underlying a PES: the fact that they aim to act on producers' practices in a way that is favorable to the environment, by banking on their voluntary participation, obtained through payments. They therefore differ clearly from approaches based on placing constraints on producers, whether only regulatory or requiring them in addition, to pay themselves to compensate for the negative effects of their activities.

On this basis, it is simple to draw out this type of mechanism, which organizes an exchange between payers (who may be for ES beneficiaries or not), and producers. Specific production practices are exchanged against a payment, when they are considered necessary or favorable for the maintenance of ES.

Hence, it is possible to identify what the archetype of this approach would be – a voluntary contractual and bilateral agreement – between a group of ES beneficiaries and a group of producers. In scientific literature this archetype is called a "market instrument", although, as in the case of any market-based trade, it transpires that it calls upon intermediaries in practice and is based on a decisive institutional framework. Finally, quite a large number of examples of this archetype can be found, and three of the five case studies undertaken for this work correspond to this category. But a large number of mechanisms differ from this archetype, when payments are not solicited from ES users, who are aware of and volunteer for such payments, and even more so when they come from compulsory contributions from the indistinct group of taxpayers.

These distinctions then make it possible to do a "mapping" exercise showing how the different types of PES are placed among each other, on the one hand, and within the field of public policy instruments, on the other, in particular as compared to the "polluter pays" kind of economic instruments and regulatory and administrative instruments.

A general overview of examples of PES located in this map would provide a portrait and an initial assessment of existing initiatives.

Among the messages stemming from this exercise, the following must be noted:

- The widespread proliferation of PES schemes in all the world's regions and pertaining to almost all environmental issues, although success seems more easily obtained by PES schemes aimed at water management and carbon sequestration
- The effectiveness – at least, the apparent effectiveness of such initiatives, in terms of the effective implementation of the activities envisaged. The fact of using literature

as the basis does, of course, generate a certain bias in this assessment (since failures or aborted attempts are naturally less often used in publications than success stories). It is nonetheless true that the PES referred to in the "overview" proposed testifies to a relative simplicity in contractual clauses. They tend to focus on the objectives and means (the practices to be implemented), thereby avoiding the problem of defining precise environmental objectives and being evaluated based on complex criteria.

To summarize, the attraction of PES schemes is fundamentally based on their particularly promising mobilization potential with regard to economic agents, associational intermediaries, public sector bodies and funding. Their main qualities are rather pragmatic: in a certain number of situations that may seem difficult, they produce arrangements that seem functional, sustainable and mutually profitable for the mechanism's partners.

The analysis has made it possible to propose a certain number of *a priori* assessment criteria that may guide development and environmental actors in their choices and selection processes. Nonetheless, the conditions for their widespread use seem somewhat problematic today: dependence on the State's "regalian" functions, potential difficulties in going beyond the scale of pilot projects, the need for solvent demand (necessarily restricted to certain economic uses and, therefore, to some ES), and the possibility of several adverse effects are just so many reasons to question the potential of PES schemes to provide the conditions for a deep-seated overhauling of environmental policies in DCs.

Moreover, in the case of PES schemes, reconciling environmental and social objectives does not seem to be easier than in the case of other public action modalities. Whichever of the two objectives is considered "secondary" often finds itself in the position of a "free riding" objective: the PES scheme offers it a way of making progress, but with no guarantee that it would reach the right destination.

In conclusion, the importance of thinking of PES schemes as monetary transfers that are added to a whole network of transfers that are already in effect and are constitutive of the economy must be stressed: subsidies, aid, exemptions, support, etc. Hence, a PES is never an *ex nihilo* money transfer system. Implementing a PES scheme among farmers so that they change their practices and better preserve forest cover makes it possible to promote the hydrological role played by their land. But when they also receive subsidies to grow corn (which constitute an incentive to cut down their forests), or get access to water, which is also widely subsidized (and does not promote a careful use of water), then the PES system must take such existing transfers

into account in its very design and while assessing its effects. In that sense, PES schemes could be seen as a new opportunity to revisit the coherence of monetary transfer policies, in order to optimize the achievement of the different objectives fixed, both social and environmental.

Appendices

Case studies

Tiphaine LEMÉNAGER (AFD, case study of Mexico)
Yann LAURANS (Ecowhat, case study of East Africa)
Hervé LÉTHIER (EMC2i, case study of Namibia)
Romain PIRARD (IDDRI, case study of Indonesia)
Bernard BARRAQUÉ and Laure ISNARD (AgroParisTech, case study of New York)

Introduction

Payments for Ecosystem Services (PES) are tools that are very commonly referred to today by the development and environmental actors' community, and sometimes presented as the future solution to check the accelerated erosion of the world's biodiversity.

A three-chapter report proposes an analysis of the fundamental concept of these tools, a general overview and a summary of the critical analyses presented in scientific and technical literature.

In support of these works, a series of five case studies has been conducted and is presented here. This presentation takes up and translates the generic system proposed in the full report, and applies a common analytical grid to it, in order to enable a transversal comparison of these tools.

Analytical grid used

The nature of ecological services and the way they have been identified as the reason behind a payment.

Context of the initiative: pilot project, case of application within the framework of an international network, spontaneous case in response to a clearly identified threat by the economic agents, etc.

What are the objectives of the operation? What are the ecological services concerned in the operation? Is it a single service or are several different types associated with it? In the latter case, is there any service that is the primary target while others are secondary? How are the hierarchies built?

How did the identification of the service come about, of any related threats, or at least the conditions to be met to maintain this service: who was at the origin of this identification? On the basis of what arguments? What studies?

How does the need to pay become manifest? Were any economic or social analyses done? What kind? Was the importance, even the value of ecological services, subject to studies, arguments? How was the link between the practices to be maintained through the PES and the services established?

Obstacles, difficulties, unfavorable factors, limitations, brakes, etc. The adverse effects listed (bonanza, impacts on prices, etc.).

Nature of actors paid for providing the service, and of beneficiaries: number, dispersion or concentration, representation by intermediary organizations, role of different types of organizations: State and services, communities, professional groups, enterprises, unions, NGOs, research bodies, role and involvement of development aid actors, trust funds. The political and historical weight of relations between these actors. Perceptions and awareness of payments by beneficiaries. Changes over time (at initiation of process/currently) in the number and nature of these actors.

Mode of contractual relations and basis for trust: Place and roles of the different institutions, registration under law practices, importance of trust, of the written word, role of the State, of intermediary bodies, or various organizations, guarantees provided, monitoring-verification-surveillance systems, punishments and regulations (*de jure* and *de facto*); sustainability of commitments, reversibility, dynamic created, changes observed/trends underway in terms of actors' commitments; clauses on the termination of a contract, revision, changes.

Payment modalities: in cash/kind; if in kind, distinguish between: equipment, raw material; technical support (specify the nature); basis for calculation, references used, differentiations or homogeneity, development and change, incorporation in the existing economic system.

Conditionalities: Practices required, and capacity to add these practices as compared with existing practices (in particular, the aim will be to distinguish additional practices as compared to the law/customs; the practices prescribed by law; payment for stopping or abstaining from illicit practices); choice and selectivity of land or other biodiversity factors placed under protection, achievement, performance or progress indicators, "performance" measurement modalities produced, or for compliance with commitments.

Scale: Mechanism that needs to be extended to obtain an impact corresponding to the general objective, or on the contrary, whose scale is adequate enough for the problem being addressed (irrespective of whether the mechanism is fully deployed or not).

Organization of the mechanism: Distribution of roles between the organizations involved. Involvement of public bodies, especially in terms of regulations (rules, standards, prescriptions, authorizations or permits, controls). Budgetary resources allocated to the operation (investments, functioning), and the sources of these resources (subsidies, aid and donations, loans, own funds). Skills put to use and assessment of their relative importance, of the shortcomings and strengths in this field. Project engineering implemented.

Transactional costs: Costs incurred for implementation (*ex ante* transactional costs): Time between start of discussions and implementation, personnel costs, cost of consultants and intermediaries/mediators, studies, wages, material and equipment, *etc.* Operational management costs.

Operational management costs: Management costs of various intermediaries related to the volume of funds invested in the field to maintain the ecological service; especially, *(i)* payment collection or recovery expenses, *(ii)* management expenses of funds raised for their reinvestment in the field, *(iii)* support to PES governance (steering or monitoring committee, communication on follow-up and results, *etc.*).

Case Study No.1
"Saltillo catchment area and Zapalinamé Forest, Mexico, Coahuila State"

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1. Case history

The Saltillo municipal area is in northern Mexico, in a region with an arid climate. It is the capital of Coahuila State. In 2010, its estimated population stood at almost 700,000 inhabitants (as against 60,000 in the 1950s). East of the city are the Zapalinamé Mountains, partly covered by the forest that takes their name. These mountains belong to the Sierra Made Oriental ecological complex spread over more than 1,000 km from Coahuila State to the south-eastern part of the country.

Map 1 *Map of case study location*

Source: Author.

Over 50% of the water now used by Saltillo's inhabitants comes from local aquifers located at a depth of between 250 and 450 meters.

In 1936, influenced by the very first conservationist movements that had identified the role of forests in relation to the water reserves used by cities, the Mexican government declared the Zapalinamé forest as a "protected forest area" (Zona de Proteccion Forestal). The declaration, which gave the area a protected status at national level, was nonetheless not accompanied by any special measures. In 1996, under the influence of various actors, Coahuila State declared Zapalinamé Forest as a "Zona Sujeta a Conservación Ecológica[24]".

Following this decree, the management of this protected area of around 25,000 hectares was entrusted in 1997 to the NGO Profauna, established in 1979[25]. It was granted a low budget towards this end by the Coahuila State government (about MXN 250,000, i.e. approximately EUR 15,000). The first management plan for the protected area dates back to 1997.

The protected area covers the territory of thirteen "ejidos" (about 7,000 inhabitants in 2010)[26]. The majority of these communities live in the "transition zone", also called the "zone of influence" of the protected area (the core area and the transition zone cover about 65,000 hectares). Given the limited amount of resources allocated by Coahuila State for managing the protected area, the NGO started thinking about the additional funding sources it could mobilize as early as in 1999.

It then decided to set up a donation collection system in collaboration with the municipal water supply company, Agua de Saltillo (with a 54% municipal shareholding). Water consumers who wished to participate filled in a form offered by the NGO. Their donation then appeared monthly on their water bill. Every month, Agua de Saltillo transferred the donations received to Profauna. The first citizens' donations were obtained in 2003.

[24] The protected area status was recognized at the State level. It restricts the activities that can be carried out within the area, without changing the ownership system. As the category of "Zona de Proteccion Forestal", obtained in 1936, no longer existed, the protected area is recognized today only at the State level. Nonetheless, the NGO Profauna hopes to be able to get it classified one day within the network of protected areas, in accordance with its 1938 status, which confers a greater level of protection.

[25] One of the rare cases in Mexico of a delegation of the management of a protected area to a civil association.

[26] In Mexico, an *ejido* means a collective property allocated to a group of farmers. On the whole, 80% of Mexican land was community-owned (by *ejidos*) in 2010. The *ejidos* have their own governing body, called the commisariado, composed of a chairperson, a secretary and a treasurer. *Ejidos* are organized on the basis of an area composed of community-owned land and individual plots.

In 2009, a little over 31,000 families (of the 200,000 water supply points in Saltillo city) donated MXN 1.2 million, *i.e.* approximately EUR 70,000 (with an average donation of MXN 3 per month per family). In October 2010, the number of families participating voluntarily in the project stood at 35,000.

In 2010, Profauna's budget depended on diversified funding sources. Along with the citizens' participation and that of Coahuila State, came those of the Saltillo municipality, the Mexican Nature Conservation Fund (FMCN) that has been supporting Profauna actively since 2000, and finally aid from a private financer, the international company, Johnson and Co.

The use of State funding is done in accordance with the protected area management plan validated by the concerned government authorities. For the rest of the NGOs budget, the communities living in Zapalinamé Forest propose activities that are then supervised by Profauna. These activities have to contribute to the catchmnent area's quality and to the maintenance of the latter's hydrological service. Following the growth in its budget, the activities supervised by the NGO have strengthened over the years. They currently focus on five main areas:

- Conservation: Fight against fire, construction and maintenance of fire breaks, waste collection, surveillance; 21% of the annual budget)
- Soil restoration: Construction of soil restoration works, reforestation (17% of the annual budget)
- Management: Implementation of alternative projects with the local communities (waste recycling centers, community kitchen gardens, management of recreation areas, sustainable cattle management); (11% of the annual budget)
- Environmental education (24% of the annual budget)
- Scientific studies and follow-up of the area (about 19% of the annual budget).

The rest of the annual budget (8%) is devoted to administrative costs.

Over 30 people work for the NGO today.

In terms of results, Profauna conducts different types of follow-up within the framework of the activities in the protected area. In addition, the Agua de Saltillo company is very clearly informed of the level of the aquifers it uses. In 2010, following an abundant rainy season, it seemed that the aquifers had reached their highest level, something that had not occurred since the end of the 1990s. However, it is difficult to assess the forest cover's exact role in this regard.

In 2010, three projects conducted by Profauna were officially qualified as PES by the NGO.

One project is implemented solely by the NGO. It is based on a 10-year contract signed with a farmer in a given community, according to which the farmer reserves 5 ha of his land which is completely denuded of plant life for re-vegetation. The latter receives MXN 1,300 (EUR 76) per ha per year in exchange for doing so.

Two other projects are conducted in collaboration with the Comisión Nacional Forestal or National Forestry Commission (CONAFOR), the federal body in charge of forest management, which is responsible for the implementation of the PES scheme established at national level since 2003. Called "Pagos por Servicios Ambientales Hidrologicos" (PSAH) or "payment for ambient hydrological services", it is now incorporated within the global national forest management program called "Pro Arbol" (pro-trees). The latter is financed by public funds. Since 2008, part of the budget has been reserved for so-called PES actions, in collaboration with other financial partners ("Fondos Concurrentes" program). The two projects concerned have been set up among two communities established within the Zapalinamé protected area. The communities have signed a 5-year contract, committing them to preserve the forest cover of a specifically demarcated part of their land (474 ha are involved in all for both communities, whose total land covers around 4,500 ha) against an annual payment of about MXN 400 per ha per year (EUR 24).

2. Contracts

All the contracts identified are based on the same format:

- *"Introduction":* Location, date of contract. Summary: parties concerned and subject of contract.
- *"Declaraciones" (declarations):* Presentation of the parties concerned and their legal representative
- *"Clausulas" (clauses):* List of commitments made by each of the parties.

Given hereunder are the two types of contracts officially recognized by Profauna and CONAFOR as being PES schemes.

2.1. PES contract, NGO Profauna

Introduction

This contract has been signed on 15 July 2010 in Saltillo between Profauna and Mr. Fidel Alvarado Ortiz (member of the El Cedrito *ejido*). The latter is the beneficiary of the contract. The purpose of the contract concerns the application of a PES scheme to a 5 ha plot belonging to the beneficiary.

Declaraciones

Six "official" paragraphs describe the two parties to the contract, Profauna (and its legal representative) and Mr. Fidel Alvarado Ortiz, their free agreement to the clauses, *etc.*

The State's Civil Code is quoted and the purpose of the contract is summarized once again: a collaboration within the framework of a PES scheme regarding a 5 ha plot, owned by Mr. Fidel Alvarado Ortiz, El Cedrito *ejido*, Arteaga municipality, Coahuila.

Clausulas

A series of nine clauses presents each party's undertakings.

The beneficiary undertakes to exclude the 5 ha plot of his property for the implementation of a program on better management practices for a 10-year period.

Profauna undertakes to define the program concerned [27].

The beneficiary undertakes to implement the necessary activities for the program.

[27] We were able to discuss the contents of this scheme with the NGO. It will be presented along with the following discussion, since the parties' commitments have not been precisely described in the contract.

Profauna undertakes to pay MXN 1,300/ha/annum (EUR 76), *i.e.* MXN 6,500 for 5 ha per annum (EUR 380).

The clauses concerning the termination of the contract are:

- Due to the non-compliance with the Civil Code
- Carrying out activities contrary to morality and good customs
- At the request of the signatories and after a joint agreement is reached between the signatories.

The parties submit to the jurisdiction of the Saltillo judicial district courts.

The contract is then signed by both parties, each accompanied by the signature of a "witness".

2.2. Profauna-CONAFOR PES contract

A collaboration contract dated December 2008 is hereby signed between Profauna and CONAFOR to establish the common fund aimed at making PES payments. This contract specifies that the said fund is to be used for two projects: the Cercado *ejido* and the Chapultepec *ejido*. The surface area covered by the PES is described: 296 ha for Chapultepec and 178 ha for Cercado. The total budget is MXN 1.025 million (EUR 62,000) for a 5-year period. The registered price is MXN 341.84/ha (about EUR 24).

Two contracts were then signed under cover of the above-mentioned initial collaboration contract between the ejido concerned and Profauna:

Introduction

Summary presentation of the three parties concerned: CONAFOR, Profauna and the concerned community (two contracts: one with the Cercado ejido, the other with the Chapultepec *ejido*).

Declaraciones

Presentation of the legal status of each of the parties. What we learn here, in particular, is that the Cercado ejido dates back to 1942 and that it owns a surface area of 3,063 ha. In the second contract, we learn that the Chapultepec *ejido* dates back to 1944 and owns 1,394 ha. Reference is also made to document C5.1 Hidrologicos 2008, which describes the program's national rules and gives the details about the activities to be undertaken.

Clausulas

A series of five clauses presents the undertakings by the parties concerned.

The main stipulations are that the Cercado *ejido* will receive MXN 412,047 (about EUR 25,000) to undertake the actions described in an official CONAFOR document common to the entire national PSAH program (cf. summary below of the national PSAH program). The signatory thereby undertakes in particular to:

- Avoid changing land use
- Preserve the forest cover and avoid its deterioration
- Avoid over-grazing
- Organize capacity-building sessions
- Undertake vigilance, prevention and defense activities against fire, including the training of at least one brigade
- With the support of the technical advisor, draft out a plan for the improvement of managerial practices based on the participatory planning process and initiate its execution as of the second year.

The Chapultepec contract stipulates that the *ejido* will receive MXN 613,732.70 (about EUR 37,000).

The beneficiaries undertake to:

- Use the totality of the funds received for the purposes for which they were allocated
- Return the resources in case of non-compliance with the contract
- Fulfill the procedural obligations mentioned in the reference document.

It is also stipulated that the parties shall submit to the jurisdiction of the federal courts based in the city of Guadalajara, Jalisco (registered office of CONAFOR).

The parties submit to the jurisdiction of the courts in the Saltillo judicial district.

The two contracts are dated 17 May 2009 and signed by the representatives of the *ejido* concerned and Profauna.

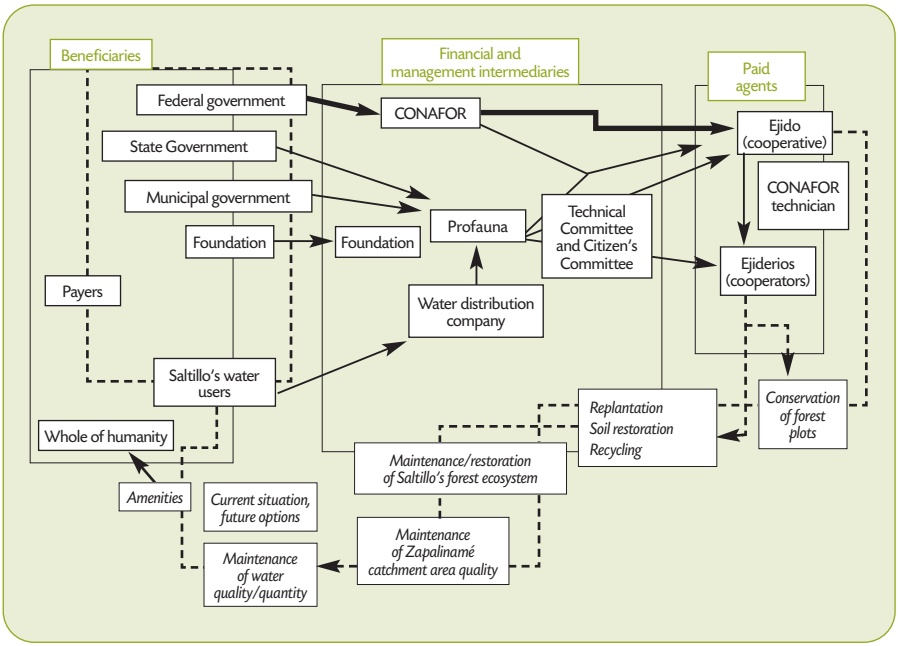
Apart from these contracts, we were able to collect an entire series of contracts signed every time a project is implemented with any of the *ejidos* related to the Zapalinamé Forest.

The purpose of these contracts is to enable better forest management, the maintenance of the hydrological service provided through the implementation, in particular, of

restoration practices (tree planting, soil restoration, *etc.*). These contracts are the subject of fund transfers or other types of support (equipment, training, *etc.*). The contracts present the reciprocal commitments made and the conditions for termination.

3. Operational diagram

Diagram 1 *Operational diagram: the case of Saltillo*



Source: Author.

4. Analysis

4.1. Context of the initiative

It may be considered that part of the activities conducted by Profauna, since it has been responsible for the Zapalinamé protected area (1997), corresponds to the PES concept. Its activities are aimed at maintaining the Zapalinamé Forest, particularly for the hydrological services it offers. It responds to fairly clearly identified threats: fires of human origin, over-grazing, water pollution, deforestation, bad waste management, etc. It is partly based on the improvement of the practices used by the communities that own the land to be preserved.

What is of more recent date in Saltillo's case, and quite unique in the country, is the initiative to raise voluntary donations from Saltillo city's water users in order to strengthen the program of actions undertaken with the communities that own parts of the Zapalinamé Forest. Some people can be identified as having launched this local initiative, in particular the manager of Profauna at the time: *"I knew that Saltillo's inhabitants made donations for religious or social causes. So the idea came to me to get them to take part in preserving the Zapalinamé Forest from which they draw direct benefits".*

While this initiative stemmed from a local approach, it seems nonetheless indissociable from two movements:

- That of the growing debate on PES programs in the USA (influence of the World Bank and the New York case) and in Latin America (examples from Ecuador and Costa Rica)
- That of the Mexican government, which implemented a national PES system related to forests and their hydrological role in 2002, a date that coincides with the Saltillo initiative. After discussions with the NGO's representatives, it nevertheless seems that the local initiative developed independently. It was only later that these dynamics came together.

Box 1 *Summary of the national PSAH program*

Given the context of intensive deforestation and the over-exploitation of national aquifers, in 2002, the Mexican government initiated a water PES program at the national level in the country, called "Pagos por Servicios Ambientales Hidrologicos" (PSAH – Payments for ambient Hydrological Services). The program's purpose was to preserve the hydrological ecosystem services related to Mexico's forest through the implementation of a payment to forest owners that gave the latter the incentive to conserve their forests. Among other factors, the decision was based on the fact that deforestation reduced the groundwater recharging phenomenon, led to a deterioration in surface water quality and increased the risk of extreme climatic events, in case of intense rainfall.

The payments made to the forest owners were defined on the basis of the opportunity costs of the targeted land. It was mentioned that the program had to be applied in areas with a high deforestation risk and a high level of groundwater use. Furthermore, the program wished to prioritize areas where forestry could not really be envisaged as an economic activity and where existing or potential agriculture was not very attractive economically.

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The opportunity cost for this has been defined on the basis of the profits obtained through low productivity plantations (Jaramilo, 2002). Various studies have been conducted by the INE (Instituto National de Ecologia) in order to define the program's rules.

The results showed that at a price of MXN 200/annum/ha, 12% of the landowners who were going to convert their forests into pastureland had not done so, and that 2/5 of the landowners who were to convert their forests into agricultural plantations had not done so either. As rainforests are of a higher hydrological interest, the price set was MXN 300/annum/ha. But given the pressures exerted by different social groups, the prices were raised and the price list established in 2003 offered to pay the following for a 5-year period: MXN 400/annum/ha for rainforest land (*Bosque mesophyll*e or mesophyll forest), and MXN 300/ annum/ha for other forest types.

Proposed in 2003 (the first program implementation year), this price rule diversified a little and today offers 5 tariffs from MXN 280/ha/annum to MXN 1,100/ha/annum, resulting from negotiations.

In 2002, the revision of the "Lei Federal de Derechos" (Federal Rights Law) allocated a budget of MXN 200 M (about EUR 12 M) per year for the PSAH program. The budget came from taxes on water use (bearing in mind that farmers and municipalities are barely taxed at all). In 2003 it corresponded to about 2.5% of the taxes imposed on water. The budget was entrusted to CONAFOR. In addition, every year, the federal government decided on a supplementary budget. Hence, about MXN 1 billion (EUR 60.5 M) was available in 2010 for the program. Every year, CONAFOR issues an invitation to tender. The landowners (often *ejidos*) who wish to take part in the program have to contact a technician recognized by CONAFOR and draft out their offer while following the rules laid down in an official annual document entitled, "Las Reglas de Operacion ProArbol" (ProAbrol Operational Rules).

The said projects have to involve an area falling under the category of "priority eligibility zones" defined by CONAFOR and the surface areas proposed have to offer a forest cover of at least 50%. "It is a program that is intended to maintain existing services" (a CONAFOR engineer). Once selected, beneficiaries sign a contract with CONAFOR. They undertake, in particular, to:

- Not change soil use
- Preserve the forest cover and avoid its deterioration
- Avoid over-grazing
- Organize capacity-building sessions
- Undertake vigilance, prevention and defense against fire activities that include the training of at least one fire brigade

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- With the support of a technical advisor, draft out a plan for the improvement of managerial practices based on participatory planning processes and initiate its implementation as of the second year.

The follow-up of the projects funded and the assessment of compliance with contractual clauses is provided for in particular through field visits and satellite monitoring (mainly SPOT imaging). Initially, the budget allocated did not make it possible to fund all the projects submitted by forest owners, as the first projects received were given a priority. But over the years, diversified selection criteria (primary and secondary) were established. In 2008, 7,000 projects were submitted to CONAFOR. Around 1,500 were given funding. At the end of December 2009, a National Technical Committee composed of various representatives was set up in order to improve the efficiency, effectiveness and transparency of the project selection mechanisms. The PSAH program was initially associated with a "Biodiversity" PES system and another "Carbon" PES scheme. In 2010, only the hydrological program remained effective. Furthermore, it was incorporated into a much larger forest management program called "ProArbol" or pro-trees, now being one of its components.

In addition to the project managed by CONAFOR and funded solely by the Mexican government, in 2008, CONAFOR initiated a program called "Fondos Concurrentes" (concurrent funds) in order to promote the implementation of local hydrological PES mechanisms. The program is the subject of an official framework document, "Lineamientos para promover mecanismos locales de pago por servicios ambientales a traves de Fondos Concurrente" (Guidelines for the promotion of local payments for ecosystem services mechanisms through the Concurrent Fund). Within this framework, CONAFOR provides a maximum of 50% of the financial resources necessary, while the rest has to be covered by another source (governmental or not). A contract is then signed between CONAFOR and the body providing the rest of the funding. The contracts are then signed by the other funding body and the contract's beneficiary. The contractual conditions are negotiated on a case-by-case basis. CONAFOR cannot pay more than the price established for the national program. On the other hand, its counterpart is free to pay whatever price it wishes. Moreover, the zones proposed by landowners are not subject to the condition of a 50% forest cover. "The issue is also to be able to work on biodiversity. In arid and semi-arid regions, the forest cover is therefore not always a good indicator. On the other hand, while the 50% is not a prerequisite, in some cases it may be negotiated and the contract may even be more demanding" (CONAFOR engineer in charge of the "Fondos Concurrentes" program).

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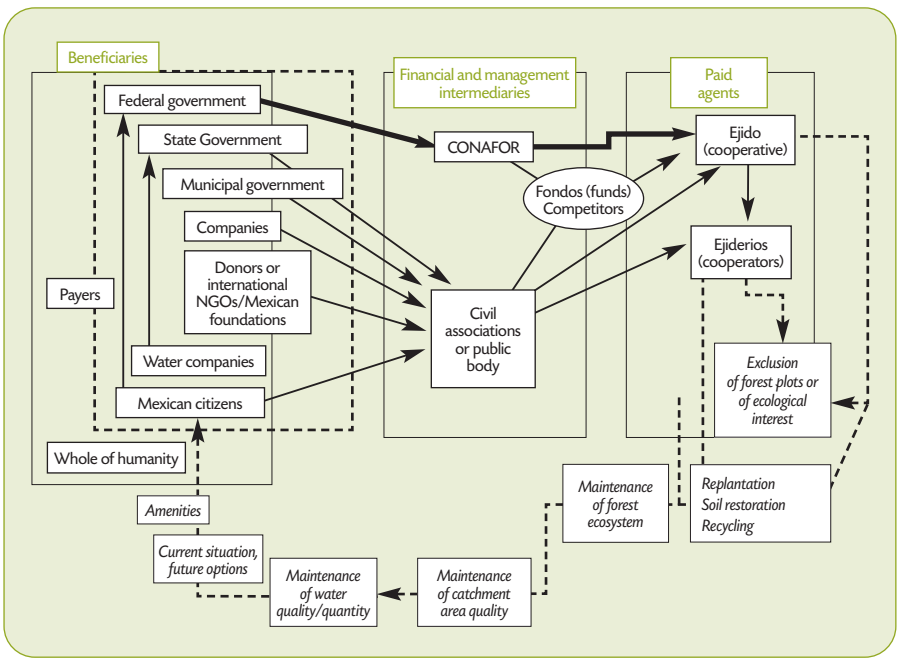
In 2008, CONAFOR therefore signed 7 contracts (of a duration of 1-10 years) for a total amount of MXN 77,188,650[28] (EUR 4.7 M). These contracts covered 26,000 ha of forest. The contract between Profauna and CONAFOR is one of the 7 contracts. It was signed for a duration of 5 years and for a total amount of MXN 1,025,779[29] (EUR 62,000), *i.e.* about 1.3% of the total amount committed in 2008 under this program.

In 2009, CONAFOR signed 14 financial partnership contracts for an amount of MXN 88 M (of which 43 million from CONAFOR), covering 91,000 ha of forest.

Diagram 2 *Operational diagram: the national case – PSAH*



Source: Author.

[28] MXN 35,604,316 from CONAFOR.
[29] MXN 512,889 from CONAFOR and MXN 512,889 from Profauna.

4.2. Objectives

The initiative examined pursues a number of different objectives.

- The primary objective mentioned by the NGO was to sensitize Saltillo's inhabitants about the ecological issues involved in the Zapalinamé area and the services the forest provided them, so that at individual level, they adopted practices that were more respectful of the forest and of water resources. "We realized that no one knew what role the forest played with regard to water. It was important for them to know it. Making them participate financially was the best way of getting them involved and of building awareness" (former Profauna manager).
- Through the sensitization campaign, the NGO also sought strong political support. Several times the NGO was able to fight for State intervention and for the enforcement of the law within the protected area. For instance, houses had been built by a promoter within the protected area. The Governor had them demolished partly due to the pressure exerted by the NGO and public opinion. Quarries were also active within the protected area. The government gradually got them to move out. The NGO was aware of the political power public opinion wielded, and it supported the former tangibly through the program. That is why it often highlights the number of families participating in the program, even before talking about the amounts raised.
- The system also aims at increasing and diversifying Profauna's budget. Until 2000, its budget consisted solely of the budget allocated by the State for managing the reserve. It was basically used to pay the guards, purchase material and initiate some activities with the communities. But it was too small and quite unstable. "We sometimes had to wait for months before getting our salaries" (Profauna employee). By diversifying its budget sources, Profauna wanted to increase and secure it.
- Finally, the aim was to strengthen the activities conducted with the communities so as to be able to fight against forest fires, institute best practices and thereby reduce pressure on the environment.

The main environmental service envisaged by the system that was set up was to promote the quality of the hydrological service provided by the forest. According to the interviews conducted, it appears that the 1936 decree was based on the same reasoning to classify the area as a forest reserve. The concept of a service was not as clear as it is today, but the logic behind it was the same. The NGO Profauna also admits that it only started calling it an "environmental service" a fairly short time ago.

"Our discourse has changed, our funding sources too, but our strategy for action remains similar: to preserve the forest, to preserve the natural milieu and to involve communities" (a Profauna official, present since the NGO was set up).

4.3. Identification

It seems that the importance of the forest's role with regard to the quality and quantity of the water available in the catchment area had never been called into question by the actors involved. The aquifers were precisely identified and located close to the forest.

According to our interlocutors, studies (that we were unable to recover) had been conducted in the 1970s and 1980s. The proximity of the autonomous agrarian university, Universidad Autonoma Agragria Antonio Naro, had always promoted the conduct of diverse and varied studies on the forest's ecological components. The fact that the university's professors were engaged with the NGO, within technical and citizens' committees, or else the fact that some were donors, strengthened the desire to conduct studies.

During meetings, we had the opportunity to ask forest-dwelling communities (associated with the dynamic of setting up the environmental service sought with the providers) what, according to them were the services the forest rendered. The first answer was oxygen (an idea that seems to have been conveyed in the oldest educational programs). Then came the fact that they found work in the forest, along with wood and grazing for their animals. They also mentioned the beauty of the landscape that their children were able to enjoy. Very few mentioned the forest's contribution to water. "It is not yet natural for them to think of water, unlike the case with Saltillo's inhabitants. That is why we need to sensitize everyone" (former director of the NGO, Profauna).

The notion of the importance of the hydrological role played by forests has developed on a country-wide scale, where the over-exploitation of aquifers constitutes a real problem, just as the intensive deforestation over the last fifty years does (with a 50% loss). The main arguments, recognized scientifically, are that forests promote the permeation of water and surface water quality, while regulating groundwater levels, that they reduce sedimentation and erosion processes and even extreme climatic events, depending on the context.

Other than the hydrological service rendered by forests, it is nonetheless the entire ecological system that is aimed at. Profauna quotes the role of the forest habitat for a certain number of species. Its cultural and landscape values are also upheld and reflections are currently underway on the role forests play with regard to carbon fixation.

The ecological complex is broached as a whole.

4.4. How did the need to pay manifest itself?

a) How did the need emerge to pay the communities living in Zapalinamé Forest for the maintenance of the forest's hydrological service?

The need can be explained by several factors:

- The communities own the land.
- The regulations that are supposed to apply in the Zapalinamé protected area were difficult to apply. Though it is difficult to apply, the status of a protected area does not lead to the exclusion of all activities exploiting natural resources. The latter are subject to the regulations.
- The communities use the natural resources to meet their needs. Their training level is low and their incomes too. When they are asked to change their practices and their sources of income, the need to compensate them emerges spontaneously.
- Moreover, they may receive subsidies from government agricultural bodies, in particular to plant corn, which leads to competition for the various bodies that wish to influence soil use.
- There is a fairly "paternalistic" model of taking care of communities that exists in Mexico.
- The communities are also paid sometimes for the work they do: fire brigades, reforestation work, construction of soil restoration works (gabions, etc.).

No estimation has been done at local level to demonstrate the economic value of the services forests render. Nevertheless, none of those we met questioned the need to preserve the forest – farmers, cattle breeders, public institutions, NGOs or companies. The Director General of the water supply company, Agua de Saltillo, for instance, spontaneously stressed the fact that the dynamic instituted by the NGO was of direct use to them.

It seems that the NGO Profauna, like CONAFOR, discusses these issues extensively with the communities to sensitize them with regard to the value of forests and the need to manage their natural resources sustainably.

The activities to be implemented in order to maintain ecosystem services, especially the forest's hydrological service, stem from reflections held within the framework of the management of the Zapalinamé protected area.

The desire to reduce fires in order to safeguard the forest cover has led to fire brigade training activities, waste collection and disposal, etc.

The soil's filtration capacity has led to the identification of extremely degraded zones and their restoration.

Other activities have not been studied as extensively, such as reforestation or re-vegetation. The objective is to speed up recovery rather than leaving it up to natural reforestation, which takes much longer. Profauna has nonetheless been able to observe that the results achieved in some of the replanted plots were not as good as those achieved in areas left to regenerate by themselves. But the contrary too has been observed.

Finally, it is interesting to compare the two different arguments underlying the three projects officially designated as PES schemes.

In the case of the two projects conducted by Profauna and CONAFOR, the plots have to have a minimum forest cover of 50% of the surface area proposed. The desire therefore is to preserve an existing forest service.

In the case of the project conducted by Profauna alone with farmers, the 5 ha subject to the contracts were formerly cultivated fields. The land was very poor (even corn no longer grows there). The forest therefore cannot provide any service at all and the objective then is to re-establish the environmental service.

b) How did Saltillo's citizens decide to pay for Zapalinamé Forest?

The voluntary donations can be explained by several factors:

- A population group used to donating small amounts for different causes (sick children, *etc.)*
- A region subject to droughts that are hard on the inhabitants
- The "terrifying" vision of forest fires on the mountain
- A sensitization campaign (posters put up across the city, radio, *etc.*) "Water comes from the forest"
- A study conducted by Profauna with WWF to verify who was ready to donate, the amounts, *etc.*

- A reflection of the NGO on the "how can the money be recovered?" Initially, the electricity and gas companies were targeted as a priority. It was finally the water supply company that implemented the system. The NGO then studied where the inhabitants paid and chose to concentrate on the main bureau, where 70% of the inhabitants paid their water bills.

According to Profauna, some donors forgot that they were donating money. The donation appeared on the water bill, but the transfer was automatic and the average donation – very low – was MXN 3 per month.

During the meetings with the communities living in Zapalinamé Forest, not connected to the city's water distribution system, several mentioned that they would nonetheless be willing to donate 1 peso per month to preserve water.

The donors never asked for economic studies. The hydrological service was, on the other hand, given in detail qualitatively on the pamphlets and posters distributed by the NGO.

4.5. Obstacles

Difficulties faced

1. The implementation of the actions undertaken by Profauna mainly faced the problem of the shortage of resources. About a dozen or so people work to cover 65,000 hectares.

   Since 2009, in the light of the country's economic context, currently facing a crisis, the annual budget, intended for the protected area's management, was cancelled. The budget intended for the "Peso por Peso" project failed to fulfill its quantitative purpose and, in 2010, was far lower than the amount expected. Finally, the money coming voluntary from citizens' donations increased with the high deficits in State contributions, whose share had been much higher earlier. The NGO's overall budget is therefore a deficit budget (cf. section 4.11). It was decided, with the agreement of the committees established, that the money coming from Saltillo's inhabitants would be used to compensate for the loss while waiting for State funding for the protected area to resume.

2. Another problem was that of continuing to collect donations from the citizens. There were 200,000 water supply points in the city that were billed by the company, Agua de Saltillo. On the whole, 35,000 were donors in 2010. The aim is to increase the average participation of donors, but above all, for the NGO, to increase the

number of contributors. In this regard, there are several water users that have their own wells. It is difficult and very costly to organize the collection of donations from them. However, they are generally high water users.

In the same way, during the meetings, the communities said that they were ready to participate financially in the system, as they also benefited from the water service. Moreover, they donate for other social causes, during their purchases in the city. But the communities are not connected to the water supply network either and do not get a water bill. Hence, the collection of donations is as yet impossible to implement at low cost.

Finally, some donors we met during the meetings regretted the lack of information concerning the use of their money. The question raised was whether current donors would continue to be donors. Among the donors we met, some had stopped their contribution due to the shortage of resources, then resumed donations later.

3. Another problem faced seems to have been political in nature. Initially, some political resistance hindered the process of fundraising from donors. But generally speaking, the hindrance no longer exists. On the contrary, policies seem to be encouraging this process.

4. For projects officially called PES schemes, the problem has been to convince communities to sign a contract to preserve their land. "People don't like signing contracts here" (a community representative). But for others, on the contrary, a written contract is very important: "Las palabras se las lleva el viento" (Talk is cheap, better to get it in writing). Some communities fear that people are trying to steal away their land. The fear stems from past abuse and regulations that once allowed squatters to take over land. So it is not always easy to engage in a dialogue with communities about the use of their land.

5. Cultural barriers may also hinder the dynamic. For example, a farmer who has signed a PES contract with Profauna for preserving 5 ha of his land explained to us that he had hesitated to accept the contract. In fact, the old man had been criticized by his community members who accused him of no longer wanting to work his field. The man nevertheless agreed, because the field concerted had become unproductive over the years: "Even if I tried to cultivate corn, nothing grows there". He stressed that "today, other members of the community want to join the program". Trust therefore seems to play a very big role.

6. Some communities refuse to join the system, for they are wary, but also because the price offered does not suit them. In this regard, it seems that the interaction of CONAFOR's national PES system with the local process conducted by Profauna

is the subject of unresolved debates. For the two contracts signed with CONAFOR, Profauna in fact used the prices decided by CONAFOR at national level as its base. However, according to the NGO, these are not optimal prices. For all that, the NGO is fully aware that it is impossible to fix different amounts for the catchment area, as each of the communities knows what the others are getting.

7. In addition, the area concerned is outside the visiting area. Monterrey's inhabitants also come for an outing to the protected area on week-ends or during their vacations. Fire risks are very high at such times and it is not easy to prevent such risks, except through the vigilance of the fire brigades and communication with the visitors.

8. Finally, another problem has to do with the measurement of changes in the hydrological service. It is not easy to measure filtration differences accurately.

Limitations – potential adverse effects: reflections at the local level

1. At the local level, one of the main limitations that may emerge stems from the fact that the biggest threat to the protected area comes from development and the rapid and badly controlled urban spread. The PES program is not intended to act on this issue. Nevertheless, through the participation and sensitization of the inhabitants, the NGO counts on the power of advocacy that the PES system can provide in order for it to put pressure, particularly on the government, to ensure that the regulations are enforced.

2. During discussions with the communities, it emerged that they did not know that water consumers were making voluntary donations to preserve the forest. In the same way, forest-dwelling communities did not seem very aware of the hydrological service provided by their forest. Does that raise a question?

3. In terms of potential adverse effects, the State's financial disinvestment, which could be observed since 2009, is deeply worrying. In fact, it is possible that the State's government may have decided to cancel the budget intended for the protected area since Profauna was raising funds from the citizens. This issue was broached during several meetings, but without any confirmation. For State bodies, the budget reduction is due to the financial crisis. Moreover, the fact that Saltillo's inhabitants support the project should encourage the State even more to fund it. Finally, they stressed that "the budget required for the management of the protected area is far higher than the donations raised. It is not logical to believe that the State is thinking of disinvesting in it and letting Saltillo's inhabitants handle it by themselves. The protected area is a State responsibility and must remain so". However, would the budget cut have been so large if Profauna did not have another parallel source of funding?

4. Another question remains pending, in terms of the example set by Saltillo: with this system, is there any risk of paying for communities not to destroy the forest in areas in which they would anyway not have done so? For example, one of the communities participating in one of the two PES projects conducted with CONAFOR has a herd of cows. The latter do not climb up the mountain to graze. The impact on the forest is therefore reduced, but the community is being compensated today for protecting the forest. On the other hand, a neighboring community did not want to join the program. Its members told us that they had goats, which grazed in the mountains. The community therefore needed the forests for grazing. In this case, it was the community that had the lowest impact on the forest that is being paid. The question of the effectiveness of the system is therefore raised.

   At the local level, the system's adverse effects or limitations did not seem flagrant. There is an environmental preservation dynamic stimulated by a civil body that calls upon diverse sources of funding and implements various actions, whose objective is to maintain the quality of ecosystems and the services rendered by them over the long term. The PES system has supplemented an entire palette of tools – whether regulatory, educational or others. It seems that the complementarity between these tools limits the adverse effects that could be feared from PES schemes: victim-payer behavior or the threat of destruction by communities to ensure land rents. Education, the regulatory framework and the proximity of the institutions seem to prevent a potential drift in the system, and the end result seems to be fairly convincing.

   It was while placing this example in a more global framework that the most interesting reflections came up. In fact, what we are witnessing is the development of a national hydrological PES system linked to forests, with implementation by the public body in charge of forests, *i.e.* CONAFOR. To this system are added various local initiatives, stimulated by local bodies and by lower government levels (State or municipality).

Limitations – potential adverse effects: reflections at national level

Implemented over the last 7 years, the national PSAH program has evolved considerably.

1. Initially, the program's primary aim was to focus on areas with the highest deforestation risks and those where aquifers were the most overexploited. At an equal level of risk for these parameters, the third criterion defined was the level of marginalization of the population. The most marginal communities became the priority.

Very soon, it emerged that only some of the country's states were concerned. Non-priority states therefore exerted pressure so that they too could benefit from the financial resources available. A system of a minimum State budget was therefore established, thereby deviating somewhat from environmental objectives, but offering somewhat greater equity.

2. Moreover, a study was undertaken to analyze the proposals that had been accepted since 2003 and the National Ecological Institute (INE) conducted a study on the criteria selected.

   In 2008, 13.5% of the projects funded were located in areas suffering from the overexploitation of aquifers and 47% were in high or very high deforestation risk areas. Hence, the landowners were paid whereas their practices did not apparently constitute a threat to the ecosystem.

   On the other hand, 80% of the projects targeted marginalized populations but the poorest of the poor were barely represented.

The INE therefore called upon CONAFOR to review its approach:

- As the program was voluntary (communities proposed their projects), it was important to sensitize communities living in high deforestation risk areas and high aquifer overexploitation risk areas much more intensively (only 28% of the proposals submitted in 2008 by communities were located in high deforestation risk areas)
- Select projects on the basis of environmental criteria, above all.

According to INE, "the primary purpose of this program is to fight against environmental degradation which is highly worrying for the country. It is not a program whose objective No. 1 is poverty reduction. There are other, more effective means available if you want to fight poverty". When the environmental objective is complied with, according to the engineers in charge and the associated research scholars, it is important to ensure that all the poor communities are able to benefit from the program when such communities are concerned, including the poorest of the poor.

3. The price lists are not transparent and may lead to a digression in the system's potential effectiveness according to INE. For the moment, the price is decided at the start of a contract and is not revised for a 5-year period. However, during those 5 years, the context may change and the opportunity costs along with it, which can lead to communities withdrawing from the program. According to INE, the prices need to be adapted during the contract period according to changes in opportunity costs.

4. Another item of discussion concerns the fact that the program is focused solely on forests. States in northern Mexico, which are more arid and with a lower forest cover, have remarked on the fact that forests are not the only ones to play a role in aquifers, and that vegetation, even the low vegetation in the North, also plays a very important role. Negotiations are underway to see how the program could be opened to types of soil cover other than forests.

5. The areas defined as eligible by CONAFOR also constitute a point of discussion. The criteria that made it possible to define these eligibility areas have changed and are not always transparent. They are being debated as project selection is directed by them. For instance, it was initially planned that protected areas would not be put in this category, because since they had other tools at their disposal, there would have already mitigated the deforestation risk. Finally, the criterion was changed and protected areas can now also be part of the eligibility areas.

6. We were also able to discuss the complementarity or, on the other hand, the competition between forest management systems in Mexico, of which the PSAH program is the most recent. For some of the actors we met, the government today preferred forest conservation programs – *i.e.* the implementation of programs that strongly restrict forest use (protected nature reserves, hydrological PES program). Budgets are allocated to these programs. According to the criticism heard, these measures are likely to limit the development capacities of the communities concerned. According to them, the sustainable forest management systems planned and approved by the Environment Ministry would be a more equitable option, more economical and more sustainable. Nevertheless, we felt that the PES program focused on areas where agriculture was not very profitable. The opportunity costs defined at the national scale correspond to this desire: they are calculated on the basis of the results of not very productive corn cultivation that is *a priori* not of interest to a landowner who would earn much more by using his forest more sustainably. Moreover, the official CONAFOR document presenting PES systems stresses the fact that a landowner whose property is used on the basis of a sustainable management plan can offer plots that are "resting" [30] for the PES program. The PES can therefore be an additional compensation, added to cultivation, making it more attractive to preserve some plots and not cultivate them for a predetermined period (5 years of the national PES scheme). Criticism accusing the PES system of competing with sustainable land management practices does not, therefore, seem valid.

[30] A sustainable forest management plan is based on a system of rotation of plots used. Some are therefore left to rest, while others are used for cultivation.

These examples only broach some of the many debates that we have heard. They show that political issues and negotiating are turning into important levers for influencing and orienting the program. Every year, the national PES program is remodeled. The rules are reviewed and modified. Furthermore, it would be an illusion to believe that this program could deal with all environmental problems by itself alone. It is just one tool among others. An analysis of the complementarity of the tools in place would be necessary to really identify the system's adverse effects or limitations.

7. Apart from the questions raised with regard to the scale of a given PES system – whether it is developed at the local or national level – we observed a superimposition and multiplication of PES systems in Mexico, which may seem anarchic. For example:
   - Profauna pays MXN 1300/ha/year for a farmer to leave 5 ha of land aside, thereby enabling it to rehabilitate. The contract is of a 10-year duration.
   - In the same location, along with Profauna, CONAFOR pays about MXN 400 per ha/year to communities for preserving existing forests. Two contracts were concluded for a total surface area of 474 ha for a 5-year duration.
   - To the north-west of Saltillo, still in the state of Coahuila, near the village of Cuatro Cienegas, the largest environmental NGO in Mexico, Pronatura, works with communities and has signed several contracts with them for biodiversity and water resource conservation in this area, known to be exceptionally rich in environmental terms[31]. One of the recently paid contracts stipulates that a community shall receive MXN 2 M (EUR 121,000) in two installments to improve its practices over a surface area of 4500 ha, for a ten-year period *(i.e.* MXN 44/ha/year, EUR 2.6). The community made several commitments, the aim being to develop environment-friendly practices. A community reserve was thus established with well-defined conservation areas and other rationalized farming zones.

In Mexico State, the government established its own hydrologic PES system, with the purpose of conserving forest surface areas (the forest cover in Mexico State accounts for about 900,000 ha, i.e. almost 40% of the national forest cover) so as to guaran-

[31] A protected area was established in 1994 in the Cuatro Cienagas valley. The specificity of this zone is the existence of underground aquifers and watercourses in a desert region with outcrops in the form of natural ponds (thus, over 400 natural pools are scattered across the desert). It's a high farm output region, leading to over-exploitation of water reserves.

tee the citizens' water consumption[32]. Operating rules (conditions, commitments, selection procedure, etc.) were published[33]. According to this program, landowners received MXN 1500/ha/year (EUR 91) to preserve their forest cover. In order to secure its budget, the Mexico State government instituted a compulsory contribution from State water distribution companies, which had to give 3.5% of their turnover to pay for the PES program.

Another example – in early 2000, the states of Mexico and Michoacan set up a financial fund (FM) of USD 6.5 million along with the Mexican Ministry of Environment, the FMCN and the WWF for preserving the monarch butterfly, with the interest amount intended to be used for managing the butterfly biosphere reserve[34]. The reserve comprises 93 private properties, of which 40 are in the so-called "core" area. The program provided for two payments so that the concerned communities enjoying forest usage rights could preserve their forest cover: communities could receive USD 12 (MXN 150) per ha of forest preserved per year and USD 18 (MXN 220) par m^3 of wood not used. In 2008, the Fund signed an agreement with CONAFOR within the framework of the Fondos Concurrentes program, which at present enables volunteering communities to receive up to USD 55 (MXN 682) per ha between 2009 and 2018 (MXN 341 from CONAFOR and 341 from the FM).

And finally, one last example from the state of Oaxaca, where Pronatura has instituted a voluntary carbon market system. Volunteer companies purchase carbon credits from communities who manage their forests so as to optimize carbon storage. The issue is no longer that of preserved forest surface areas, but of tons of carbon equivalent stored by a forest. Within the framework of the system in place, companies purchase a ton of carbon equivalent for USD 36 (MXN 445, which is much higher than the price on the international market). Communities sign contracts with Pronatura, which provides them support so that they can manage their forest and ensure carbon storage. The contracts thus signed are for a duration of 21 years. The companies pay for their certificate each year, according to the amount of storage achieved. These initiatives have been compared in Table 1.

[32] http://www.edomex.gob.mx/portal/page/portal/probosque/restauracion/estudios-de-manejo/psah

[33] http://www.edomex.gob.mx/legistelfon/doc/pdf/gct/2009/dic242.PDF

[34] The monarch butterfly biosphere reserve is located in a mountain range about 100 km north-west of Mexico, spanning the states of Mexico and Michoacan. Its 56,259 ha of surface area receive millions of butterflies coming from the vast North-American continent every autumn, piling up on small plots within the reserve's forest. In the spring, these butterflies start migrating to eastern Canada for 8 months before returning to Mexico.

Table 1 *Comparison of Mexican PES examined*

PES Project	Organization involved	Price	Contract duration	Initiative
Saltillo – Zapalinamé Forest (State of Coahuila)	Profauna	MXN 1300/ha/year	10 years	Local
Saltillo – Zapalinamé Forest (State of Coahuila)	Profauna / CONAFOR	MXN 400/ha/year	5 years	National Program Fondos concurrentes
Cuatro-cienagas (State of Coahuila)	Pronatura	MXN 44/ha/year	10 years	Local
"Water" PES State of Mexico	Mexico State Government	MXN 1500/ha/year		State of Mexico
Fund for the conservation of the Monarch Butterfly	States of Mexico and Michoacan, FMCN, WWF	MXN 150/ha/year + MXN 220 per m^3 of wood not used		Monarch butterfly *biosphere reserve*
Volunteer carbon market	Pronatura + purchasing companies	MXN 445 per ton of carbon equivalent stored	Annual payment Community contract with *Pronatura for 21 years*	State of of Oaxaca

Source: Author.

Therefore, the multiplicity of systems with different rules raises many questions, without it being possible at this stage to analyze the effectiveness of the system. The objectives seem be common, the rules are different, but with equivalent guidelines, prices are nonetheless different, contract durations differ, and so on. The issue of globalizing PES systems is indeed quite topical here.

8. Finally, generally speaking, there seems to be a very strong climate of paternalism in Mexico, which has been criticized by several of the people we met. The PES system, which is for the most part controlled by the government today, seems to be an additional segment of government action, according to these interlocutors.

4.6. Nature of actors paid for the provision of services, and of beneficiaries

In Saltillo, Profauna works with 9 out of the 13 communities that live in the area: the protected area and its zone of influence, which together account for thousands of people (the 13 communities are composed of a total of about 7,000 people).

With regard to PES projects, he project funded 100% by Profauna is aimed at one farmer from one of the 9 communities. In the case of the other two projects, two communities are involved, *i.e.* less than 1,000 people.

If we were to look more specifically into the contracts officially called PES, the remunerated economic agents are of several different types:

- The agent directly concerned by the change in practices (case of farmers who set aside 5 ha as a conservation area).
- The commissariados des ejidos who subsequently decide on the distribution of funds received. The distribution is done differently from one *ejido* to another. The commisariado is the community's official governing body. It comprises of a President, a Secretary and a Treasurer. It does not have any decision-making power and is merely a representative body. All decisions are taken during monthly meetings by vote, and in accordance with strict rules.

Intermediary organizations play a very important role:

- The NGO Profauna plays a key role in the system – the role of a financial and management intermediary. It is in some ways the driving force behind the system.
- The State, through its regalian role and as a natural resource management organization (CONAFOR, Semarnat). These intermediaries approve the management plan for the protected area (Semarnat) and help define the rules for some of the PES projects (CONAFOR).
- Agua de Saltillo helps collect voluntary donations from water users.
- The FMCN foundation funds Profauna to support the launch of this initiative. It provides both financial and technical support (organization of workshops for the exchange of experiences, training, *etc.*).
- Technical and citizens' committees grant their approvals for the way the money spent is used. They enjoy real power and influence. They can reject projects or modify them.
- A research centre was also included in the PES system. It receives payments from Profauna to implement and monitor the re-vegetation process in the 5 ha plots.

In terms of the beneficiaries:

- A section of the final beneficiaries is aware of the payment, comprising of the 35,000 families who made voluntary donations in 2010 through their water bills. According to Profauna, some may have even forgotten that they were making a donation.
- Other Saltillo citizens make direct donations to Profauna. They too are aware of the payment.
- The Gonzalo Rio Arronte foundation is also aware of the funding. Established in 2000, after the death of Mr. Gonzalo Arronte, it is one of the most important foundations in Latin America. It functions solely with the funds inherited from Mr. Gonzalo Rio Arronte and only uses the interests it generates from the investment of these funds. It works primarily in areas concerning water, health, and drug-related problems. Biologists are in charge of water-related programs. They chose to work with FMCN on the Saltillo project with a part of their budget.
- The municipality's contribution and that of the state of Coahuila correspond to the mandatory participation by all the citizens. The latter are not aware of this payment.

4.7. Contractual relationship mode and the foundations of trust

The contractual relationship is based on a relatively simple written contract. Our interviews showed that communities considered the document to be highly important, while it was less so in the eyes of the intermediaries. The fact of signing something represents quite a strong commitment for the communities. According to them, "las palabras, el viento se las lleva" (Talk is cheap, better to get it in writing). For the NGO, the issue of initiating proceedings against a community does not really arise. Nonetheless, it seems that some penalties may be possible for contracts signed with CONAFOR. Consequently, such measures were taken against a community that had tried to conclude several contracts for the same project. For several years, it will no longer have the right to propose contracts to CONAFOR. All the communities in the neighborhood are aware of the case.

Furthermore, it has clearly emerged that the level of trust established between Profauna and the communities played an extremely significant role in the system. Some of the Profauna employees spend their days going from one community to another. "If several weeks go by without a visit from us, they become impatient and reproach us for our absence when they see us" (a Profauna employee). Profauna has

had a local presence since over 30 years and some of its representatives have been here for the same number of years. In comparison, the constantly changing CONAFOR technicians do not seem to have earned the communities' trust, as they tend to be wary about anything concerning their property, given their history.

The communities seem to be quite keen for contracts to continue to be signed and willing to respect their commitments. One of the communities that had offered a given plot of land for a contract with CONAFOR saw its project being partly rejected. A smaller plot of land was defined in order to abide by the 50% forest cover rule required to participate in the program. The community showed a high level of motivation to reforest the section that had been rejected, so that it could be included in the CONAFOR contract in the years to come.

All the contracts stipulate regular checks and at least one annual check (especially for the CONAFOR Fondos Concurrentes projects). In reality, we concluded that there was a lack of well-established control systems. However, regular visits by park wardens and CONAFAR technicians ensured that the communities continued to meet their commitments. In the case of the farmer with 5 ha reserved for reforestation, one of his commitments was to weed the land around the trees that had been planted. One of the park wardens mentioned that it was sometimes necessary to call him to order to ensure that he met his commitments.

Each contract includes termination clauses. Non-compliance with the commitments made is therefore one of the clauses that is part of the mutual agreement by the parties.

4.8. Payment terms

Payments are made in Pesos on an annual basis for PES projects. For projects funded within the framework of the CONAFOR Fondos Concurrentes mechanism, CONAFOR pays its share after the financial partner engaged has provided its share – Profauna, in this case.

Payments are made directly to the *ejidos'* bank account when they have one. Otherwise, there is a system of checks that the communities can exchange at the bank or use directly in some shops.

When it is a matter of a payment for a given task (plantation of trees, construction of gabions, *etc.*), the payment is made by check after the completion of the job. Other transactions also take place within the framework of the work done with the communities:

- Technical support: Profauna's park wardens, researchers and CONAFOR's technicians organize training and sensitization sessions for the communities, among others.
- Purchase of material: purchase of seeds, solar furnaces, the construction of waste storage premises, education.

The economic value of the ecological services provided is never included as a separate head in the accounts while determining the price paid. Each service (reforestation, construction, firefighting, *etc.*) is paid for as per the existing working rules. Contracts often stipulate terms and conditions: payment for the work implies commitments concerning the work done over the specified duration so as to ensure conservation or that the trees planted are not cut.

If we were to look at the two projects referenced as PES projects, they present significant differences in terms of the price determination:

- The project promoted by Profauna alone: an old farmer, who owned 8 ha in an ejido, used to cultivate corn on the entire plot of land. As the harvests were very poor, he decided to set aside 5 ha of his land for re-vegetation and reforestation and now receives MXN 1300/ha/year. The price corresponds to the subsidy he would have received from a rural development government organization if he had decided to plant a traditional variety of maize (program to promote a certain level of diversity in corn crops). What is interesting is that this farmer was not covered by this program. In fact, he was getting a subsidy of MXN 800/ha/year within the framework of another governmental rural development organization program to cultivate corn.
- In the case of the project established in partnership with CONAFOR (Fondos Concurrentes), the part of the funding paid by CONAFOR cannot be higher than the price defined in the ProArbol national program's operational rules. When the national PES project was started in 2002, two rates were provided for: MXN 300/ha/year and MXN 400/ha/year, depending on the ecosystem identified (type of forest). These prices had been calculated by the INE by calculating the opportunity cost as compared to non-intensive corn and bean plantations, or pasture for cattle or small ruminants. However, the rule changed, to include 5 types of prices (MXN 280, 382, 350, 700 or 1100/ha/year), without any clear explanations given for the price finally selected. It is worth noting that the INE had explicitly told us that there were two ways in which a price could be defined: on the basis of the opportunity cost or by taking into account the value of the service targeted. Without providing any specific reasons, they explained that they had selected the opportunity cost as the basis.

With regard to the contracts concluded with the Chapultepec and Cercado *ejidos,* the recorded price is MXN 341.84/ha. However, the amount allocated to each *ejido* does not correspond exactly to this amount for the defined surface area. Consequently, Chapultepec received MXN 613,723.70 for 296 ha for 5 years (*i.e.* MXN 414/ha/year) and Cercado received MXN 412,047.10 for 178 ha for 5 years (*i.e.* MXN 463/ha/year). The difference can undoubtedly be explained by the amount allocated for technical assistance.

With regard to the PES program managed by CONAFOR, the national PSAH and Fondos Concurrentes, a Mexican Forest Fund was established to which funds would be transferred from State budgets every year, while ensuring payments for durations of more than one year.

In the case of the Pronatura program, implemented in Cuatro Cienegas (Coahuila State), one of the contracts recently concluded stipulates that a community shall receive MXN 2 M in two installments to improve its practices over a surface area of 4500 ha, for a 10-year period, which corresponds to MXN 44/ha/year. The person in charge we had met explained that the price paid depended on the money available. In fact, Pronatura is being funded by an American donor in particular. "We make do with what we have. The communities know that we do our best to raise enough money to help them" (a Pronatura representative). The per hectare price seems very low. That is why the payment is made in one or two installments whereas the contract is for a 10-year duration. "The communities would not accept an annual payment. It is having access to a large amount in one go that interests them" (a Pronatura representative).

These examples show that, generally speaking, the opportunity cost may be the official reference, but in reality there are no rules that have been established as such for initiating a paid transaction in exchange for a change in practices in Mexico.

4.9. Conditionalities

For the contract signed between Profauna and the farmer for 5 ha, the requirement was for the implementation of a practice improvement plan as defined by Profauna.

There was no requirement with regard to the initial state of the land.

At the time of signing the contract, the land was bare. Every year, the landowner planted corn, but for the past several years, the harvest had been very poor. The old farmer explained that in his parents' and grandparents' time, corn used to grow well, but nothing grew here any longer now. After signing the contract, the land was

protected from grazing by an enclosure. Trees and various seeds were planted, while diversifying species so as to represent the area's biodiversity. A research centre set up a monitoring program to show the growth of the plant species. Ongoing studies have shown that the vegetation is growing and that biodiversity is improving from year to year, regaining a diversity that indicated a good environmental condition (low rate of invasive plants). Changes in the vegetation are compared against a nearby control plot of land that has not been cultivated for several years.

The landowner has made a commitment to keep his plot of land secure, not to plant corn and to promote the growth of the trees planted (watering in case of drought, clearing of weeds, etc.).

Non-compliance with the commitments made would entail the termination of the contract. However, it seems that this was not really a consideration for either of the parties. The trust established between the parties and the frequency of visits seemed to keep the project sufficiently supervised to avoid any cancellation of the contract.

For the two contracts signed between Profauna, CONAFOR and the Chapultepec and Cercado *ejidos,* there were certain prerequisites concerning the initial conditions of the land, as well as commitments for the duration of the contract.

The *ejidos* had to offer land located in an eligible area as per CONAFOR terms, which offered a forest cover deemed to be of interest. The plot offered had to measure at least 200 ha. If the land offered consisted of several plots of land, the latter could not be less than 5 ha. The land could not be already committed within the framework of other government programs with the same objectives, at the risk of sanctions being imposed.

The landowners had to contract a technician recognized previously by the ProArbol program to organize capacity-building activities, define a practice improvement plan and supervise its implementation, etc. The technician's payment comes from funds granted by CONAFOR. He is paid directly by the landowners.

The contract must be for a duration of 5-15 years. Longer duration contracts are preferred.

The landowners specifically undertake to make no changes in land use, to conserve the forest cover and ensure that there is no loss or degradation in the forest cover.

In addition, the funds released by CONAFOR are used to pay for the environmental service rendered and the necessary technical assistance. On several occasions, a few

critical interlocutors mentioned the fact that CONAFOR compelled communities to use the funds for specific purposes. After verification, this seemed to be incorrect. CONAFOR does not impose any obligations concerning the use of the funds given. The communities themselves decide how they will use the funds.

The funds contributed by the project's financial partner can also cover monitoring activities (up to a threshold of 8% of the total budget) or even concrete activities with the purpose of improving practices and conservation (replantation, development of soil restoration structures, security and vigilance, *etc.*).

With regard to monitoring and performance measurements, the contract indicated that monitoring and measurement activities could be paid for by an amount not higher than 8% of the total budget. In the case of the projects examined, activities of this type were not provided for, except for the monitoring undertaken within the protected area. Furthermore, the Fondos Concurrentes rules stipulate that annual checks should verify the fulfillment of commitments. In case they have not been fulfilled, the contract may be terminated. We could not gather much information on these monitoring campaigns.

The three PES projects described as such were signed in May 2009. At this point, it is difficult to have a clear idea of their outcome.

Apart from the so-called PES contracts, the other contracts that we were able to analyze included reciprocal requirements and commitments, such as waste recycling activities. Profauna undertook to build a local waste storage facility and organized waste transportation provided that the community agreed to keep it well maintained and to implement waste collection activities for at least 5 years.

In the case of other contracts, the conditions seemed less restrictive. For example, Profauna undertook to purchase gabion construction material (soil restoration structure) and to pay for the daily work necessary for constructing the gabions, provided that the community agreed to allow Profauna's technicians to come and monitor them over a period of 10 years.

In terms of results, if we were to look at the activities conducted by Profauna, which are often based on contracts with reciprocal commitments, the following could be listed:

- Fight against over 150 forest fires
- Maintenance of 32 sq. km. of firebreaks

- Elimination of 123,625 kg of firewood
- Reduction in fire response times from 4 hours to 30 min
- Help in firefighting outside the protected area
- Between 2007 and 2010, 13,032.36 kg of waste was collected and separated for recycling in the 9 recycling centers
- 97 family kitchen gardens in 7 communities
- Educational activities conducted among 1,032 school and non-school groups
- Construction of 947 soil restoration structures, with the restoration of 1,050 ha and a contribution to the economic well-being of community members to the tune of MXN 1,601,543 in the form of daily wages
- Plantation of 711,150 trees of over 7 different varieties, with a survival rate of 45.5%, contributing to the economic well-being of community members for an amount of MXN 625,350 in the form of daily wages
- Monitoring of 24 water sources, demonstrating that Zapalinamé's water is potable.

Whereas only 5% of Saltillo's inhabitants linked the water they consumed with the condition of the Zapalinamé forest at the end of the 1990s (study conducted jointly with WWF), the study done in 2008 showed that the figure had risen to 17%, which proved that there had been a real improvement.

4.10. Scale

Profauna's action is inadequate to ensure a good ecological status for the forest and hydrological ecosystem in the Zapalinamé forest and the catchment area associated with the aquifers used by Saltillo City. Nonetheless, their action seems positive. The CONAFOR Fondos Concurrentes program further strengthened their activities in 2008. The issue of urban development remains the main threat and only the status of protected area may prevent an urban spread along the edges of the Zapalinamé forest, further reinforcing the need to associate different tools in order to achieve the expected results. Similarly, Profauna considers that the education of citizens and future generations is a major challenge to ensure the ecosystems' survival.

It seems that Profauna's example has begun to impact on neighboring states. A program quite similar to Profauna's is being initiated near Monterrey City.

At the national level, the CONAFOR ProArbol system is not enough to guarantee the sustainable development of the forests and aquifers. It must be considered as one among an entire range of programs. That is the argument put forward by CONAFOR

and INE: the program is aimed at certain territories, certain threats and certain beneficiaries only.

An increase in the number of programs and tools may, however, lead to certain problems, such as, in particular, transaction costs, access to information, *etc.*

4.11. The mechanism's organization

The NGO, Profauna, is the system's mainstay as a financial and management intermediary. The staff recruited has very high-level skills in the ecological and social areas.

Public (federal, state and municipal) institutions play different roles: allocation of the protected area's management to the NGO Profauna, approval of the protected area plan, validation of PES projects by CONAFOR within the framework of their Fondos Concurrentes program, enforcement of laws and participation in the budget.

The FMCN foundation has also been playing an important role since 2002. Its role is financial but it can also be associated with other management intermediaries because of the training workshops it organizes, the consultancy it offers Profauna, *etc.*

Profauna's annual budget has varied enormously in the last two years. There has been a rise in funds from voluntary donations, but at the same time, the state budget allocated for the protected area's management (necessary budget estimated to be about MXN 3 M by Profauna) was cut drastically. The budget is used to pay the salaries of the park wardens and for material purchases. This state of affairs led Profauna to use the donation money to ensure a minimum budget for the protected area in 2010 (after approval by the technical and citizens' committees).

The funding sources are:

- The FMCN, itself funded by the FGRA for this program
- Coahuila State (two budget heads – protected area and Peso por Peso)
- The Saltillo municipality
- Donations from Saltillo's water users
- Contribution by the company, Johnson Controls (dedicated to youth education).

Table 2 *Breakdown of partners' funding in the Saltillo case (Mexico)*

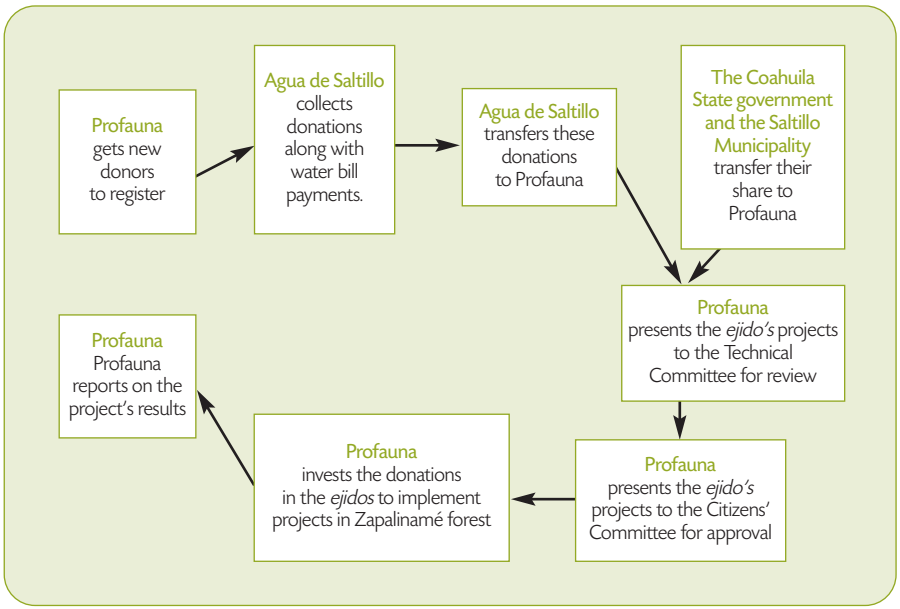
	2005	2006	2007	2008	2009	2010
FMCN (FGRA)	USD 812,756 EUR 49,171	USD 717,905 EUR 43,433	USD 740,544 EUR 44,802	USD 477,236 EUR 28,872	USD 164,886 EUR 9,975	USD 1,100,000 EUR 66,550
Coahuila State	Protected area (SEMAC) USD 1,200, 000 EUR 72,606	Protected area (SEMAC) USD 1,550,000 EUR 93,783	Protected area (SEMAC) USD 2,70,000 EUR 137,392	Protected area (SEMAC) USD 2,500,000 EUR 151,313	Protected area (SEMAC) USD 200,000 EUR 12,105	Protected area (SEMAC)
		Peso por Peso USD 237,666 EUR 14,385	Peso por Peso USD 570,399 EUR 34,525	Peso por Peso USD 370,399 EUR 22,416	Peso por Peso USD 705,465 EUR 42,694	Peso por Peso USD 792,500 EUR 47,961
Saltillo Municipality		0	0	0	0	USD 500,000 EUR 30,259
Donations by Saltillo's water users		USD 531,138 EUR 32,138	USD 742,930 EUR 44,953	USD 900,121 EUR 54,465	USD 1,200,000 EUR 72,606	USD 1,200,000 EUR 72,606
Johnson Controls Company					USD 261,674 EUR 15,835	USD 372,546 EUR 22,545
TOTAL	USD 2,012,756 EUR 121,807	USD 3,036,709 EUR 183,779	USD 4,323,873 EUR 261,677	USD 4,247,756 EUR 257,071	USD 2,532,025 EUR 153,236	USD 3,965,046

Source: Author

If we were to take only the voluntary donations by Saltillo's water users into consideration and the corresponding contribution by Coahuila State's Peso por Peso program [35] (since the contributions from the FMCN and Gonzalo Rio Arronte foundations are for a limited period: "we are there to help implement the system, which must become autonomous"), the way it operates can be shown in the form of the following diagram:

[35] The Peso por Peso program was established by Coahuila State, which was initially supposed to pay 1 Peso for every Peso given by the citizens.

Diagram 3 *Operational diagram of Saltillo's PES voluntary donation system*



Source: Author.

The three projects described as PES projects were allocated funds as per this process and it seems that all projects conducted with the communities that require a payment are organized along the same lines (plantation campaign, gabion construction campaign, etc.).

4.12. Transaction costs

The transaction costs are very difficult to assess in this system because of the superimposition of the protected area management system on the activities conducted with the communities.

According to Profauna, the administrative costs involved are of around 4%.

For the system presented in Diagram 3, the costs borne by Agua de Saltillo in collecting and processing the donations also need to be assessed. We could not get these figures as the company had not done any assessments on its part.

The Technical and Citizens' Committees are voluntary.

Case Study No. 2 Conservation Easement in East Africa

Yann Laurans, Ecowhat

At the request of the partners involved in the system studied here, their names and place names have been anonymized.

1. Case history

The case study lies in the part of the country that is best known for its natural spaces and wildlife, harboring the areas occupied by the Maasai – nomadic cattle breeders – in particular. Natural parks occupy large surface areas, hence the Maasai were forced out so as to organize these spaces without any human presence. But these natural parks do not cover the entire territory that is part of the ecosystem. Zebra and wildebeest migrations, in particular, cover areas that are much bigger than those turned into game and tourist reserves. This is particularly the case of the T. plains, surrounding a National Park.

While there is a concentration of animals in the National Park in the dry season, it is only because it protects the river that goes by the same name, which provides a vital quantity of biomass for the animals during this period. However, the quality of the fodder is much richer and more attractive in the T. plains that surround the park, representing a much larger surface area.

In fact, as soon as the rains begin, most of its migrating animals leave the Park: wildebeest, zebras, elephants and associated predators follow long migratory paths in a sort of continuous loop, which may cover areas ten times greater than the Park's surface area in the case of some of the species. During this period, for a month and a half, the cattle breeders avoid any contacts between their animals and the migrating herds because of a lethal fever that can be transmitted to cows by female wildebeest when they give birth.

Since the 1980s, actors interested in the wildlife in these regions have noted a downward trend in the density of wild animals. The trend is concomitant with cultivation on land previously devoted to livestock farming in the T. plains and the pressure exerted by poaching for bush meat, which is sold cheaply in the nearest urban centre (Arusha) by members of different tribes (the consumption of wild animal meat is forbidden in the Maasai culture).

Since tourism is the primary economic resource for the country, the Ministry's Wildlife Department is concerned with this trend and has undertaken measures in the form of meetings with Maasai villages. The history of expropriation does not favor contacts or confidence. Furthermore, given that the wildlife is State property, the villagers do not understand the consequences of these activities at all – hunting or tourism. Thus, these meetings have had no significant effects.

The tour operators formerly established here – some of whom are quite well-informed about the region's ecology – as well as experts in environmental NGOs – are concerned about these trends and have been documenting them, especially through "observation transects" by which the number of visible animals one comes across per kilometer crossed at a given moment is counted. Their collective deliberations for a year and a half led them to favor one of the seven villages in the T. plains: the village of S. For this group of actors, S. offered both good governance (a courageous and consequential municipal council) and an explicit attachment to the conservation of its land and culture of origin, and a low proportion of crops. It was a village in which there were greater chances of initiating activities and making them work. Enlisting six other tourist companies, they proposed a business deal to the village council, without any participation from ministerial or even local authorities.

The deal consisted of adding to the village's general budget every year, provided that it undertook to prevent farmers from settling down on a section of its territory that had earlier been demarcated by a land occupation plan. The village and its pastures were not directly used by the tour operators for the time being, for reasons of inaccessibility, wildlife density and the seasonality of migrations.

The village council accepted the deal, but in addition, it asked for the remuneration of four guards, working on a rotational basis (changed every year so as to provide employment to the entire community). The conservation NGOs present agreed to pay the guards, but only agreed for a rotation of two of the four guards.

The first year, the municipality used the funds to initiate legal action to secure its borders (Maasai village pastures belong to the community) and evict a "rich farmer" who had occupied land without any title. Subsequently, it funded the construction of a school and awarded scholarships. No monetary remuneration was given to the cattle breeders, who were only guaranteed access to the land for their animals. That being so, Maasai territories are not the exclusive property of the inhabitants of a village, as a cattle breeder can take his herd wherever he likes. Hence, it could not even be envisaged that access to land would be restricted for breeders from another village.

The guards, because of their presence and surveillance, assured the partners in this deal that no major infringement of their terms was noted. Equipped with a motorbike, bicycles and cell phones, they keep poaching down by warning the armed patrols of hunting societies and the authorities, who have the means to intervene.

For the moment, it is not possible to measure the impact on wildlife density. The observations noted by the guards have not been studied.

A village in the immediate neighborhood signed a similar deal, just 15 days before our trip. The territory targeted by the actors includes 7 villages of which one, F., close to the Park, is already extensively cultivated.

2. Contract

Introduction

The contract concerns the protection of S. village's land, demarcated for wildlife and animal grazing.

The contract was based on two laws: the Village Land Act, Section No. 1, 1999, and the Local Government Act, 1982.

Perimeter

A paragraph that describes the plots of land and the borders of the land intended to be used.

Payment

The stakeholders, whose list is given in the contract, would pay S. village D. 5 million [EUR 2,500], in order to strengthen and implement the easement, once a year, for a period of 5 years.

Terms and Conditions

The villagers would continue to use the land for "impermanent" animal grazing, but no other form of farming would be allowed.

The villagers and the village council would see to the implementation of the environment protection and land use plan.

Coal production, illegal hunting and the capture of wild birds would not be authorized.

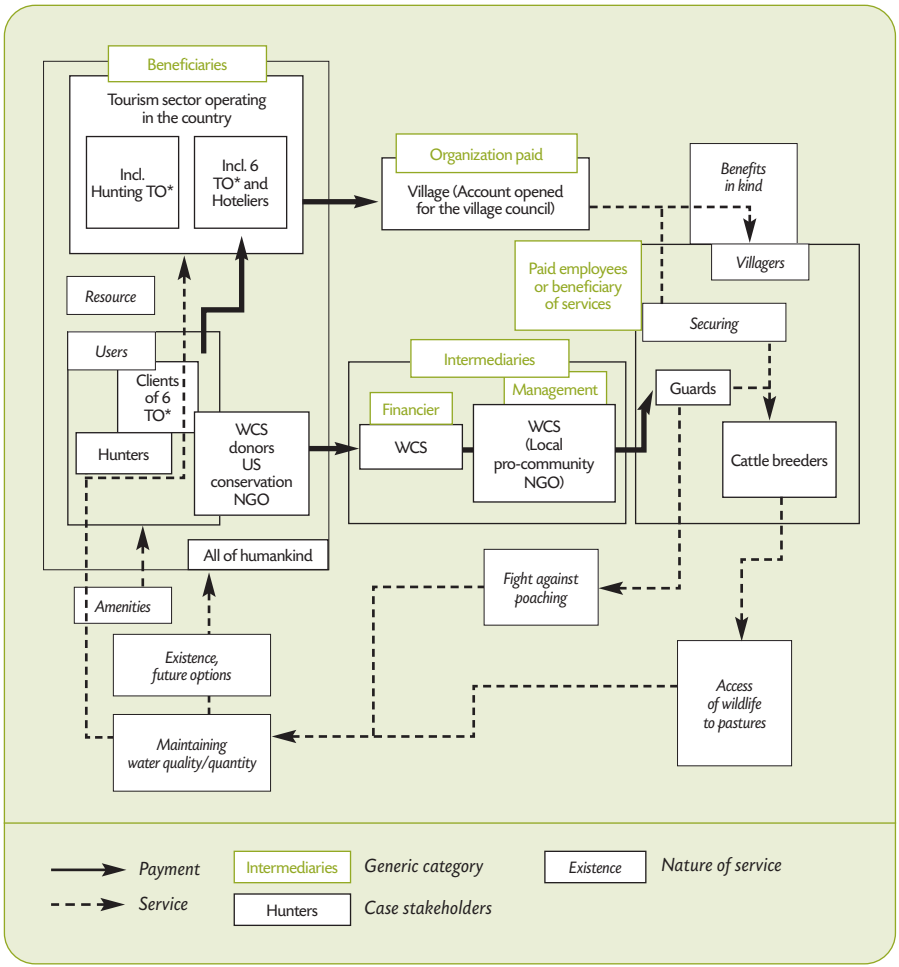
The villagers and their council would consult and seek the stakeholders' advice before initiating any other land use project, including tourism.

Annexes

The minutes of the village council's deliberations and approval during a special session are annexed to the contract.

3. Operational diagram

Diagram 4 *Operational diagram for the East African PES scheme*



Source: Author **TO = Tour Operators.*

4. Analysis

4.1. Context of initiative

This is a pilot project in the sense that it is supposed to be extended to six other villages for its size to be in line with the scale of the problem.

The initiative was taken by a small group of tour operators of American culture who had grown up in the country, an American consulting scientist and a British elephant specialist paid for by a conservation NGO, based in New York.

The promoters justified their initiative by their real and shared perception of a strong threat to the ecosystem. To this threat could also be added their shared opinion concerning the ineffectiveness of the strategy adopted by the authorities for wildlife protection. The promoters criticized it for being based on the public ownership of wildlife, but without any management corresponding to this responsibility, due to political inadequacy, the lack of means and corruption. Furthermore, public management was based on limited protected areas. Lastly, it had been alienated from Maasai public opinion because of the government's past policy of expropriation, whose justification was challenged (by the Maasai, objecting that they had a long-lived practice of living together with the wildlife).

4.2. Objectives

The plan envisaged indirect action, based on the conditions in which a section of the region's wildlife ecosystem functioned, which was not protected by regulations.

The biodiversity targeted is the one that attracts visual and hunting tourism: primarily the "big five" of visual tourism: lions, leopards, buffaloes, elephants, rhinoceros; hunters' game: gazelles, *etc.*

The question that emerges has to do with the objective's indirect ecologic consequences: would the action of protecting the ecosystem of migrating ungulates and their predators lead to a positive (or even negative) impact on other biodiversity criteria (flora, fauna, specific natural wealth, abundance, etc.)?

The "ecosystem service" intended here may be seen differently, depending on how the beneficiary is defined. It could be *(i)* all of humankind, as a custodian and beneficiary of a genetic or ecologic heritage, among others, with the conservation of subsistence

conditions for some fragile if not endangered species; *(ii)* users of specific activities: contemplation of nature (what the PES literature generally likens to the "beauty of the landscape" or "esthetic" ecological service), safari photos or hunting; and, finally *(iii)* producers of tourist activities for whom the wildlife is a natural renewable resource and who benefit from the activities generated by it. For each of these beneficiaries there is a corresponding stakeholder in the operational diagram: NGO donors, clients of tour operators, tour operators themselves.

The hierarchy stemmed from the project's promoters, and seems to be as follows: 1) the service rendered to users; 2) the conservation of a renewable natural resource; 3) the conservation of the ecological heritage. This hierarchy is based on the assessment that a protected area is not used directly by tour operators and that their role in the conservation of endangered species is neither evident nor pivotal (wildebeest, zebras, elephants or giraffes are not endangered species, although they are fragile and protected).

4.3. Identification

The role of cattle-breeding prairies in the migrating fauna ecosystem, and the design of protected areas, were identified gradually. This identification in the 1970s and was particularly highlighted in this region by a biology thesis by one of the tour operators in the 1980s.

The identification of threats was the result of field observations as related to the decrease in the observation of wild animals (counted in transects, in the number of observations per kilometer covered) and to the growing cultivation in some villages around the National Park.

4.4. How did the need to pay come to the fore?

No economic assessment of the service was considered necessary – it seemed obvious to those who declared that they were motivated to act: some operators mentioned reasons of business and a business deal. In other words, it was a matter of the potential victims (tour operators) themselves realizing the negative external effects of their own activities.

The link between the Maasai practice of extensive breeding and the ecological service concerned had long been known, because: *(i)* they both needed a similar type of area; *(ii)* the cattle-breeders avoid contact between their animals and the ungulate because

of the risk of fevers; *(iii)* the Maasai tradition of not eating wild animal meat; *(iv)* the direct competition between poaching and Maasai cattle-breeding (the former producing cheap meat and competing with the latter).

4.5. Obstacles

The case being examined seems to be a success story for the moment. The main limitations have to do with poaching, which is difficult to reduce. Its impact on the ecosystem and its ability to raise questions about the outcome of such an operation are not clear.

The main difficulty the project faces is its current size: just one village (two if the signing of a similar type of contract with a neighboring village is taken into consideration) out of the 7 surrounding the Natural Park. However, the project is being implemented without the participation or even the support of government authorities, who do not use this type of approach or could even oppose it. The generalized expansion of indirect support to cattle-breeders in 7 villages by the tourism industry would call for public initiative or at least public participation, which is far from guaranteed.

4.6. Nature of actors paid for the provision of services, and of beneficiaries

The main actors paid are not directly the economic agents whose practices are necessary for the service, but their village's municipal council, indirectly. Because of this, the payment helps all the village's inhabitants, whether or not they are cattle-breeders (but the main activity seems to be cattle-breeding). Within this framework, the municipal council plays several roles: almost the role of a professional representative when it acts to ensure the respect of the village's territorial borders – such as when it evicted a farmer who had settled down on cattle-breeding land; and the role of a conventional municipal authority – such as when it used its resources to strengthen the school infrastructure.

The State and government bodies play a key role, not as biodiversity management bodies but rather a regalian role: legal issues, land registry and potentially even policing (to ensure the application of legal decisions). Conservation NGOs play a related role by funding the employment of the guards and providing support (either directly or as the main donors of the local NGO for the promotion of community management).

The final beneficiaries are not aware of any payment: tourists are invited to contribute voluntarily, but the idea, initially expressed, of organizing a payment of one Dollar per night was relinquished for fear of a negative reaction from clients. The intermediary beneficiaries (tour operators) are both aware of the payment and willing to make it, but their involvement is irregular. On the one hand, some of the operators involved in the payment were rarely present (one of them did not want to meet us, refusing to give the matter the necessary time). On the other hand, the vast majority of tour operators benefited from the program without being associated with it (the promoters deliberately decided to keep their numbers down for reasons of effectiveness and because the financial requirements are really quite low).

The project seems to be witnessing a growth dynamic with the recent addition of a second village. The initiators spoke of enlisting a few additional colleagues to increase the financial resources. In addition, they are examining the possibility of a partnership with the Park's government authorities for strengthening anti-poaching activities in the concerned villages.

4.7. Contractual relationship mode and the foundations of trust

The contractual relationship is based on the contract's simplicity. The village's actors appreciated this characteristic, while they would have considered the reverse as a potential source of disputes. Their trust was gained by approaching various reference personalities in the village, who were trained and knew the local NGO well and who acted as intermediaries with the municipal council. Subsequently, the fact that the operators presented themselves in this manner and explained their economic needs in the form of a business deal, rather than proffering philanthropic or conservation reasons, had a positive impact.

The contract was in writing and was ratified by the village assembly (which everyone can attend), signed and countersigned. No jurisdiction was invoked, but it was placed within the framework of the village's fundamental property laws and those involving the exercise of power.

A permanent village committee was established to monitor the project (Easement Committee), consisting of half a dozen municipal council members.

No penalties and no guarantees were included. Trust was based on the terms and conditions established for pursuing the contract, which allowed for the non-renewal

of the annual payment if they were not fulfilled. The monitoring modalities consisted of a commitment by the village to communicate and ask the signatory operators' opinion before initiating any projects likely to significantly change land use. Insofar as this can be observed easily and, in addition, four guards were being paid, monitoring these clauses was quite easy.

The permanent committee declared it was satisfied with the contract and demanded a higher payments so as to fund village infrastructure (village hotel), increase the number of students benefiting from support, pay better lawyers and strengthen their anti-poaching resources through the training of guards, possibly carrying arms, and a vehicle (currently the guards essentially do their patrolling on bicycles and convey their observations by cell phone).

4.8. Payment terms

The Municipal Council is paid in the local currency through a single annual transfer to an account opened for this purpose. The cattle-breeders receive benefits in kind: on the one hand, by securing their activities through the conservation of cattle-breeding areas and anti-poaching activities and, on the other hand, the strengthening of the local school infrastructure.

The amount was fixed following a simple discussion: the tour operators proposed an amount, stating that it was what they could offer. They had estimated the amount on the basis of a modest contribution by each of them and on their knowledge of the village's low level of monetization and very low living standards. They felt that they had adjusted their offer so as not to disturb operations with amounts that would have been disproportionate given the project's needs. The village council accepted the amount, while requesting (and obtaining) that the guards be paid by the NGOs.

Consequently, the payment was homogenous per hectare. The area covered was selected because of the potential it presented and the relative ease with which discussions could be initiated with the authorities, as well as the low opportunity cost involved for the villagers (since they still did not have too many crops and so there was no need to remove and rehabilitate cropped land extensively at a high cost). No expansion of cropping is envisaged.

4.9. Conditionalities

The payment secures an existing but endangered practice (*a priori,* the threat is not from the cattle-breeders themselves, but from farmers coming in from elsewhere). Hence, there is no additionality.

The land concerned is the area designated as cattle-breeding land by a village planning decision. The planning criteria were based on its agronomic qualities (cattle-breeding land is typically flat and open, with little vegetation; cultivable land is usually close to the villages, sometimes in small valleys, with a more dense forest cover and, therefore, with more tsetse flies, in particular).

The (contract) implementation indicator is the absence of crops, which can easily be observed by all the villagers, and *a fortiori* by the guards and the local NGO. The impact or effect indicators would be the density of animals observed per transect, but it is impossible to hope for the project really having a direct impact on this indicator. It only makes a more or less marginal contribution. Furthermore, and perhaps for this reason, while it is an indicator that is noted by the guards, the results are not really studied and used, which may potentially reduce the guards' motivation levels in carrying out the monitoring work.

4.10. Scale

At present, the project concerns two-sevenths of the area identified as strategic and needs to be expanded for any significant impact. The rapid growth of cultivation in G., the village bordering the National Park, points to the likely difficulties in this regard.

4.11. The mechanism's organization

The functioning of the PES scheme has been given in detail in Diagram 4. Government wildlife conservation organizations are not involved directly. Indirectly, the project is associated with the National Park, which it complements, but there are no interventions by the park authorities (who refused all interviews, claiming there was no mission letter from their Ministry).

Budget resources:

For the easement itself: EUR 2500/year for 5 years, *i.e.* EUR 12,500 for the project's entire duration.
Source: Tour operators.

For the guards (salaries, fuel for one motorbike, training, equipment): EUR 2400/year[36], *i.e.* EUR 12,000 for 5 years.

Source: WCS donations *via* local NGO.

For project expenses: meetings, study visits, transportation: EUR 3180/year on the basis of an annual budget of EUR 22,260[37].

Source : WCS *via* local NGO.

Total: EUR 8,000/year incl. 2,500 (31%) from operators and 5,500 (69%) from WCS. *i.e.* EUR 40,000 covering the period of one contract (5 years).

Skills and engineering implemented: skills in ecology for the identification of issues; institutional skills with regard to how to approach and work with the municipal council.

4.12. Transaction costs

Design, set-up, argumentation and mapping costs:

Altogether, 3 months of full-time employment, essentially distributed between two experts, one local and the other international (local NGO and WCS): in all, EUR 8,000 to 12,000[38] (*i.e.* 20 to 30% of the total cost).

Running management costs:

Contact and follow-up by local NGO; about a tenth of full-time employment per year, *i.e.* EUR 2,200 for the duration[39] (*i.e.* 5.5%).

Total transaction costs:

Transaction costs can be understood in two ways:

1) All operational management costs. In this case, the guards' costs must be considered as transaction expenditure: they undertake a monitoring and follow-up function, *etc.* Transaction costs would therefore account for 600% of the PES scheme itself.

2) Only the costs involved in the process of establishing contacts among actors, concluding the agreement, administrative management, *etc.* (design, set-up, mapping and running management costs, related to payments, including payment to guards).

In this case, the transaction costs account for 25-35% of the project.

[36] USD 3,270, on the basis of USD 9,000 for 11 guards, of which 4 in S., 6 in F. and 4 in G.

[37] Based on a total budget of USD 30,000 for 7 villages.

[38] Hypothetically, 1.5 months each. Local expert: Based on a cost of USD 500/month: USD 750/550. International expert: on the (hypothetical) basis of EUR 5 -8 K/month of the total cost of an on-the-spot international expert (charges, expenses, salaries): EUR 7.5 to 12 K.

[39] Based on a qualified local cost of USD 500/month, *i.e.* USD 600/year, i.e. USD 3,000, *i.e.* EUR 2,200 for the project's 5 years.

Case Study No. 3 Community-Based Natural Resource Conservation Program, Namibia

Hervé Léthier, EMC2i

1. General context

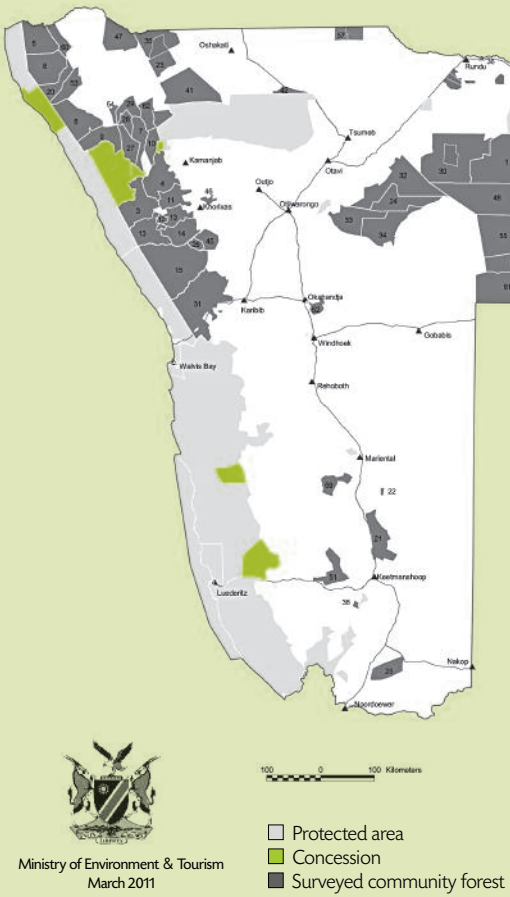
For almost 20 years since it was initiated, Namibia's Community-Based Natural Resource Management Program (CBNRM) has spearheaded government policy, at the service of the country's sustainable development.

The program is based on the idea that at the price of appropriative incentive measures, a sustainable use of natural resources may contribute both to local economic development, the enhancement of community well-being and the conservation of biodiversity. It was on this basis that the Ministry of Environment and Tourism (MET) established a legal system acknowledging exclusive natural resource usage rights in favor of communities desirous of developing hunting and/or tourism related activities in 1996 [40].

As soon as they received the MET's approval, on the basis of documents establishing the perimeter of action, as well as providing a management plan for the concerned resources and a business plan, these "conservancies" formed as associations, were granted legal and financial autonomy; they strive to develop their activities within a contractual framework, binding them to specialized local operators. The 59 conservancies set up as on date (cf. Map 2) and essentially spread across the north-west and north-east of the country, continue to receive substantial support from a large number of actors, NGOs, and public and private (including foreign) donors, gathered together under a associative coordination structure called NACSO [41], The latter contributes extensively to building their technical, human and financial capacities for interventions.

[40] Nature Conservation Amendment Act No. 5-1996.
[41] *Cf.* Namibian Association of CBNRM Support Organizations, NACSO. http://www.nacso.org.na/index.php

Map 2 *Map of spread of conservancies*



	Name	Survey date
01	Nyae Nyae	1998 Feb
02	Salambala	1998 Jun
03	Torra	1998 Jun
04	#Khoadi//Hoas	1998 Jun
05	Marienfluss	2001 Jan
06	Orupembe	2003 Jul
07	Omatendeka	2003 Mar
08	Puros	2000 May
09	Sesfontein	2003 Jul
10	Ehirovipuka	2001 Jan
11	//Huab	2003 Jul
12	Uibasen Twyfelfontein	1999 Dec
13	Doro!nawas	1999 Dec
14	Sorris Sorris	2001 Oct
15	Tsiseb	2001 Jan
16	Kwandu	1999 Dec
17	Mayuni	1999 Dec
18	Mashi	2003 Mar
19	Wuparo	1999 Dec
20	Sanitatas	2003 Jul
21	!Khobf Naub	2003 Jul
22	Oskop	2001 Feb
23	Uukwaluudhi	2003 Mar
24	Okamatipati	2005 Sep
25	//Gamaseb	2003 Jul
26	Otjimboyo	2003 Mar
27	Anabeb	2003 Jul
28	Ozondundu	2003 Jul
29	Okangundumba	2003 Jul
30	Nlle-Jaqna	2003 Jul
31	#Gaingu	2004 Mar
32	Otjituuo	2005 Sep
33	Ozonahi	2005 Sep
34	African Wild Dog	2005 Sep
35	Uukolonkhadi-Ruacana	2005 Sep
36	Joseph Mbambangandu	2004 Mar
37	George Mukoya	2005 Sep
38	!Gawachab	2005 Sep
39	Muduva Nyangana	2005 Sep
40	Shamungwa	2005 Sep
41	Sheya Shuushona	2005 Sep
42	King Nehale	2005 Sep
43	Kasika	2005 Dec
44	Impalila	2005 Dec
45	Ohungu	2006 Oct
46	/Audi	2006 Oct
47	Kunene River	2006 Oct
48	Ondjou	2006 Oct
49	Balyerwa	2006 Oct
50	Sobbe	2006 Oct
51	!Nan/Awab	2008 May
52	Ovitoto	2008 May
53	Okondjombo	2008 Aug
54	Otjambangu	2009 Mar
55	Eiseb	2009 Mar
56	Sikunga	2009 Jul
57	Okongo	2009 Aug
58	Dizoti	2009 Oct
59	Huibes	2009 Oct
60	Otjitanda	2011 Mar
61	Otjombinde	2011 Mar
62	Onjuupa	2011 Mar
63	Omuramba ua Mbinda	2011 Mar
64	Bamunu	2011 Mar

Source: NACSO (2009).

The challenge is sizeable – both national and local; in fact, Namibia still enjoys a rich and diversified biodiversity, thanks to the six major biomes present on its territory. However, it has somewhat eroded since the country's independence in 1960, because of considerable poaching, combined with the excessive taking of large animal specimens.

The country has also long suffered from regional geopolitical instability and tensions, particularly armed conflicts, which have affected the neighboring countries.

However, Namibia looks like a young country today, one that has been able to take up the challenge of biodiversity conservation, in favor of sustainable development. In this context, the experience of conservancies has generally been perceived as an absolute success. It is true that the rise in the number of big game has been spectacular since the establishment of the conservancies, to the extent that man/fauna conflicts have now emerged as one of the greatest challenges to be dealt with in order to ensure the sustainability of this development model.

So what is the true picture? How can what has been presented as a great story inspire the debate on ecological goods and services?

These are the two questions that shall be dealt with in the present study, in the light of the case of the Caprivi Strip in which the conservancies – currently around ten – seem to have obtained excellent results, both in terms of conservation and local development.

Located in the country's north-eastern extremity, the Caprivi Strip, where bushmen communities reside, stretches over an area about 60 km wide and 300 km long, bordering Angola and Zambia in the North, and Botswana and Zimbabwe in the East and South.

The area spreads around the Okavango and Zambezi Valleys, with high densities of big game, elephants, buffaloes and antelopes, whose populations also spread out over the neighboring countries. It is no less an issue than that of regional cooperation regarding wildlife management, once the biological balances have been drawn up – in the present case, in terms of systemic units largely exceeding the Caprivi region and even in the case of species with a far wider distribution area – going well beyond national borders.

The evolutionary trends among these species have generally been particularly spectacular since early 2000; correlatively, these developments have been accompanied by a net growth in conflicts in all the conservancies (*cf.* Table 3).

Table 3 *Trends in number of man/fauna conflicts in all conservancies between 2001 and 20088*

Year	No. of farm damage cases	No. of attacks on humans	No. of attacks on animals	No. of other damage cases	Total
2001	57	8	256	4	325
2002	434	2	324	11	771
2003	1,098	17	1,733	171	3,019
2004	1,084	14	1,684	154	2,936
2005	1,470	15	2,658	139	4,282
2006	2,350	11	3,174	178	5,713
2007	2,390	20	3,194	291	5,895
2008	2,475	29	4,384	207	7,095

Source: NACSO (2009).

The activities developed by the conservancies fall into two specialized areas of intervention assigned to them by law: trophy hunting and the bushmeat trade associated with it, as well as tourism – particularly green and visual tourism.

Other secondary activities are also associated with the development of ecological goods and services, such as the manufacture of goods and jewelry from natural mineral, vegetal or animal resources. However, these are by far products related to trophy hunting, bushmeat and tourism in general, which provide the highest income. In fact, in 2008, they accounted for almost 83% of income, with an extremely significant growth in the last decade.

2. The conservancies

2.1. Introduction

To date, there are 59 registered conservancies covering 133,000 sq. km., *i.e.* over 16% of the national territory. About 15 of them are in the process of being registered. That accounts for over 176,000 inhabitants, *i.e.* about 1 out of every 4 Namibians living in rural areas covered by a conservancy.

The 30 or so agreements signed between conservancies and private operators in the tourism sector have brought the concerned communities about 17 M Namibian Dollars (NAD) in 2008.

Table 4 *State of registered conservancies – October 2010*

Region	No. of registered conservancies	Surface area (sq. km.)	No. of inhabitants
Caprivi	11	3,118	25,119
Erongo	4	17,419	6,800
Hardap	2	1,422	270
Karas	4	6,550	11,280
Kavango	4	1,190	6,000
Kunene	20	41,690	30,960
Ohangwena	1	1,340	336
Omaheke	1	6,625	221
Omusati	3	9,496	60,425
Oshikoto	1	508	20
Otjozondjupa	8	43,734	34,365
TOTAL	59	133,092	175,796

Source: NACSO.

To be registered, conservancies must fulfill a certain number of conditions set by law. These include having:

- A Board of Directors consisting of elected members
- Statutes
- An equitable profit distribution plan
- An area with clearly defined boundaries.

2.2. Perimeter

The definition of a perimeter of intervention is one of the initial obligations to be fulfilled for a conservancy to be registered by the government authorities. The perimeter must be defined after agreement has been reached with all the parties involved,

including traditional authorities. It is only after a long local consultation process and on the basis of a consensus that the territory of a future conservancy is determined, covering quite variable surface areas, from just a few sq. km.[42] to several thousand sq. km.[43]

The registration application includes the production of a map demarcating the conservancy's perimeter and documentary proof of the agreement of all the parties.

2.3. Operation

The conservancies function on the basis of model statutes approved by the authorities. Their operation is entrusted to a Board of Directors consisting of elected local representatives for a fixed period. A President, a Secretary and a Treasurer are designated from among them.

The members meet in an annual General Assembly, whenever it is deemed necessary. It is interesting to observe the growing presence of women within these bodies[44], particularly in the posts of Secretary and Treasurer.

However, the administration of conservancies does pose a certain number of difficulties, related to the volatility of staff [45], the instability of the elected representatives themselves, and also because of the disputes that develop between members. The low-level of human resources in these institutions adds to these difficulties and, consequently, even today, after twenty years of existence, few conservancies are autonomous and able to manage without external, technical and/or financial support. One of the strengths of the CPNRM lies precisely in the fact that the program was able to provide unfailing and continuous support to the local communities for almost twenty years, for the formation as well as operation of conservancies. There can be no doubt that such support is still indispensable today for securing these structures and for their sustainability, and that in the medium term, it will remain so.

The activities conducted by conservancies are based on a management plan approved by the public authorities, to which plans for the structure's development are presented; the implementation of these plans remains difficult for many conservancies that have not yet achieved the required level of maturity.

[42] 336 sq. km. in case of the smallest – the Joseph Mbambangandu conservancy in the Kavango region.
[43] 9,120 sq. km. for the largest, the N-a Jaqna conservancy in the Otjozondjupa region.
[44] More than one-third of the board members are women, who also occupy about half the conservancy accoun-tant posts.
[45] 276 employees in 2008, of which 154 funded from their own funds by the conservancies.

The conservancies' own funds amounted to NAD 32 M in 2008, *i.e.* about three-quarters of the total resources, estimated at NAD 41 M, the rest being drawn from secondary tourist activities and external contributions. Therefore, it appears that the conservancies have not yet reached a deadlock and that, in the future, they would still be dependent on external support – for their functioning as well.

To conclude on this point, the conservancies seem to be divided into three major categories today:

- Those that make a considerable net profit from hunting and tourism activities and have achieved a certain degree of functional and financial maturity; at present, about fifteen conservancies are able to cover their operating costs from their own funds, and there are about fifteen others who are able to cover about half these costs.
- Those that remain at a low or even elementary development level, either because their human capacities still remain markedly inadequate or because economic activities of this type will undoubtedly never enable them to develop or, finally, because they have not yet achieved an optimum level of activities. In fact, it would be illusory to hope to be able to propagate trophy hunting and tourism over Namibia's entire territory or even in all the existing 59 conservancies.
- Those that are still in the process of being approved, *i.e.* currently, about fifteen.

These disparities undoubtedly mark the need to review the model, by expanding the range of conservancy activities and by ensuring a fairer distribution of financial products, bearing in mind in particular the distribution of the growing number of man/wildlife conflicts[46], often to the detriment of communities and individuals that do not draw any benefits from such products.

Such a change could be implemented in relation to the "forest communities"[47], – currently about a fifteen, plus about thirty that are in the process of receiving an approval – sometimes established within the conservancy territories, with analogous governing bodies, so as to act in favor of adding value to other supply and regulatory ecosystem services, associated with the forest in this case. This would be in line with better integration of the conservation of natural resources as a whole, claimed by the very title of CPNRM.

[46] The number of these conflicts has risen 20-fold between 2001 (325 conflicts) and 2008 (7095 conflicts), mainly leading to impacts on crops (33%) and on cattle (40%); Cf. Tables 3 and 4.

[47] *Cf.* the 2001 Forest Act No. 12 establishing these communities as well as the Development Forestry Policy for Namibia, in the same year.

2.4. Payment

The payments for services, on the basis of which trophy hunting and tourism activities are developed, are done on the basis of contracts between the parties, the conservancy and the operator to whom their use has been granted.

They may therefore vary in terms of their amount and their modalities vis-à-vis the service concerned. The amount may be fixed at the end of a competitive process; in many cases, it is decided by mutual agreement between the parties. The conservancy may ask for financial guarantees from its partner, who provides a business plan in all cases, which provides information on how it is related to the latter's objectives, its professionalism, its technical, human and financial abilities, its commercial expectations, its intention to generate employment and recruitment, as well as all the resources it intends to devote to the project's success.

Negotiations are initiated on the basis of model, renewable contracts of a variable and limited duration [48] ; the conservancy then receives the support of NACSO and its members in the negotiations.

Contracts included resolutory clauses in case of the non-respect of commitments by the parties, especially a partial or total default in payments. There have been cases of such agreements being terminated by conservancies, following the default of payment by the operator; such disagreements are now being resolved with private hunting operators. Apart from compensation for damages, which the injured conservancy can demand before a civil judge, the MET (Ministry of Environment and Tourism) reserves the right to punish operators responsible for the dispute by withdrawing their right to carry out contracts or to tender for any other public contracts in the future.

Notwithstanding the contractual provisions that the parties willingly agree to, the hunting operators are awarded an annual quota of animals they can hunt by the conservancy, which is fixed beforehand by the MET and allocated to the conservancy after consulting a national commission, as well as an inventory of the animal populations concerned. The inventory and monitoring operations are carried out locally thanks to the irreplaceable expertise of the communities; they combine traditional methods of aerial monitoring with detailed land interventions, thereby making the monitoring of African big game one of the most accurate. From a social point of view, this is a

[48] The duration is of about 3-5 years of use for hunting purposes and, generally, 10-20 years for tourism activities, after a test period of one or more years, if required.

significant acknowledgement of local know-how, whose consequences, although difficult to assess, are undoubtedly and particularly positive, including in terms of the conservation of natural resources.

Bushmeat is generally sold directly on the hoof to butchers, who take on the task of slaughtering the animals as per the culling limits set by the administration, and of preparing it and selling it to the end consumers.

In any case, the entire financial income from these activities goes back to the conservancy, which uses it in accordance with the documents submitted to the authorities at the time of its application for approval.

The remuneration and payment modalities for supply services leading to the trade of artisanal products follow other processes. In the Caprivi region, the artisans – mostly women – receive a monthly payment from the association that they have formed and entrusted with the responsibility of selling the products directly to the consumers on their behalf. Part of the sales' income is allocated to the association for community investments [49] and operating [50] expenses, while the remainder is re-distributed among the artisans on a *pro rata* basis as per the actual sales of the products they have personally created [51]. In this case, the conservancy is just a breeding ground favorable to the emergence of secondary activities, conducted totally autonomously by the concerned local actors. In a certain manner, it may be considered an indirect outcome of ecological services.

In any case, ecological services are promoted because of the presence of conservancies that generate and/or encourage the development of such activities. Correlatively, the recognition and use of the economic value of the concerned natural resources result in a considerable reduction in poaching and contribute towards the re-constitution of the biodiversity.

The additionality of these activities, riding on the back of the promotion of ecological services, therefore seems well-established.

[49] Example: Construction of shops.
[50] Examples: Staff expenses and administrative and accounts management expenses, maintenance of shops, *etc.*
[51] On the basis of a statement written and signed by the artisan and the association.

2.5. Conditions

The rights granted to trophy hunting and tour operators are exclusive; however, they are not opposed to the use of other ecological goods and services by the local communities, including the exploitation of other forms of hunting, for instance for bushmeat, and the practice of related or derived tourism activities, such as craftwork and the production of honey.

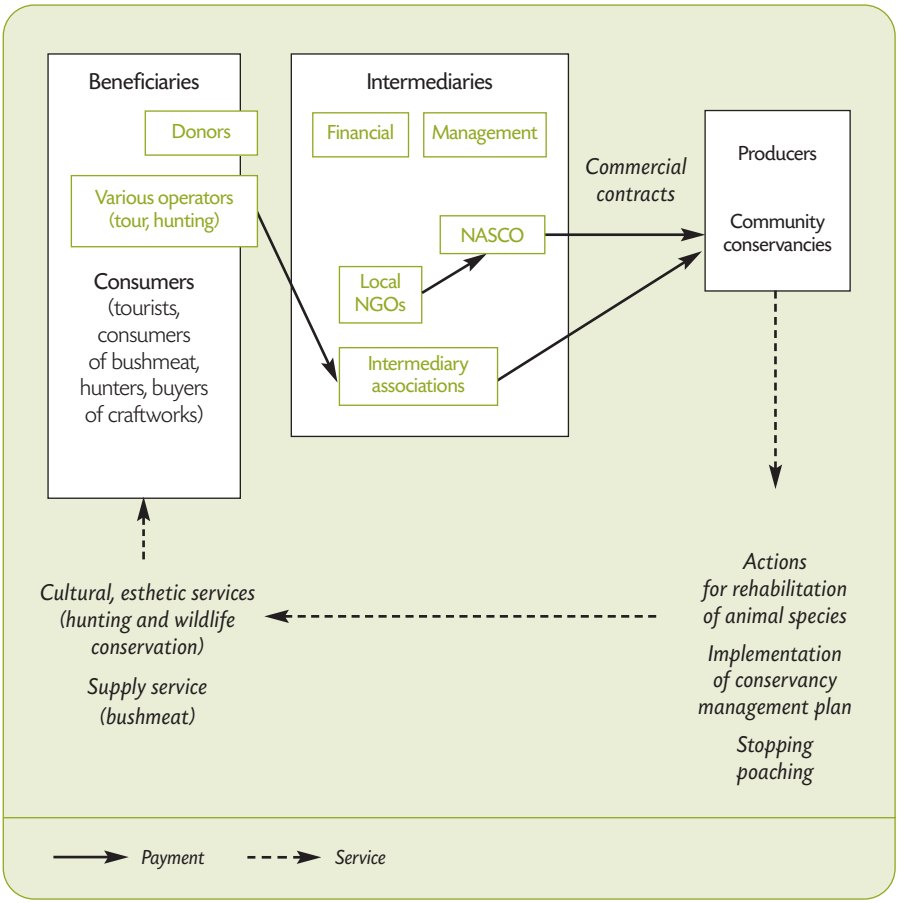
Hunting for the purpose of gathering bushmeat is therefore carried out directly by the conservancy or its members, depending on the situation. It can also be entrusted to a third party – a butcher for example – who would then be responsible for hunting the animals himself, preparing them and marketing butchery products, in accordance with the contractual conditions defined by mutual agreement between the parties – always within the national regulatory framework set by the MET.

The type and number of animals intended for slaughter are, in fact, decided upon by the parties as per the regulations. Furthermore, bushmeat from trophy hunting remains the property of the conservancy, whose decision-making bodies decide on its sale for the benefit of the community, or on its distribution to the members.

The MET is in charge of monitoring the application of the rules and agreements at the national and field level, through the conservancy security personnel recruited and trained for this purpose.

Moreover, the establishment of a training and certification system for the technical staff, and the hunting and tourist guides and guards in particular, remains a significant factor adding value to the project. In all, almost 300 jobs have been generated by the conservancies to date and almost half of them are funded through own funds. A large majority of these employees are assigned these tasks.

Diagram 5 *Operating Diagram of the Namibian PES scheme*



Source: Author.

3. The services concerned

The fundamental question that remains is whether and how conservancy activities can be considered to be ecological services, as we understand them.

Beyond the conventional nature of the debate, in fact, the notion of ecological services covers highly varied realities, to such an extent that it is sometimes quite tricky to understand the significance of this notion and draw up the outlines of its field of application.

If we were to refer to the commonly used typology at the international level[52], the hunting and tourism activities mentioned above as well as bushmeat trading seem to quite clearly illustrate what we consider to be "supply services" and what are "cultural services and other amenities".

Moreover, the academic criteria established in specialized literature, which makes it possible to describe payments for such a service, also seem to have been met:

- These are voluntary transactions, decided upon freely, whose modalities are defined by mutual agreement between the parties.
- The ecological service is perfectly well described and falls under a type that is well recognized.
- It involves intervention by an operator desirous of doing so, freely and as per the terms and conditions the operator also helped define directly.
- It also involves a clearly identified supplier (the conservancy, for the most part), enjoying exclusive prerogatives *vis-à-vis* the use of the services in question, as guaranteed by law.
- The terms and conditions under which the service is used are "sustainable" in the sense that the natural resources linked to ecological services used seem to be preserved, *a posteriori,* as far as current knowledge and monitoring go. The status and trends related to the development of the natural resources promoted have therefore improved considerably since this mechanism was implemented, which has contributed directly to reducing the pressure on the ecological goods and services in the case under study.

Diagram 5 illustrates how this mechanism is organized.

The prospects of expanding the conservancies' range of activities and their connection with forest communities have opened up other horizons for the promotion of ecological services, including regulations.

The additional effects of activities based on these services are already visible and objective, in terms of the volume of activities, employment generation, an increase in big game numbers, the increase and optimization of local capacities, improvement in the status of women, etc. They have made it possible to significantly reduce the harmful consequences of the widespread poaching that took place before the start

[52] *E.g.:* Millennium Ecosystem Assessment.

of the program. They made it possible to initiate accelerated social and economic development through the changes brought about. This development would also contribute to the model's economic, financial and social sustainability.

4. Contracts

4.1. Introduction

The following elements of information add to the preceding analysis and provide greater details about some of the aspects of the contractual process characterizing this mechanism, depending on the types of activities.

From a general point of view and in each case of application, the process clearly reflects a meeting of minds between the parties, generating certain rights and, correlatively, obligations, both of which are recorded in a written document that is mutually binding on all the parties.

The terms and conditions for a contract to be signed are therefore perfectly fulfilled. However, they may vary with the contract's purpose (service) and the subjects (actors) involved; in fact, the commitments recorded differ in nature and degree, characterizing the result of conventional negotiations between actors, in each case.

In the case studied, a third party, NACSO, contributes methodological support to the service administrators – the conservancies. The support is provided at all phases of the process, before negotiations (training, sensitization and production of adapted material, model contracts, guidelines for the use of contract forms[53]), during negotiations (choice and definition of obligations, fixing of rents) and in the contract application stage (administrative and accounts support, legal assistance for protection of the conservancies' rights).

4.2. Perimeter

The contract is applicable *ratione loci,* most often at the level of the entire conservancy area, though sometimes for only a part of it, as defined after the approval procedure.

[53] It also helps in the enforcement of government rules (*e.g.:* Guidelines for Developing a Conservancy Management and Utilization Plan, a document that must accompany applications for a conservancy's registration, annexed to the Ministry of Environment and Tourism's letter, intended for all conservancy chairpersons and dated 18 February 2008).

4.3. Payment

Financial flows may differ, depending on the activities. In all cases, the conservancies directly receive the entire financial income from the contracts concluded with hunting and tour operators. They can use the income as they wish to fund activities of community interest or redistribute the amount to individual members of the concerned communities.

The related activities facilitated or motivated by this mechanism, such as the trading of plant species (for instance, devil claws[54]) and the manufacture of craftwork from natural products, follow less formal contractual systems and payment processes that are significantly different, in which the final consumers pay intermediary associations who return the largest share of the financial income to the producers.

4.4. Conditions

Apart from the statutory terms and conditions imposed on conservancies through the decision granting approval and related to the common governance and operational rules for such structures, the activities at issue come under the general regulatory framework (*e.g.:* hunting quotas, the obligation to provide reports on the animals hunted, permits to build and practice, *etc.*), without any specific dispensations.

Decisions to draw up a contract and with regard to the contract's contents are taken by the community on the basis of a consensus, for the most part within the conservancy bodies, at statutory assemblies and in agreement with the civil and traditional authorities.

On the whole, the terms and conditions for the use of the services in question are accompanied by a particularly sophisticated monitoring mechanism, involving regular follow-ups and an end to the trends recorded for the main animal species concerned, as well as the collateral consequences of these trends on goods and persons. Compensation measures for damage caused to the wildlife are taken by the conservancies, whereas the government also takes recourse to a national fund formed on the basis of the income from the sale of ivory and meat in particular, depending on the permit granted by the CITES and from extraordinary animal deaths (*e.g.:* traffic accidents, human conflicts) to compensate for the general damages caused for the entire national territory.

[54] The devil's claw or *harpagophytum* has long been used to treat a large number of diseases such as arthritis, rheumatism, etc.; the main production comes from Namibia. This activity is based on a specific system in which producers sell the plant directly to a single buyer – an intermediary – who then exports the products for their final processing and trade. The market conditions are currently unsatisfactory and are based on a monopoly that provides barely any guarantees to local producers.

5. Analysis

5.1. Context of the initiative

The community-based approach adopted is based on a national regulatory mechanism and inspired by strong political will on the part of the government. This is in itself an extremely original initiative, linking a top/down approach to a bottom/up mechanism, both conditioned by compliance with certain obligations that are monitored at all levels (national and community levels).

The decentralization of the usage rights upon which community activities are based, as defined by law, within structures established especially for this purpose, is relatively innovative. It has proved effective after over fifteen years of implementation, although over the years, it has seemingly failed to fully satisfy the actors in practice, especially individual actors, since it favors a community approach. In fact, individuals increasingly seem to be demanding financial returns, especially with the significant increase in man/wildlife conflicts over the period considered.

5.2. Objectives

The objectives essentially involve the use of big game related supply services and a series of amenities enabling the development of tourism activities.

Although directed mainly at wildlife resources, the program indirectly helps attract attention to the promotion of other resources as well, particularly flowering plants, leading to economic wealth and improved social well-being. In addition, work has been undertaken for a greater upcoming promotion of floral resources, associated with supply services[55].

The growing place of women in this mechanism and their key role in conservancy governance and operation deserves special mention. Whereas the objective of natural resource management in general, as promoted by the program, and the legal framework in which it is included, is only partially achieved, it is permissible to think that the mechanism will grow in future towards a greater integration of activities and, therefore, a better promotion of ecological services, including regulation.

It can already be seen that some of the regulations are integrated indirectly by the ongoing program, such as fire management, with the aim of improving the natural habitat of big game.

[55] Eg.: ICEMA project funded by FGEF for an amount of EUR 1.4 M and allocated to the restoration and management of animal and plant biodiversity for the benefit of local communities.

5.3. Identification

The program is based on the assessment of the shrinking of big game numbers as a consequence of poaching by the communities. This assessment, made by all the actors (the State, NGOs, donors and community members themselves), has led to the selection of a limited number of potential areas of development oriented towards the use and hunting of wildlife resources deemed to be the most directly usable.

The experience of other African or South African countries may have inspired all the actors desirous of developing a model that makes the most of the country's natural assets, including the physical environment, which is still of good quality and not much degraded, offering a favorable carrying capacity for African big game.

5.4. How did the need to pay come to the fore?

The need to make a payment emerges from the terms and conditions laid down, on a case by case basis, by a contract, which provides a framework for the activities concerned (trophy hunting, tourism) or for the sale of products that may result from it (artisanal products, devil's claws).

It is only fairly recently that the realization has dawned that such trading takes place within the framework of the development of ecological services. This can be explained by the fact that although it was initiated in the 1990s at a time when the concept of ecological services had not been theorized as such[56], the program was inspired by a simple desire to economically develop the country's natural resources, while paying the price for actions aimed at rehabilitating animal species, which was still technically possible given the habitat's ecological quality.

From this angle, for the program's initiators, big game emerged as an element to be leveraged as a priority, although the idea of developing such services had not yet really come up; what was expressed was merely the desire to market some of the country's natural assets.

[56] Emerging at the end of the 1990s (*e.g.:* Daily, 10997 – Nature's Services: Societal Dependence on Natural Ecosystems, Island Press, Washington DC), it was mainly since 2005 that the concept was politically (MEA, 2005 – Ecosystem and Human Well-Being: Synthesis, Island Press, Washington DC) and technically affirmed (*e.g.:* Grieg-Gran, M. and J. Bishop, 2004 – How can Markets for Ecosystem Services Benefit the Poor? in D. Roe editor. The Millennium Development Goals and Conservation: Managing Nature's Wealth for Society's Health, IIED, London).

The concern to place conservancies within the framework of the ecological services preservation issue grew and was included in local and internal reflections by the program's facilitators[57].

The thinking on this issue is continuing at present, within the framework of ongoing work aimed at improving the sustainability of the results achieved:

- Technical sustainability, towards the consolidation of ecological achievements and the reinforcement of promising local structures, conservancies and forest communities; besides, the merger of these two types of structures is the subject of reflection[58]; efforts to streamline their governance and operations have already been successful in several cases.
- Financial sustainability, for these structures' autonomy over time, which, however, does not exclude the maintenance of a permanent support platform.

5.5. Obstacles

The current mechanism does, however, present a certain number of weaknesses and limitations, of which local actors are perfectly aware, for the most part. These are:

- Institutional: placed under the MET's authority, the program is not really a government program. The absence of ministerial transversalities reduces its scope and limits its extension. How can ecological services be managed sustainably when the natural elements upon which they are based – biodiversity, water, forest, rural areas, etc. – are distributed between several ministerial departments? Furthermore, the conservancies' human capacity is still inadequate for conducting and upholding the activities autonomously and for developing them further.
- Technical: biodiversity management – that of big game in particular – calls for a regional vision leading to the strengthening of international cooperation in this part of Africa, so as to move closer to ecological realities.
- Financial: Namibia's entire rural territory cannot be given over to hosting hunting and tourism activities; founding a local economy based on these activities in the best-off geographical areas has already highlighted a certain number of limitations, leading to the expansion of the conservancies' material field of intervention. *A fortiori,*

[57] Naidoo, R *et al,* 2010, Namibia's Community-Based Natural Resource Management Program: Payment for Ecosystem Services Scheme in Disguise?

[58] Sprung, R., 2008, Proposal for a Community Forestry Constitution for the Conservancies, Namibia Nature Foundation, August 2008.

it is important to broaden local development vision to include other sectors of activities based on ecological services, out of the concern to optimize the use of these services and to distribute the social and economic risks inherent in these activities.

Pernicious effects were mentioned previously, which for the most part are: an increase in man/wildlife conflicts, the creation of distortions between beneficiaries of financial income and those that have to bear the burden of an increase in the wildlife, the individual interests vs. collective interests' debate, and the formation of monopolistic and imbalanced markets.

However, these effects do not have to weigh heavily on the encouraging results obtained to date by the program. They do, on the other hand, inspire thinking on the possibility of replicating such a model and its necessary development, including in Namibia's national context, 87% of whose territory and 75% of whose population are not concerned.

It is therefore only with a broader vision of the mechanism – based on a more universal approach to the conservation of natural resources – that it may be possible and necessary to move towards a sustainable development model for the entire country.

5.6. Nature of actors paid for the provision of services, and of beneficiaries

The preceding developments have demonstrated the wide variety of actors involved. Among them, local communities, at the conservancies' initiative, emerge as producers of ecosystem services, paid for the provision of such services, alongside craftspersons and small producers who also benefit from the dynamics initiated.

For all that, intermediary economic operators – conservancy partners – also draw an indirect financial income from these services.

5.7. Contractual relationship mode and the foundations of trust

Overall, the system is based on a contractual approach in which the modalities for commercial trading and the rights and obligations of the various parties are clearly defined and controlled.

The system is reinforced by the administrative control mechanisms put in place, imposed by regulations established by the authorities.

5.8. Payment terms

Payments are made in cash (NAD) and their amount is settled during a negotiation process leading to a contract; references to market prices make it possible to align the contractual amounts with the economic context. In most cases, annual updating formulas are provided for in the contracts, for adjusting these amounts according to developments in the context.

In the case of secondary activities and products, these payments are determined on the basis of the market in which the sellers freely set their products' price. This formula may not be fully satisfactory if a market is not well organized, or may even be particularly imperfect in some cases (*e.g.:* devil's claws).

5.9. Conditionalities

The contract secures the mechanism, within the limits of its proper application, controlled by the conservancies themselves, which is subject to sovereign appraisals by the courts in the event of a dispute.

Monitoring the assets used and reports on the conditions of use of the quotas imposed by the authorities make it possible to assess the users' compliance with their commitments, as well as whether the rules for the use of resources are appropriate for the ecological context and its capacities.

In the present case, changes in big game numbers have revealed highly favorable trends that may be credited, for the most part, to the program's implementation.

5.10. Scale

The program is currently applicable to less than 20% of the territory and covers a quarter of the rural population, which is already an excellent outcome. The result should, however, be secured through a better integration of activities in all public policies concerning the rural milieu and by being placed at government level.

Partially based on ecological services, which can only be balanced at the regional level of the corresponding biomes, international coordination is imperative. The latter, currently based on a few bilateral and local connections for the most part, deserves to be upscaled so as to deal with the problems raised at the level where natural processes and ecological adjustments take place. International technical cooperation in particular – more formal and ambitious – would be appropriate.

One of the mechanism's strengths is unquestionably the mid/long-term duration of the project. The resilience of the resources targeted by the activities calls for such a time scale, and the donors' intelligence in this regard must be acknowledged for they have understood this constraint and provided their enduring support for the long run. Hopefully, this support will continue, thereby enabling the program to develop fully and contribute towards the institutional, technical and financial sustainability of the whole.

5.11. The mechanism's organization

The mechanism's operational organization diagram ensures the participation of the main actors interested or involved in the preservation of the concerned ecological services. However, the government does not have a holistic vision of the mechanism, which would have made it possible to integrate the various issues (forest management, water management, agriculture and land development, in particular) without which it is difficult to establish overall coherence. These limitations clearly appear today in the complementarities to be sought between conservancies and forest communities, and man/wildlife conflicts, among other examples.

5.12. Transaction costs

After over fifteen years of implementation, the mechanism has not achieved a balance, including the financial balance; for all that, all the benefits, including social benefits, which it has made possible are not accounted for and cannot easily be calculated in monetary terms.

The program's financial income has risen regularly during the years of its application, as well as the relative share of the conservancies' own funds.

In addition, 2007 marked a major step in the slow maturing process, when, for the first time, donors' contributions were lower than the financial income the conservancies earned from the project.

These are very positive signs.

In 2008, the total amount of the conservancies' receipts was NAD 32 M, for a total cost of NAD 41 M; of the 53 conservancies established at the end of 2008 – 59 have received approval as of now – 34 have therefore been able to fully cover their operating expenses and 11 have been able to cover at least half.

Although the mechanism has not yet become fully autonomous, the trends observed make us hopeful that the financial sustainability of such activities is not illusory, for such a result would also partly depend on the development of the conservancy network and the ability of the new structures to generate their own funds.

Case Study No. 4
Lombok, Indonesia

This study, conducted and written by Romain Pirard (IDDRI), is partly based on the article: Pirard, R., 2010, "Payments for Environmental Services (PES) in the Public Policy Landscape: "Mandatory" Spices in the Indonesian Recipe", Forest Policy and Economics, extract from a special issue on global governance (under print)

1. Case history

The case is located in Lombok Island, covering an area of 5,435 sq. km. and part of the Indonesian province of Nusa Tenggara Barat to the east of the archipelago. The forests, located on and near the Rinjani volcano – a key element of the landscape, are considered crucial for regulating the water table in the northern part of the island as well as for limiting erosion on the volcano's slopes. In fact, the volcano area plays has a key role in the water supply upstream of the capital Mataram, and it is estimated that about 600,000 persons depend on this supply. The degradation of water flows, as well as the state of the forests, have been observed since over a decade, as illustrated by the following figures: 43% of springs around the volcano have dried up and about 30% of the woodland on its slopes have disappeared over the 1992-2002 period.

A workshop was organized in 2001 in response to this alarming assessment, within the framework of the NRM project funded by the American aid agency, USAID. The workshop led to an economic assessment of the catchment area a year later.

Very high figures were calculated, showing that the economic importance of the catchment and volcano zone, which prompted the establishment of three working groups involving several stakeholders, such as the district authorities, Rinjani National Park, water users subscribing to the local distribution company, private bottling companies and NGOs. These working groups successively dealt with: *(i)* the requisite legal framework for better environmental management at the district and province levels, and *(ii)* the possibility of setting up a PES system. In the end, it was decided in 2003 that a PES scheme would be set up. A biophysical study was then conducted so as to gather together all the necessary information for the formulation of a PES scheme that would ensure the maintenance of water-related services in an

optimum manner (for example, the largest plots of land to be reforested so as to impact water flow).

Negotiations for setting up the mechanism took place between 2004 and 2007, with the establishment of a formula that was initially developed on a voluntary basis, but was intended to become compulsory in terms of fundraising. In fact, whereas some of Mataram city's residents agreed at the time to participate in a pilot project during which their monthly contributions were purely voluntary, the district authorities finally decided to change the situation and adopted a regulation making payments from all water users widely applicable. The financial aspects of the negotiations – particularly in terms of who pays whom – as well as the formulation of laws and decrees were settled between 2007 and 2010. At the time of writing this paper, the implementation process was underway. However, preceding decrees had already made it possible to determine that 75% of the money raised would be allocated for payments through PES type of contracts, whereas the remaining 25% would be allocated to the district's budget for overheads.

The process was therefore remarkably long – about 10 years – but in return, it made it possible to conclude a full-fledged agreement with the potential to generate adequate financial resources and to give an impetus to sustainable and satisfactory environmental management in the Rinjani area. The agreement led to the establishment of a multi-party institution (IMP) responsible for financial resource management and for concluding agreements with water users. The institution was a pre-requisite demanded by most stakeholders, particularly Mataram's residents as the main payers, in order to avoid a situation in which local or provincial authorities alone would be responsible for fund management. In a country as corrupt as Indonesia, with heavy liabilities in terms of State fund management, it was hardly surprising that Mataram's residents showed limited confidence in the subsequent management of their contributions by the State or local authorities. Consequently, the IMP was established, involving WWF, the forest agency, a private bottling plant, the district authorities and Rinjani National Park. The process produced regulations at the district level that *(i)* indicated quite explicitly that the maintenance of ecosystem services had to be funded by the beneficiaries (thereby formally acknowledging the main paying beneficiaries), *(ii)* established the IMP with its associated responsibilities, *(iii)* fixed the amount of payments by the various beneficiary categories (families as water users, bottling companies, water distribution companies, ecotourists), and *(iv)* determined the share of funds that would be allocated to overheads (through the local budget) and to conservation measures.

The process of raising funds began at the end of 2009, and the amounts raised until now were remarkably close to the IMP's projections. But in terms of payments to service providers – *i.e.* landowners and upstream farmers – things took longer, and no PES contract has yet been signed in the target zone. For several years, pilot activities were conducted in order to restore degraded land, thanks to the financial support provided by development agencies and/or the Indonesian government through its various programs. But no contract has yet been finalized on the basis of new funding, mainly due to a shortage of capacity and of the human resources assigned for negotiations and the formalization of contracts (as per the interviews conducted on site). It is therefore not really a question of the lack of motivation or desire on the part of the service providers – the rural populations, in this case.

2. Contracts (on the basis of contracts being finalized)

Introduction

The originality of the mechanism is that it dissociates fund raising – which is the subject of regulations that apply to all the concerned city's residents – and the distribution of funds through voluntary contracts signed with landowners and farmers. The first contract being finalized will be signed by the district forest agency (on behalf of the IMP in charge of financial management) and a group of farmers, to reforest 5 hectares. It must be noted that until now, more efforts have been devoted to fundraising aspects than to the expenditure side.

Perimeter

The plots in which reforestation activities will be undertaken have been identified and selected in accordance with how important they are for the provision of the service (based on a biophysical study), as well as the inhabitants' ability to form themselves into groups to sign the contract and ensure its fulfillment.

Payment

The IMP will pay family groups the total sum of Rupees (IDR) 50 M (about EUR 4,000) for 5 ha, with an initial payment of 60% and the remaining 40% when the first part of the work is completed (soil preparation and plantation). The amount corresponds to the cost of the work, including labor, but does not include profits. The reason is that the families can later make use of these plantations, mainly in the form of agro-forestry.

Conditions

(i) Villagers must carry out the tasks in compliance with the work plan previously agreed upon, so as to avail of the two payment installments.

(ii) Plantations must survive, which would mean that the efforts made for their maintenance were correctly conducted. Otherwise, the villagers have to pay back part of the payments.

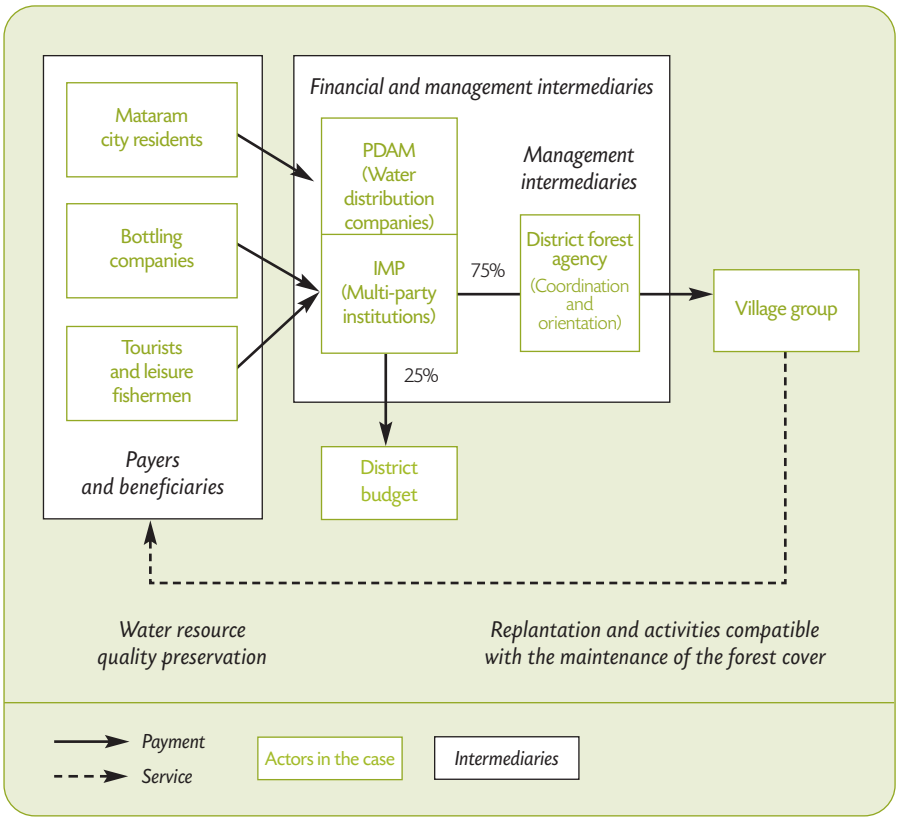
(iii) Trees should not have been cut, except in extraordinary circumstances and with the agreement of the IMP, otherwise a part of the payment has to be returned.

Other

Villagers have to form themselves into groups. The surface areas concerned remain very small and it has been observed that the mechanism only functions when there is a real convergence between the objective of supplying ecosystem services on the one hand, and on the other, the villagers' ability to benefit from soil restoration activities for their own livelihood. That is why reforestation based on ligneous species, useful for fruit production and other consumable products, is favored and is even a necessary pre-requisite for the villagers' involvement.

3. Operational Diagram

Diagram 6 *Lombok PES functioning diagram*



Source: Author .

4. Analysis

4.1. Context of initiative

The project has been carried out with initial funding from the American aid agency, USAID, and subsequent funding from various international organizations and foundations.

The project was initially conducted in response to the observation of significant environmental problems.

It may be noted that the project as such aimed at establishing a legal and institutional framework, rather than the formulation and funding of a PES type of contract.

In other words, the funding and the project itself were aimed at creating all the necessary conditions to multiply the number of PES contracts and ensure their sustainable funding.

The service beneficiaries were constrained to pay and there is no indication that they had a good understanding of the environmental problem and its remedies. However, efforts were clearly made to promote awareness among them.

4.2. Objectives

The sole purpose of the mechanism instituted is to ensure the maintenance, or even the improvement, of hydric regulation in the catchment area. That is why water users are the payers and upstream villagers the sellers.

4.3. Identification

The site was identified thanks to the donor's efforts to find cases where the PES principle could be applied. Economic and biophysical studies were then conducted (following the initial observation), so as to refine the knowledge and understanding of the problem, for optimal implementation.

4.4. How did the need to pay come to the fore?

An economic assessment was conducted to illustrate the importance of the catchment area and a biophysical study was then conducted to refine the intervention, particularly to identify the sites in which soil restoration activities were the most important. In that sense, the process was conducted on a rather strong basis, to the extent of convincing one section of the beneficiaries (the residents of the city downstream of the volcano) to willingly pay, at least initially ("willingness to pay" was incorporated in the economic assessment).

4.5. Obstacles

The case presented seems promising from the institutional point of view and for the sustainability of funding, but remains in an embryonic stage in terms of the

PES contracts concluded with upstream villagers. The gestation time was long – about 10 years – but seems justified in the light of the mechanism's apparent soundness. However, the future will tell us whether the administrators were able to ensure widespread participation by the service providers, or whether the resources raised were assigned to the budget of the local forest agencies or even captured by the various stakeholders that were part of the IMP, responsible for regulating the whole system.

4.6. Nature of actors paid for the provision of services, and of beneficiaries

The actors who are paid are villagers who own or control the land on the Rinjani volcano's slopes. These villagers have to form into groups in order to be eligible for the contracts.

The beneficiaries are Mataram city's residents, as well as the water supply company and local bottling companies. It may be considered, to a certain extent, that travel agencies and local guides also benefit from the mechanism, because tourism is fairly well developed around the volcano. Tourists are expected to contribute through an entry fee to the mechanism's funding.

4.7. Contractual relationship mode and the foundations of trust

A regulation provides for and organizes the payments made by the water supply company's consumers in Mataram city. The payments are monthly and are additional to the water charges themselves. Making them permanent or even raising them over time has been envisaged.

The first PES contracts with the villagers are being finalized and shall be signed between the agency in charge of supervising the soil restoration activities (district forest agency) and the villagers' groups.

4.8. Payment terms

Payments are made by bank transfer to the accounts of the villagers' groups participating in the contracts. The payment amount stands at IDR 50 M for 5 ha restored, for instance. Furthermore, the district forest agency supervises the work and may provide technical assistance in case required. The species planted are selected by mutual agreement and must combine fruit trees or those producing other non-ligneous forest products along with trees potentially intended for ligneous use.

Payments are decided in accordance with the soil restoration costs (including products and labor), without any specific benefits given on account of the service provided, because the villagers can make profits from their new plantations, whose cost is therefore covered by the PES system.

4.9. Conditionalities

Conditionalities do not seem to be a priority and the contractual relationship works on the basis of trust, on the one hand, and on the other, that of common interest in conserving the land in a state that would make it possible to maintain the environmental service. Therefore, the payments are made in two installments and in principle, the second is made quite soon after the plantation work is done. It is sometimes stipulated (but it may be recalled that the contracts are still being finalized) that the money must be reimbursed in case of non-compliance with the objective of keeping the plantation as it is (apart from the occasional cutting of trees based on mutual agreement). The risk is apparently limited because the villagers have an interest in preserving the forest cover for at least two reasons: on the one hand, agro-forestry practices are competitive from an economic point of view; and on the other, in many cases, maintaining the forest cover enables the villagers to secure their ownership rights over the resource [59].

4.10. Scale

The fund raising part seems to be operational, and at an adequate scale – at least initially, so as to give an impetus to real practice-related changes in soil usage.

With regard to the part pertaining to financial support for changes in practices through contracts with villagers, it was clearly insufficient at the time of writing this paper, because the contracts were being finalized and only concerned a tiny part of the land to be restored. In that sense, a change in scale is therefore absolutely necessary and is envisaged with optimism by its promoters, particularly in view of converging interests between the payers and those selling the service.

[59] For more details on this important point, refer to Pirard's article (2010) from where this case study has been extracted.

4.11. The mechanism's organization

The initial and transaction costs were covered by various international projects, particularly with the involvement of a project funded by USAID.

Subsequently, the resources raised from water users on the basis of the establishment of a regulation in this regard, made it possible to cover operating and transaction costs (25% of the money is assigned to the provincial budget to cover operations) in a sustainable manner.

Consequently, it may be considered that government authorities organized and steered the whole process and use the new resources available to fund a section of their own objectives through the local forest agency.

4.12. Transaction Costs

At the time of writing this paper, the author had no precise or reliable information on the transaction cost amounts. But they are normally covered by 25% of the money raised and assigned to the provincial budget, to ensure the system's operation.

Case Study No. 5
The Catskills – Upper Delaware: PES scheme with New York City

Bernard Barraqué, Laure Isnard, AgroParisTech

1. Case history

New Yorkers enjoy access to good quality drinking water, coming mostly from the upper Delaware and Hudson River basins (the Catskills), far upstream of the city. The water does not require any filtration before being distributed by the Department of Environmental Protection (DEP), responsible for water services, as well as for effluent collection and wastewater treatment for the entire city of New York. Maintaining the quality of this water resource is a major challenge for public health reasons, but not only for these reasons: as long as the water from Delaware and the Catskills can do without any filtration to meet the standards set by the US Surface Water Treatment Rule (SWTR), the DEP will not have to invest in a costly filtration plant, whose construction cost is estimated at over USD 6 Billion, with annual operating costs between USD 150 and 300 M.

For this purpose, the DEP has developed a whole range of programs in the last fifteen years or so to protect the quality of the water resource, based particularly on the purchase of several plots of land located in the zone and the implementation of certain activities by the farmers and foresters present in the perimeter. The DEP's experience – frequently cited as an example in PES studies – sheds an interesting light on the rationale and practical modalities underlying the implementation of management policies of this kind. To better understand it, the discussion first needs to be contextualized. In the United States, the fairly harsh use of the land conquered from the Indians led to several known ecological disasters, such as the dust bowl. Since the early 20th century, going far beyond nature protection by establishing national parks, several administrations conducted a conservation policy, in the sense of a rational development of natural resources. But water was not the most important resource and the priorities were soil erosion and the loss of biodiversity.

The roots of the Conservation Reserve Program (CRP) go back to the 1950s, with the establishment of a conservation branch within the soil bank program. But it gained in importance at the end of the 1970s, following the unprecedented intensification

of farm production. It was the 1985 Farm Bill that truly initiated a soil protection policy by offering farmers aid to the tune of 50% of soil protection costs for a 10-15 year period, whereas until then, contracts had been limited to 3 years. The CRP budget also made it possible to potentially increase the protected land from 2 to 16 million ha per year. And in 2005, USD 1.6 Billion covered activities over 14 million ha.

The relationship with water production by the Upper Catskills/Delaware basins lies in the fact that it was first the limitation of anthropized runoff in New York City's reservoirs that were targeted. But it was since the early 20th century that the State of New York authorized the city to control soil usage. However, in the face of the environment administration's urgent demand to filter water or ensure its better protection in the early 1990s, the City Council sought to reinforce restrictive measures, which generated a heated debate among its local population: how could such a rich city, over 200 km away, regiment this region's economic life?

New York City's drinking water supply system provides water to almost half New York State's population – *i.e.* 8 million New York inhabitants and a million people living in the counties upstream of the city – as well as millions of workers and tourists transiting daily through the city. The Catskills/Delaware system is one of the largest unfiltered drinking water supply sources in the world. The Catskills/Delaware groundwater recharge catchment area covers a surface area of 5,100 sq. km., more than 240 km away to the north of New York City. As for the oldest catchment area – the Croton Reservoir – which produces about 10% of the drinking water distributed by the DEP and had gradually been surpassed by the urbanization of New York City's peripheries, it would be equipped with a filtration water plant as of 2012.

Water is transported to the city through a network of 19 reservoirs and 3 highly controlled lakes, which account for a total retention capacity of about 2 billion cu. m. of water. The system depends on the level of rainfall (rainfall and thawing snow) and the runoff trickling into each of the three reservoirs – Delaware, Catskills and Croton. The streaming water joining the watercourses is stored in the reservoirs, before being transported by aqueduct to the Kensico and New Croton Reservoirs (located downstream of the Croton system), then distribution by urban drinking water supply systems. By filling up the water reservoirs, rainfall and surface runoff influence the quantity of pollutants and the level of turbidity in the reservoirs directly, as well as water residing time in the lakes and, therefore, on water quality.

Water quality monitoring is, therefore, an essential task for DEP. In 2008, almost 70,000 chemical, physical and microbiologist tests were conducted on 6,660 samples from 53 key locations along the aqueducts.

2. The agreement

In 1993, given the high quality of water distributed by the DEP, the Environmental Protection Agency (EPA) granted a first Filtration Avoidance Determination (FAD) to New York City. This agreement contained 150 conditions pertaining to the protection of water recharge catchment areas, the monitoring of water quality and the funding of studies. But faced with the DEP's difficulties in fulfilling these conditions, getting a permit for purchasing land and modernizing the treatment plants located outside the New York City's limits, the EPA refused to renew the agreement for the Catskills and Delaware systems in 1996.

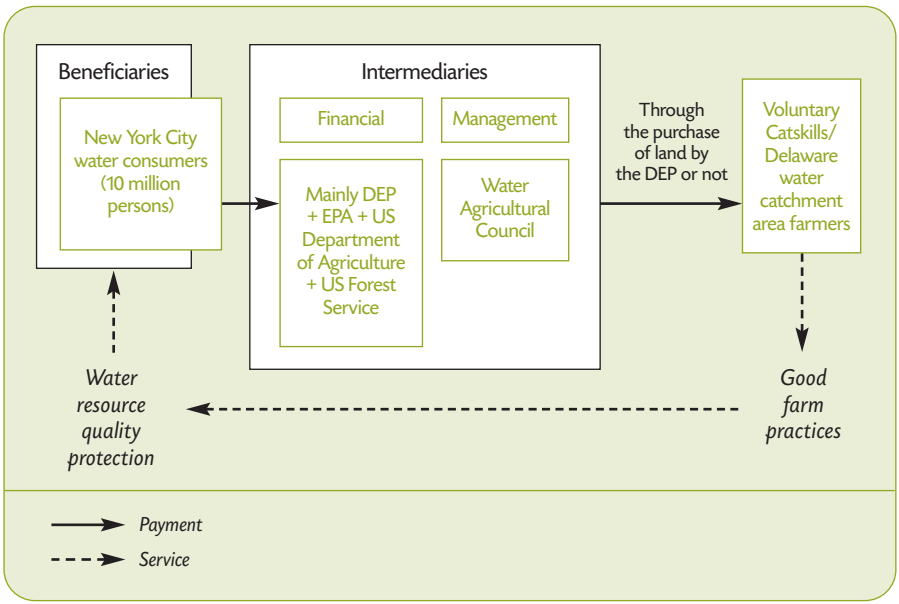
In 1997, after several months of negotiation between the stakeholders (New York City, New York State, EPA, etc.), a new agreement (Memorandum of Agreement, MOA) was signed, enabling the city to conduct a complete water recharge catchment area protection program. Thanks to this agreement, the New York State Department of Environmental Conservation granted, in particular, a real estate purchase permit to the DEP, applicable within the perimeter of the water recharge catchment areas. In May 1997, the EPA issued a new FAD for a 5-year period and set its conditions: New York City must repurchase land in the water recharge catchment areas that was sensitive from an environmental point of view, adopt a strict control and monitoring system and sustainably implement its catchment protection program. The adoption of the MOA stipulated an envelope of USD 1.5 Billion, to be used over 10 years, in order to finance a water resource quality protection policy.

In 2002, the EPA renewed the FAD for the Catskills and Delaware catchment perimeters, also for a 5-year duration. The EPA then insisted on the importance of undertaking long-term water catchment area protection programs and took the support of the other actors present in the territory, such as the Watershed Agricultural Council (WAC), in order to ensure the acceptance of these programs. One of the 2002 FAD's conditions also consisted of expanding the farm program to include small farms within the Catskills and Delaware perimeter, as well as farms located to the east of the Hudson (Croton network).

In 2007, deeming the water catchment area protection program implemented in New York City as pertinent, the EPA issued another FAD for the Catskills and Delaware, which is still in force today.

3. Operational Diagram

Diagram 7 *Operational diagram of the New York PES (Catskills)*



Source: Author.

4. Analysis

4.1. The environmental issue concerned

The issue is the quality of water resources for New York City's 8 million inhabitants, threatened by the EPA's demand to filter the water. An Upper Delaware and Hudson catchment area land monitoring program had to imperatively be adopted and developed. The success of the initial measures led the EPA to extend its FAD agreement until today.

The main problems were the contamination of water collected in the storage reservoirs upstream – as well as in the Croton intermediary reservoirs (older and nearer the city) – by runoff, stemming partially from forest exploitation and partly from farming, and partly also from urban discharge and that of other activities (industry, leisure). The main pollutants identified were phosphates, pesticides and turbidity.

Furthermore, the catchment area's desertification would have implied the recolonization of land in the basins and around storage reservoirs by wildlife, particularly avian fauna, which could have led to the contamination of water by pathogens (*cryptosporidium* and *giardia* being the best known). Therefore, the idea was for New York City's Department of Environmental Protection to control emissions of the pollutants identified, while maintaining adequate farm, tourism and leisure activities in the basins. There was no plan to "sanctuarize" the catchment area.

4.2. Qualitative criterion sought and assessment indicator

All the actions taken by the DEP to protect the Catskills/Delaware water resources had one specific aim – that of not having to build another filtration plant and thereby to avoid the investment and operating costs for such a plant. For this purpose, the drinking water criteria set by the EPA, within the SWTR, had to be respected. The latter imposed severe standards with regard to turbidity, coliforms, disinfectant residues (trihalomethanes), etc. But for there to be no need for filtration of water meant for consumption, the catchment area from where the water came also had to be covered by a monitoring program that minimized risks of contamination of microbial origin, taking into account the catchment area's hydrological characteristics and land use within this perimeter, and identifying all the activities – natural or artificial – that may have an impact on the quality of water (US EPA).

In 1997, for the FAD to be approved, the EPA imposed an expenditure of at least USD 201 M on New York City, to acquire at least 32,300 ha (80,000 acres) of land located in the catchment areas. This accounted for about 7% of the total surface area of these basins and led to more than the doubling of New York City's land assets. It must be noted that at the time, the State of New York owned 23% of the catchment area. Even if the quantity of land to be acquired was considerable, in the end, it only represented a small portion of the catchment area. Consequently, the DEP had to concentrate its efforts on purchasing the land that was the most sensitive in terms of its future development or any other alteration. That is how New York City initiated its Land Acquisition Program (LAP) in 1997.

4.3. Objective

New York City based its Catskills/Delaware and Croton water recharge catchment area management policy on the close relationship between the activities conducted in catchment areas and the quality of water resources. The DEP programs of action

also laid emphasis on the deployment of anti-pollution initiatives – preventive and curative, as well as general and targeted – when the origin of pollution had been clearly identified. Among the tools developed by the DEP, land acquisition (imposed by the EPA) and the signing of contracts with farmers play a vital role.

The purpose of the land acquisition program was to prevent any future water quality degradation through the purchase of plots identified as sensitive from an environmental point of view. The DEP could therefore ensure the maintenance and protection of undeveloped land in the water recharge catchment areas. Between 1997 – the LAP's launch date – and 2008, New York City "secured" over 36,800 ha in the Catskills/Delaware catchment areas (in 1996, the city only owned 14,410 ha land). In all, 13.5% of Catskills/Delaware basin's surface area was therefore controlled by the City, as against only 3.5% in 1996. In 2009 alone, 115 purchase contracts were signed for total surface area of 4,576 ha and a budget of USD 50 M (i.e. 11,000 USD/ha on an average).

Once the DEP became the owner of all this land, it became responsible for its use and management (Land Management Program). The DEP identified four main objectives that the management program had to meet:

- Controlling and coordinating land use in order to meet various objectives, such as drinking water supply infrastructure management, maintenance of soil and forest quality, watercourse protection and provision of benefits to the local populations (*e.g.* authorization for the recreational use of these areas).
- Developing the IMG (Integrated Management System) and make it a decision-aid tool to make management more effective, thereby avoiding filtration.
- Implementing a clearly oriented process to make better use of wooded land for water quality and public health protection.
- Continuing to control (and diversify) the catchment area protection easements imposed by the city, so as to guarantee quality water in the long term.

The controlled use of the land acquired by the DEP fell within the larger framework of the Watershed Agricultural Program (WAP), which sought to prevent pollution at the source and to improve water quality by limiting polluting waste in farms. Implemented by the Watershed Agricultural Council in 1992, the WAP created a partnership between the DEP and voluntary farmers, to establish pollution prevention plans (also called Whole Farm Plans). These plans aimed at identifying the best farming practices for water resource quality protection and disseminating them to farmers, without in any way comprising the farms' viability.

The 2007 FAD required the DEP to attain a 90% share in large farm holdings in the Whole Farms Plans by end September 2010 (EPA, 2007). The same decree imposed annual reports by the DEP on the establishment of the Watershed Agricultural Program and identified the actions to be undertaken the following year and the budget committed (number and type of best practices, cost estimation of these best practices, nutritive substance management plans to be implemented or revised, WFP to be revised, *etc.*). For 2010, the DEP had identified the following objectives:

- Implementing 109 Best Practices on large farm holdings at a cost of USD 2.7 M.
- Developing 75 Best Practices on small farms for USD 451,000.
- Establishing 49 Best Practices on the Croton system's farms for USD 622,000.
- Completing or updating nutritive substance management plans for 64 big and 24 small farms.
- Reviewing the Whole Farm Plans for 6 big priority farmholdings.

Generally speaking, several factors made the program implemented in New York City considerably complex, apart from the size itself of the catchment areas upon which it was developed. First of all, the land acquisition program and participation in the farm program were completely on a voluntary basis. Then, the local political landscape was complex: the communities located upstream of the reservoirs formed a group to oppose New York City's acquisition and control program, whereas the EPA and local environmental organizations were pushing the DEP to come up with stricter regulations and a more aggressive land acquisition policy. In particular, residents in these communities feared sanctions against certain practices by New York City or that the DEP actions could undermine the economic and social dynamism of the communities located in the catchment areas. Therefore, the DEP had to deal with pressure from all sides while trying to implement an effective land acquisition program that clearly targeted the objectives of protecting the water resources.

4.4. Final payers (economic agents on whom the payments rely, as distinct from the operators through whom the payments are made)

The DEP does not receive any subsidies for conducting its own program of action for water resource protection. It is therefore New York City's water service users who pay the most for the environmental service.

However, it is the DEP and, therefore, New York City's water users that finance 91% of the Water Agricultural Council, which manages most of the partnerships between the DEP and farmers for the development of best farming practices. The rest of the Council's funding comes from the EPA, the US Department of Agriculture and, finally, the US Forest Service.

4.5. Number of final payers

The drinking water supply network managed by the DEP provides water to 8 million New York inhabitants and about 1 million residents of counties located upstream of the city. Pendular migrants who come to work in New York and tourists who transit through the city are also final payers of these services, albeit indirectly. In all, almost half of New York State depends – at least during working hours – on the water distributed by the DEP, *i.e.* almost 10 million inhabitants.

4.6. Beneficiaries

The DEP-managed PES program's beneficiaries are also New York City's 10 million water service users. By funding this water resource protection policy, the water service users have access to water whose quality is naturally guaranteed. Furthermore, they avoid having to bear the cost of building and operating an additional drinking water treatment plan and, therefore, benefit from a not so high water bill – especially in the long term.

In addition and more indirectly, the entire operation benefits those who enjoy the quality of the water resources and the amenities offered by the catchment areas: trekkers, kayakers, hunters, fishermen, campers, residents, *etc.*

List of acronyms and abbreviations

AFD	Agence Française de Développement
CAP	Common Agricultural Policy
CAZ	Ankeniheny-Zahamena Corridor (Madagascar)
CBNRM	Community-Based Natural Resource Management
CEPF	Critical Ecosystem Partnership Fund
CFA	Conservation Finance Alliance
COFAV	Fandriana-Vondrozo Corridor (Madagascar)
CONAFOR	Comisión Nacional Forestal (National Forest Commission)
CRP	Conservation Reserve Program
CVC	Cauca Valley Corporation
DC	Developing Countries
DEP	Department of Environmental Protection
DNRE	Department of Natural Resources and Environment (Australia)
EMAAP-Q	Quito Municipal Drinking Water and Sanitation Corporation
EPA	Environment Protection Agency
ES	Environmental Service
ESPH	Empresa de Servisios Públicos de Heredia (Heredia Public Service Company)
FAD	Filtration Avoidance Determination
FAO	United Nations Food and Agriculture Organisation
FGEF	French Global Environment Facility
FMCN	Mexican Nature Conservation Fund
FONAFIFO	Fondo Nacional de Financiamiento Forestal (National Forest Financing Fund), Costa Rica
FONAG	Water Protection Fund
FSC	Forest Stewardship Council
GEF	Global Environment Facility

GIS	Geographic Information Service
GRAF	Gonzalo Rio Arronte Foundation
IDCP	Integrated Development and Conservation Projects
IDDRI	Institut du développement durable et des relations internationales (Institute for Sustainable Development and International Relations)
IMP	Multi Party Institution
INBIO	Institut national de la biodiversité (National Biodiversity Institute), Costa Rica
INE	Institut national d'écologie (National Ecological Institute)
INRA	Institut national de la recherche agronomique (National Agronomical Research Institue)
IRD	Institut de recherche pour le développement (Development Research Insitute)
IUCN	International Union for the Conservation of Nature Livestock Unit
MOA	Memorandum of agreement
MSC	Marine Stewardship Council
NGO	Non-Government Organisation
PEFC	Programme for the Endorsement of Forest Certification
PES	Payment for Ecosystem Services
PSA	Pagos por Servicios Ambientales Hidrologicos (Payments for Hydrological Services)
RedLAC	Environmental Fund Network in Latin America and the Caribbean
SWTR	Surface Water Treatment Rule
TGAP	General Tax on Polluting Activities (French taxation)
UNEP	United Nations Environment Programme
USAID	United States Agency for International Development
USDA	United States Department of Agriculture
WAC	Watershed Agricultural Council
WAP	Watershed Agricultural Program
WCS	Wildlife Conservation Society
WWF	World Wildlife Fund

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Payments For Ecosystem Services

From Theory to Practice – What Are the Prospects for Developing Countries?

Today, the acronym PES (Payment for Ecosystem Services) has become an omnipresent concept in funding environmental projects, in scientific publications as well as in arenas where environmental and developmental policies are discussed. Companies, political circles, NGOs, donors, researchers – all use it and comment on it.

However, the concept only gives the appearance of being a specific and operational notion. On the contrary, it raises several questions: Where has this concept come from and why has it been so successful in discourses? How is this instrument placed in relation to all the environmental tools available? What PES examples have been implemented, what are their strengths and their weaknesses? To what extent could PES systems be applied widely as funding tools for environmental policies?

By responding to these questions, this publication offers readers an in-depth reflection on the PES concept and provides them with a fundamental key to better understanding and using this tool.

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