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**PAYMENT SCHEMES FOR WATER-RELATED ENVIRONMENTAL SERVICES:
A FINANCIAL MECHANISM FOR NATURAL RESOURCES MANAGEMENT
EXPERIENCES FROM LATIN AMERICA AND THE CARIBBEAN**

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Introduction

The concept of Payment for Environmental Services (PES) has received much attention in several Latin American countries over the last few years as an innovative tool to finance investments in sustainable land management. Payment schemes for environmental services (PES) are flexible compensation mechanisms by which service providers are compensated by service users. However, there are important challenges to be met, such as identification and quantification of the environmental service, performance monitoring, as well as the sustainability of the schemes. PES schemes in watersheds usually involve the implementation of financial mechanisms to compensate upstream landowners in order to maintain or modify a particular land use, which is assumed to affect the availability and/or quality of the downstream water resources. Providers and users of the service are located in the same watershed. Other PES schemes involve compensation of global environmental services such as biodiversity conservation and carbon sequestration; however, these do not form part of the present review.

The Food and Agriculture Organization of the United Nations (FAO) has promoted discussion and exchange of experiences on water-related PES schemes in Latin America, through the documentation of PES cases in the Land-Water-Linkages Case Study Series, the Regional Forum on Payment Schemes for Environmental Services at the Third Latin American Watershed Management Congress held in Arequipa, Peru in June 2003, as well as the Electronic Forum on Payment schemes for Water-related Environmental services, in May 2004.¹ These Fora were attended by professionals with experience in PES in watersheds throughout the region, representing governmental organizations, non-governmental organizations, universities, the private sector and international organizations. They identified general lessons learned regarding PES systems in watersheds as well as the advantages and limitations of these systems.

¹ All related documentation is available at www.fao.org/landandwater/watershed additional cases of PES are available from the case-data-base of the FAO/Netherlands Conference on Water for Food and Ecosystems: http://www.fao.org/ag/wfe2005/casedb_en.asp

The current article summarizes characteristics of water-related PES schemes in the region, as well as conclusions and lessons from the Fora for the establishment of water-related PES schemes.

Characteristics of water-related PES schemes in Latin America

In Latin America, numerous initiatives have been implementing water-related payment schemes for environmental services at very different scales and to attain various objectives; ranging from the micro-watershed level – addressing a very specific service – and usually managed by an NGO, to national programmes controlled by the State. In their exhaustive review of environmental markets, Landell-Mills and Porras (2002) identified 18 water-related PES schemes in Latin America – over the last three years, this number has at least doubled.

Generally, PES systems in watersheds have been restricted to one of the two following purposes: a) to improve the availability and quality of water for human consumption, mainly in urban areas, and b) to improve the availability and quality of water used in hydroelectric generation. Other potential users such as irrigations schemes have only played a limited role in PES schemes. The payment mechanisms, the system structure and the scale of application show a high degree of variability due to the heterogeneous characteristics, both institutional and geographical, of the Latin American region. The schemes can be divided as follows:

- Local initiatives with public participation supported by an international donor (examples: the Pimampiro Municipality and FONAG Quito Municipality, Ecuador, San José de Otoro, Honduras);
- Local initiatives with public participation, without external support (example: Heredia Municipality, Costa Rica);
- Self-organized private deals at the local level, without external participation (example: La Esperanza Hydropower Project, Costa Rica);
- Programmes at the national level (example: FONAFIFO, Costa Rica, Watershed Management Plans, Colombia);

Local initiatives are financed directly by the service users, such as the municipal water supplier or the hydroelectric company (eg. through an increase in the residents' water charges or part of the electricity sales). Schemes with external support are usually financed through an initial fund provided by the donor(s), which is replenished by contributions of the service users. Donor-financed schemes frequently face challenges in reaching financial sustainability. National PES programmes are frequently financed by cross-sectoral subsidies: in the case of Costa Rica, by a fuel tax, and in the case of Colombia, by taxes on hydropower production, and also may involve international contributions for environmental services other than water-related services². The current paper will focus on local PES schemes only, as in the case of national programmes, there is no direct relation between service providers and beneficiaries.

Identification and quantification of water-related environmental services

The basis of any water-related PES scheme is the assumption that a change or preservation of a specific land and water use in the upstream part of the watershed will be beneficial to downstream water users in terms of water availability or quality. These beneficial uses are thus defined as environmental services to downstream users. Which services downstream users may beneficially utilize, depend very much on the type of water use, the hydrological regime and geological features

² The FONAFIFO scheme in Costa Rica markets carbon sequestration and biodiversity conservation services in addition to water-related services to users abroad such as governments or private companies. The revenues from these agreements are pooled with the revenues from local agreements for water-related services from hydroelectric companies and bottled water producers as well as proceeds from the fuel tax to finance the scheme.

of the watershed, as well as climatic factors. Table 1 summarizes typical water related services in Latin America according to the types of use.

These services...	are typically required by these users.
Improvement or stabilization of annual water flow	Drinking water suppliers* Hydroelectric facilities with multi-annual storage Irrigation**
Improvement or stabilization of dry-season flows	Drinking water suppliers* Run-of river hydroelectric facilities Irrigation**
Low concentrations of suspended sediments	Drinking water suppliers* Hydroelectric facilities with multi-annual storage Run-of river hydroelectric facilities
Low concentrations of sediment bedload	Hydroelectric facilities with multi-annual storage Irrigation**
Low concentrations of fertilizer and pesticide residues	Drinking water suppliers*
Improvement of microbial quality	Drinking water suppliers*

* Includes producers of beverages

** Irrigation is a potential beneficiary of water-related environmental services, but in practice it plays a marginal role in PES schemes as financial contributors.

Generally, the availability of reliable hydrological or land use data in Latin America is limited, particularly in rural areas. As studies to confirm linkages between land use, hydrological regime and/or water quality are cost-intensive and time-consuming, PES schemes are normally based on assumptions about these linkages that have not been proven or may not apply to the local context where the scheme is executed. This applies particularly to linkages between forest cover and hydrological regime (see Box 1).

Box 1: Hydrological impacts of forests – conventional wisdom vs. reality

While watershed management interventions are widely assumed to have downstream effects, considerable controversy about the direction and magnitude of the land use impacts on water resources prevails, especially with regard to the role of forests. A recent review of generalizations based on conventional wisdom relating to forestry impacts yielded the following results:

Forests increase runoff?

Catchment experiments generally indicate reduced runoff from forested areas compared with areas under shorter vegetation. Exceptions to this finding are cloud forests, where cloud-water deposition may exceed interception losses, and very old forests.

Forests regulate flows – increase dry season flows?

Forestation will not necessarily increase dry season flows. Competing processes may result in either increased or reduced dry season flows. Effects on dry season flows are likely to be very site specific. Forests and natural vegetation are also large consumers of water through evapotranspiration which tends to significantly reduce or nullify the potential benefits when accounted for.

Forests reduce erosion?

Competing processes might result in either increased or reduced erosion from disturbed forests and forest plantations. Forest cover as such does not guarantee low rates of erosion – the forest quality, e.g. existence of surface litter, is an equally – if not more – important factor. While erosion control can also be effectively achieved through good agricultural practices as conservation agriculture.

Forests increase rainfall?

The overwhelming hydrological evidence supports that forests are not generators of rainfall. Although the effects of forests on rainfall are likely to be relatively small, they cannot be totally dismissed from a water resources perspective. Further research is required to determine the magnitude of the effect, particularly at the regional scale. Only cloud forests have a proven positive effect on capturing more water in the watershed.

Source: Ian Calder (2000): Land Use Impacts on Water Resources. Background paper for the FAO E-Workshop on Land-Water Linkages in Rural Watersheds.

<http://www.fao.org/landandwater/watershed/watershed/papers/paperbck/papbcken/calder.pdf>

See also Becky Hayward (2005) “From the mountain to the tap: how land use and water management can work for the rural poor” NR International

The land uses which receive compensation by the PES schemes mostly encompass forestry-related activities, and, to a lesser extent, agricultural lands. They typically include the following:

- Forest conservation
- Reforestation
- Conservation of natural grassland
- Soil and water conserving agricultural practices (for example, maintenance of permanent soil cover, mulching, no-burning)
- Reduction of water pollution (for example, treatment of coffee pulp residues, no grazing near watercourses)

Compensation mechanisms

For most PES schemes, there are no studies or data that enable one to quantify the water-related services of different type of land uses, and thus the compensation mechanisms are not based on a full economic valuation of those services.

Compensation for providers of services

In most schemes, service providers are compensated by payments for services on a per-hectare basis that vary by land use. The payment amounts are a function of the available funds under the scheme, the opportunity costs of the service providers and the assumed services of the type of land use. Typically, forest-related land uses and conservation activities receive higher payments than agricultural land uses. For example, in Pimampiro, Ecuador, a farmer receives 12 \$ / ha / year for the conservation of primary forest, however, this amount is lowered to 6 \$ / ha / year if the forest is used for grazing. The amount of payment varies greatly across the schemes for the same land use. For example, a farmer in Pimampiro, Ecuador, receives 12 \$ / ha / year for conservation of forest land, while a farmer in Heredia, Costa Rica receives 57 \$ / ha / year for the same land use. These differences reflect the highly variable opportunity costs for the service providers, as well as variable availability of funds in the PES scheme itself.

Some schemes, such as the FONAG Quito and the Watershed Management Programme in Colombia, do not provide direct compensation. Instead they provide financial investment funds for

the development of upper catchments. The funds may be invested in conservation projects; environmentally friendly agricultural development, establishment and implementation of management plans for watersheds, etc.

Compensation by users of services

On the side of the users of water-related services, there is little evidence of any objective economic rationale underlying the exact height of their payment. In a few cases involving payments by drinking water providers, such as Heredia, Costa Rica, and Jesús de Otoro, Honduras, willingness-to-pay studies have been conducted among the population. Interestingly, in both cases, the tariffs were set by regulatory bodies, far below the estimated willingness to pay (Muradian, 2005)³ This may be due to several reasons, including possible discrepancies between actual ability and stated willingness to pay of households; difficulties to guarantee the promised service levels that are linked to the stated higher willingness to pay; and political reasons, as it is currently unpopular in Latin America for municipal governments to raise water tariffs. The finally agreed upon PES charges vary widely in relation to the economic costs of water provision: in La Heredia, payments amount to 6 per cent of the average water bill for domestic users, (Muradian, 2005); the municipality in Pimampiro, Ecuador destines 20 per cent of the residents' water charges to finance the PES scheme (Ambrose, 2002); and in Ecuador the Municipal water supplier of Quito pays one percent of its revenue into the FONAG PES fund (small in relative terms, but considerable in absolute terms) (Lloret, 2004).

The limited role of economic valuation in designing compensation mechanisms

This shows that crude estimations of expected per-hectare benefits and pragmatic considerations of willingness and ability to pay are driving the height of compensation payments. In many cases, other factors than economic reasoning alone may provide important motivation for providers and users of the environmental service to enter into the scheme. In reality, these are often important driving forces which lead to the establishment of water-related PES schemes.

Providers may...

- see a benefit in adopting environmentally friendly land use methods voluntarily and for a compensation now, rather than being forced by rising public pressure in a few years' time, without compensation;
- perceive a latent threat that if they do not cooperate, their lands may be incorporated into adjacent protected areas (Muradian, 2005)
- perceive the granting of PES benefits as informal recognition of their property to the land in the absence of formal titles (FAO, 2003)
- see the payments as an additional source of income for activities they would carry out anyway, for example in the case of conservation NGOs (Rojas and Aylward, 2002)

Users may...

- see the PES scheme as an opportune mechanism to solve conflicts with upstream communities (FAO, 2004)
- expect benefits in terms of improving their "green" image for supporting environmental activities, beyond the hydrological benefits, particularly private companies
- have other relationships with the providers which foster the PES scheme, for example, in the case of the Monteverde Hydropower project, the provider leases the land on which the power station is to be built as part of the PES scheme (Rojas and Aylward, 2002)

³ In La Heredia, the tariff was set at about 10 per cent of the WTP, in Jesús de Otoro, at 3.6 per cent.

These factors explain why PES schemes can be popular with providers and users in spite of the lack of clearly identifiable and quantifiable environmental services, and even if the payment does not always compensate providers fully for the direct opportunity costs for the land use. This may have an impact on the sustainability of these schemes, as discussed below.

Institutional issues and legal framework

General institutional set-up

The institutional set-up of a water-based PES scheme features four main entities: the users or beneficiaries, the providers, sometimes the intermediaries who take care of administrative tasks and the actual fund, which will have its own organizational arrangements such as a committee and supporting staff, and which is the institutional centre that binds the other three entities.

The users or beneficiaries of water-related environmental services are likely to include households and small companies that rely on upstream watershed for their water supply. Although this is usually a diverse and large group of users, they are usually represented in the form of municipalities or drinking water utilities, which channel the contributions to the scheme. In some cases, the scheme is set up by a single company such as a bottled water company or a hydroelectric producer.

The side of the service providers is usually more problematic. Providers are likely to be many and diverse, and thus providers' organizations can greatly facilitate the set-up and functioning of PES schemes. Existing organizations that can be used as providers' organizations include farmers' organizations, cooperatives, and conservation NGOs. However, the PES is then dependent on the institutional strength and cohesion of these general or other purpose organizations and their capacity to incorporate the PES-specific capacities.

Well-organized users and providers minimize costs for the establishment and functioning of the transactions between them, ensuring that the funds raised under the PES scheme are used for payments to service providers. In large schemes, administration costs can be quite high. In the case of Colombia, in 2000 only 20 per cent of the funds channelled to the Regional Development Authorities, the implementing agencies for watershed protection, were actually used for investments in conservation activities with a view of generating water-related environmental services (Estrada and Quintero, 2004).

To reduce the administrative burden to service providers and users, many schemes work with intermediary organizations whose functions may include making contracts and administering payments to service providers, and monitoring compliance. Intermediary organizations may be non-for-profit organizations, such in the case of Pimampiro, Ecuador, or may be private consultant firms who offer their services for a fee, such as in the case of La Heredia or FONAFIFO in Costa Rica. It is important that costs of the intermediary are included in the calculations of the scheme: In some schemes, intermediaries charge their providers part of the PES payments. In cases where there is only one provider and one user of services, such as the case of La Esperanza, there is typically no intermediary.

In terms of payment mechanisms, local schemes usually set up a fund which is administered by a committee typically comprised of representatives of the service beneficiaries, local authorities and the donor organization, if the scheme is externally funded. The fund collects all contributions from beneficiaries, a base financing from the donor (if applicable), pays compensations to the service providers (either directly or through an intermediary) and accounts for the funds' balance. For the fund to be sustainable, it is important that the contributions by the users cover the compensation payments as well as the administrative costs of the scheme. If a public agency is administering the

fund, it is crucial that the fund's finances are clearly separated from the regular budget of the agency, and it is monitored by an independent committee, to ensure that the resources are used for compensation payments and not for general administrative tasks which are not connected to the scheme (see the example of the Regional Development Authorities in Colombia above).

In establishing the PES, the involved parties should agree on compliance control mechanisms, as compliance control is a key feature of well-functioning PES schemes. Since there are no monitoring systems for the actual delivery of environmental services, compliance control is typically centred on monitoring the service providers' compliance with the land uses or activities that they have agreed on under the agreement. It is equally important that schemes define sanctions for non-compliance and mechanisms for their enforcement. Sanctions for providers usually vary from a suspension of payments, to exclusion from the scheme and legal action. Few schemes define sanctions for non-compliance on the part of the users, other than the possibility of legal action.

Legal framework

With regard to the legal framework, the fact that many PES schemes in Latin America function in countries without a specific legal framework for PES schemes show that such a framework is not a necessity for the establishment of a PES scheme. Agreements and strategic alliances between environmental service providers, beneficiaries and environmental authorities are often enough to implement these economic mechanisms. Trust between users and providers as well as the existence of a good intermediary are considered more important than a legal framework. (FAO, 2004; FAO, 2004b)

However, the existence of a PES legislation which defines a regulatory framework may facilitate the dissemination and implementation of these systems by providing a blueprint for private agreements. Also, a functioning public institution at the national level which administers a PES scheme may facilitate the creation of privately funded schemes by allowing the interested parties to link into the existing public schemes. Both can be observed in Costa Rica. Here, private PES schemes such as the La Esperanza scheme have integrated elements of the FONAFIFO scheme into their agreements, for example the value of the hydrological service which is supposed to be provided by a certain area. (Rojas and Aylward, 2002) Other interested buyers, such as the Cervecería Costa Rica and several hydroelectric companies, channel their payments for water-related PES systems through the public FONAFIFO scheme. (Rojas and Aylward, 2003)

While it is not necessary to have a specific legal framework for a PES scheme to function, the schemes do have other important legal prerequisites. It is generally considered that the clear definition of property rights is an essential requirement for the smooth operation of markets, including markets for environmental goods and services. In Latin America, land titles are usually not clearly defined in rural areas. Some PES cases show, however, that this is not an insurmountable obstacle to establish compensations to the providers of the desired environmental services, at least temporarily, since this type of system can be considered as the beginning of a legal recognition process of their land use (FAO, 2004). Schemes that require service providers to have legally registered land titles operate with a greater legal security, however, may exclude a considerable number of potential service providers from the scheme, particularly poor smallholders who typically have no titles and who cannot afford to regularize their situation.

A related point of importance is the legal definition of property rights on water resources. In many countries in the region, water is legally considered a public good. Thus, it may not be consistent with legislation if service providers are compensated for the quantity or quality of water which flows from their land, as they legally do not have a property right over the water. In these cases, it may be better to define the service as "protection of water resources" than the delivery of the water

resource itself (Echavarría 2004). Likewise, many countries have a forestry legislation which regulates the use and protection of forests even on private lands. PES schemes have to ensure that the incentives they offer are in line with these regulations.

For many PES schemes which operate on a local level it is an important prerequisite that the scheme is recognized by local legislation, for example through a municipal ordinance, to ascertain legitimacy for local actors. The PES fund needs to have a corporate status backed by legislation in order to be able to sign legally binding contracts, take legal action against non-complying participants and respond to legal action in case of conflict.

Finally, a functioning legal system is important as a mechanism to solve disputes between service providers and users arising from the application of the PES scheme.

PES in the context of rural development

Apart from the benefits relating to the improvements of natural resource management, PES schemes can have other impacts in certain contexts.

PES schemes can serve to resolve conflicts over the allocation of resources between upstream and downstream users in a watershed by establishing a negotiation platform for the different actors and clarifying access rights to water and land (FAO, 2004b). This can be a considerable benefit in terms of community development in rural areas.

PES schemes can serve as instruments to raise environmental awareness among the actors, by assigning tangible economic values to the services or externalities which typically have no price associated to them. Service providers realize that there is added value if their land is used under a conservationist system which allows them to produce and ensure conservation of the resources at the same time. Service users better realise the economic value of the environmental services they enjoy, and the fact that they depend on the proper management of watershed natural resources for their continued supply. However, the establishment of a PES system itself does not necessarily reach the goal of increased awareness among service providers and users. In many cases in Latin America, the knowledge of the local population about the functioning of the PES scheme is limited. Providers may see the compensation as another incentive that they have been used to from technical cooperation projects, rather than a payment for a service rendered, and users may not understand the meaning of the payments, eg. a rise in their water bill (FAO, 2004).

There are few studies in the region to quantify poverty-related impacts of PES schemes in implementation areas. It is often thought that PES schemes have a potential to improve equity in the access to resources and alleviate poverty by transferring funds from downstream to marginalized upstream residents of a watershed. However, experience to back up this claim shows mixed results. In Pimampiro, Ecuador, the PES scheme has helped to reduce some hardships in families of producers since the compensation paid under the scheme has been used to cover some healthcare, education or food expenses, thus helping to improve the living conditions for those benefited by payments to some extent (Ortega, 2004). On the other hand, a quantitative study of the social impacts of the FONAFIFO scheme in the Virilla watershed, Costa Rica (Miranda et al, 2003) found that most of the people who have access to the PES programme are mid- or large-scale producers whose livelihood does not depend on PES income. In this case, this is due to four main reasons: (i) Small farmers who receive a government subsidy or technical assistance are not eligible to receive benefits under the PES scheme. (ii) For small farmers, transaction costs in terms of waiting time and bureaucracy are very high. (iii) Small farmers generally cannot easily afford to set aside a part of their land for conservation, as their opportunity cost is higher. (iv) Although areas from 1 ha may qualify for PES payments, in practice, FONAFIFO adopts a minimum threshold of 10 ha, thus excluding small farmers. (Hayward, 2005).

This illustrates that PES schemes will not automatically improve equity in the watershed context. In fact, there may be a trade-off in reaching the environmental goals of the scheme in an economically efficient manner and contributing to poverty alleviation (Kerr, 2002). While it may be more cost-effective for schemes to target large land holdings to reduce transaction costs, the potential impact on equity and possibilities to include the poorer strata of the watershed population is reduced. If social objectives are to be reached by the PES scheme, the design has to be carefully tailored to include poor and small landholders, which may reduce the attractiveness of a PES scheme as an efficient tool to realize environmental sustainability.

Sustainability of water-related PES schemes

Sustainability issues

Water-related PES schemes have gained popularity in many Latin American countries as an innovative instrument to finance investments in natural resource management. Since most schemes are very recent and operate for less than five years, it is difficult to arrive at conclusions about their sustainability. Based on the features of the schemes, it is possible to identify typical strengths and weaknesses which may influence the long-term viability. This section reviews these features.

The links between land use and the desired water-related services are generally not well understood. This may pose a potential threat to the long-term functioning of the schemes, as it is not clear if and to what extent the land uses under the scheme will actually provide the services desired by the users, that is, the users may or may not get what they are paying for. This is particularly relevant in cases where the service involves stabilization of total or dry-season water flow, as the related land-water linkages are often based on common perceptions which may not apply to the local contexts (see Box 1). The land use-water quality linkages seem more straightforward, however, the establishment of the PES scheme, alone may not be sufficient to ensure that the services are delivered under the scheme, as water quality effects may only be tangible if a considerable portion of the upstream watershed, including areas with a potentially large impact such as riparian areas, are included. Thus, it must be ensured that the owners of these areas participate in the (voluntary) scheme to ensure service delivery to the users.

A related point concerns the lack of monitoring. For financial or technical reasons, PES schemes mostly restrict monitoring to oversee compliance of the service providers with the activities or land uses they have agreed to under the scheme, and do not monitor the delivery of services in terms of flow regime and water quality. It would be desirable to include such monitoring to provide proof of the service delivery to the water users, thus ensuring the willingness-to-pay in the long term.

In those schemes which have been established as part of a technical assistance project, there are issues regarding the financial sustainability. The schemes are usually financed through an initial fund provided by the donor(s), which is replenished by contributions of the service users (eg. through an increase in the water charges) and others (eg. the municipality). Furthermore, donors often provide funds for the establishment and functioning of the scheme's institutional framework, monitoring, and compliance control arrangements. While the fund can function as a financial "cushion" in the first phase of the functioning of the scheme, it is essential that the regular contributions are enough to cover both the compensation payments as well as the administrative costs, which may be considerable. In many schemes it is not contemplated to cover the administrative costs through regular contributions to the scheme, and in some systems not even the compensation payments are covered by the contributions. This is clearly not sustainable. International cooperation can play a very important role in the initial financing of PES systems, providing funds for feasibility studies and the establishment for the market, for instance. However,

many existing projects run the serious risk of not being able to exist independent of external resources in the medium and long term. Once initial transaction costs have been covered for market establishment purposes, the local market forces should ensure the scheme's sustainability (FAO 2004).

The few cases where willingness-to-pay studies have been carried out show that people in general are willing to pay for an improvement of their water sources. However, the actual contributions to the PES scheme, usually set by a regulatory agency, can be significantly lower than the willingness to pay for reasons indicated above. This can hinder the adoption of water-related PES schemes without initial external financing.

Options to improve the financial sustainability of PES schemes

One possibility to increase the financial sustainability of municipal PES schemes is to integrate service users with a higher ability to pay such as private companies (hydroelectric suppliers, breweries, bottled water plants etc.) into the scheme. However, this will generally require that those private companies also have an economic interest in the conservation and/or improvement of the water resources.

The economic interest by private companies manifests itself in their opportunity costs to join the PES scheme. The establishment of a PES scheme may reduce the need for costly investments associated with for instance building or increasing the capacity of water treatment plants, deep groundwater extraction, or even water acquisition from neighbouring watersheds for urban water supply and industry; loss of storage capacity, increasing dam-levels or requirements of new dams for the hydro-electric sector; etc. These averted expenditures may provide a huge economic incentive for private companies to partake in PES as paying beneficiaries. Nevertheless, the experience in Latin America shows that this potential high economic value of PES does not translate itself directly into levels of pricing. This is due to the fact that the water-based environmental services are difficult to quantify and far from secure, which makes a precise assessment of opportunity costs difficult.

Once the services and the corresponding land uses have been agreed by the users, negotiations can start on the level and mechanism of payment to be adopted in the PES. In practice the level of payment may be stipulated as a percentage of obtained revenue (usually for urban supply companies and hydro-electric entities)⁴, or contribution of a yearly fee (usually industry). In most cases the financial contribution by the users to the PES will be a reflection of (i) an assessment of feasible increase of tariffs/consumer prices, (ii) an assessment of the value of the services, possibly based on the expectation that the PES will help reduce the need for costly investment as mentioned above.

Another option to increase the financial sustainability of PES schemes, is to study options to combine water-related schemes with markets for other environmental services such as biodiversity conservation, carbon sequestration, or landscape beauty, to tap into additional resources. Many land use changes promoted under water-related PES schemes may also contribute to other services, however, in some cases they may reduce other services. As markets for water-related services are local, and those for other services global in scope, however, such a combination will need complex institutional arrangements that serve as intermediary for both levels. The FONAFIFO scheme in Costa Rica is an example of the marketing of a "shopping basket" of various environmental services. (Landell-Mills and Porras 2002)

⁴ These companies may or may not decide to charge these payments directly to their consumers in the form of higher consumer tariffs.

Conclusions

In Latin America, water-related PES schemes have gained popularity in recent years as instruments to finance activities of natural resources management at the watershed level with a view to improving water availability and/or quality for downstream users. Schemes range from local initiatives with or without external financing to national programmes financed through cross-sectoral subsidies.

Driving forces for the establishment of water-related PES schemes have been political decisions at the national level (such as in Costa Rica and Colombia), the existence of local conflicts about natural resources at the watershed level, concerns about the viability of water sources by water users, and the initiative of international donors.

Valuation of water-related services has only played a limited role as a driving force in the establishment for PES schemes. The total economic value of the supply of environmental services is very difficult to assess as there are no local studies on the relation between land use and water resources, as well as no reliable data on hydrology and water quality. Most PES schemes are a product of negotiation processes between the participants in which the actual value of the service plays only a marginal role. Contributions by users are often a small fraction of their willingness-to-pay. Compensation payments to providers are mostly based on available funds and are oriented at opportunity costs for forgone benefits of their land use.

A strong organization of users and providers is an important prerequisite for the establishment of a PES scheme, as otherwise transaction costs for the establishment of the scheme would be prohibitively high.

With regard to the legal system, experience in Latin America shows that many schemes function without a PES-specific regulatory framework. However, PES legislation may encourage private deals that are modelled after the official scheme. There are other regulations that are instrumental to the functioning of PES systems: many schemes require service providers to hold a legal title to their land. Furthermore, it is important for local schemes to be recognized by local legislation in order to improve acceptance by the participants. The financial mechanism must be legally recognized as a corporate entity. Finally the court system is an important platform to resolve conflicts arising out of the application of the scheme which cannot be resolved among the actors directly.

In the broader context of rural development, PES schemes can provide negotiating platforms for local actors to resolve conflicts about natural resources in the context of a watershed. Also, PES schemes may raise awareness of the participants about environmental issues, however, a communication component is necessary to reach this goal.

Although PES schemes are a mechanism to transfer funds from urban and lowland population to dwellers in more remote upstream areas, they do not generally improve equity among the population. It is more difficult for small and poor landholders to access PES benefits, as the transaction and opportunity costs involved are relatively higher for them than for large landholders. However, there is anecdotal evidence from one scheme that household income from poor landholders was significantly improved. If improving equity is an explicit goal of a PES scheme, it has to be carefully designed to facilitate access of the poor. However, this will likely make the scheme more expensive in terms of administration and transaction costs.

In terms of sustainability, it is difficult to reach conclusions, as most schemes are recent. However, there are some factors that may impact the schemes' functioning in the long term. First, the lack of

understanding of linkages between land use and water flow and quality in the local context makes it difficult to assess how much of the desired service actually reaches the users. Also, hydrological monitoring is usually absent in the schemes. This may affect users' willingness to pay in the long term. Second, schemes that have been initiated with the financial assistance of an international donor often lack the funding from regular contributions to pay the compensation to service providers as well as administration costs of the scheme, which may put financial sustainability of these schemes at risk. Third, in schemes involving municipal water suppliers, anecdotal evidence shows that regulatory agencies are reluctant to raise water tariffs, which considerably reduces the scheme's financial capacity.

Donor involvement in PES schemes can be important to cover the development costs of PES (initial assessment of services and beneficiaries, initial training and equipping of PES fund, etc). However, it must refrain from financing any recurrent costs; whether administration, salaries, depreciation of assets, and of course compensation payments. There may be a niche for donor support in developing the monitoring and evaluation capacity of PES schemes.

To improve financial capacity of the schemes, one strategy could be to include private water users with a higher ability to pay, if available. The economic rationale for such private water users might be based on clear economic benefits in terms of averting costly investments that would be necessary if water-related services would be no longer sustained. Another strategy could be to expand the schemes to include other environmental services such as carbon sequestration of biodiversity conservation which would justify long-term international support to the schemes. However, such expansion to other services would require a new institutional set-up to combine local markets for watershed services and global markets for carbon and biodiversity services, as well as a careful analysis which land uses simultaneously generate these services.

This review shows that water-related PES schemes can be promising mechanisms to improve natural resource management in rural watersheds upstream of water users with a sufficiently large willingness to pay for water-related environmental services, and which meet a number of other characteristics which are conducive to the establishment of such schemes. However, water-related PES schemes are far from being a panacea for water management: They are only applicable if there are users that match an ability to pay with a sufficient willingness to pay, and they always concern only specific service, never the full range of water-related services that ecosystems may offer. Thus, water-related PES schemes should only be considered as one instrument for specific cases in a basket of options available for sustainable natural resources management.

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Annex: Four water-related PES schemes in Latin America

1. PROCUENCAS PROGRAMME, LA HEREDÍA MUNICIPALITY, COSTA RICA (SELF-FINANCED PUBLIC SCHEME)

Problem structure

The Municipality of La Heredia en Costa Rica (about 200,000 inhabitants) receives its water from partially forested catchment (about 15,000 ha). Opportunity costs for landholders to conserve the forest land are high (alternatives are housing development and conversion to pasture) and the alternative uses are assumed to have negative consequences for streamflow and water quality, putting at risk the water sources of the city.

Objective

Main goal of the scheme is the conservation of existent forest cover and reforestation in the upstream watershed in order to ensure a stable streamflow and water quality to ensure the city's drinking water supply.

Cooperation agreement, mechanism or instrument

The municipal water company (Empresa Municipal de Servicios Publicos de Heredia, ESPH) is paying landowners who are willing to participate in the scheme a compensation for conservation of forest on their land or reforestation. Contracts are for 5 years in the case of forest conservation and 10 years for reforestation. Furthermore, ESPH has signed contracts with the administration of a National Park which partly covers the upstream area of the watershed and a consortium which operates another PES scheme in the area of interest, topping up payments of the existing scheme to equal payments under the PROCUENCAS scheme. A cooperation agreement was also signed with the Ministry of Environment and Energy which offers consultancy services to the scheme in terms of monitoring and compliance control. An intermediary organization (FUNDECOR) brokers contracts between ESPH and land holders in exchange for a fee charged to service providers.

Participating parties in the agreement

The municipal water company and upstream land users, including private landholders as well as the administration of the National Park; the consortium of the existing PES scheme in the area, as well as the Ministry of Environment and Energy.

Financing

The scheme is financed through contributions of water users as an addition to their monthly water bill. The contributions are about 0.005 US\$/m³. A willingness-to-pay survey conducted by ESPH had established possible contributions of 0.045 US\$/m³. ESPH is channelling the funds to the service providers.

Institutional framework (Existing laws, policies, administration)

Several laws and regulations of Costa Rica deal with the protection of ecosystems that regulate water resources, e.g. the Environmental Law (1995), Forestry Law (1996), and Land Use and Management Law (1998), which imposes restrictions and limitations of land use in forested land to preserve vegetation cover and to avoid pollution. The Ministry of Environment is in charge to ensure the conservation of forest cover, to impose fines, and grants water concessions to the hydropower plant (LEHP). The conceptual framework of the contract is based on the Costa Rican concept of the Payment for Environmental Services (PES), developed in 1996. PES was developed to create economic incentives for the conservation of forest and to compensate land users for the

environmental services their land or their land use generates. Several government-sponsored PES schemes exist in the country.

Outcomes

The scheme is operational since 2002. There is no data on how much land is currently under the scheme. It is estimated that with current levels of funding, the scheme is capable of conserving about two thirds of the existing forest in the upstream watersheds.

Sources: FAO 2004, Cordero 2004

2. PIMAMPIRO MUNICIPALITY, ECUADOR (PUBLIC SCHEME WITH EXTERNAL FINANCING)

Problem structure

The Pimampiro Municipality (about 20,000 inhabitants, out of which 6300 are urban residents) depends on the water supply of sources which originate in upstream forests and grassland (páramo). In the 1987, an agricultural cooperative, the “Asociación Nueva América”, started to acquire land in the upstream part of the watershed, and until 1997, controlled 638 ha of forest, páramo and agricultural lands. Further encroachment on existing forests and páramo is assumed to put the water supply of the city at risk.

Objective

Objective of the scheme is to preserve forest cover and páramo on the land owned by members of the cooperative Nueva América, with a view of protecting the water sources which supply the city of Pimampiro with drinking water.

Cooperation agreement, mechanism or instrument

The municipality, through its “Unit on environment and tourism” (UMAT), makes contracts with members of the cooperative on a basis of a management plan for their land. A compensation is paid on a per-hectare basis for land uses which are assumed to be beneficial for the provision of water. The highest payments (1 US\$/ha/month) are made for conservation of primary forest and páramo, less is paid for secondary forest (US\$0.75/ha/month), and intervened primary forest or páramo (0.50/ha/month). No payment is made for agricultural lands. Payments are made upon inspection by an UMAT technician every four months. In cases of repeated non-compliance, providers will be excluded from the scheme.

Participating parties in the agreement

The scheme was conceived in the context of the FAO project “Desarrollo Forestal Comunal” (DFC) in the 1990s. After the end of the project, an NGO, CEDERENA, took over the supervision of the activities. CEDERENA is providing technical assistance to the municipality and participates in the oversight of the scheme’s fund. Furthermore, the municipality, through its UMAT unit, which effects the payments, and the members of the cooperative, as service providers.

Financing

A seed fund of US\$ 15,000 was established by DFC and the “Fundación Interamericana”, an international NGO, in 2001. The municipality directs 20 % of the residents’ water charges into the fund, which amounts to almost 4000 US\$ per year barely covering the 4,200 US\$ needed to pay the compensations to cover the 638 hectares. Administration costs are not covered by contributions to the fund, but by the municipality. Technical assistance is provided by CEDERENA.

Institutional framework (Existing laws, policies, administration)

There is no specific legal framework for PES schemes in Ecuador. The Law of Municipalities which stipulates that municipalities may collect fees for providing public services. Furthermore, the municipality of Pimampiro is handling the administration of the scheme. Furthermore the scheme operates in the framework of the forestry law which protects forest on private lands. This law provides an additional incentive for providers to comply with the agreements under the scheme.

Outcomes

The scheme covers the entire area that belong to the cooperative Nueva América. (638 ha) However, there are issues of financial sustainability: Present regular contributions barely cover the compensations paid to providers, and administration costs and costs for oversight and technical assistance are borne by the municipality and CEDERENA, respectively. Furthermore, in order to cover the entire upstream area which provides water, a total of 4285 ha would have to be covered under the scheme, implying a sixfold increase in compensation payments.

Source: Ambrose 2002.

3. WATERSHED PROTECTION FUND (FONAG), QUITO, ECUADOR (PUBLIC-PRIVATE SCHEME WITH EXTERNAL FINANCING)

Problem structure

The water supply of Ecuador's capital Quito originates mainly from two watersheds located in the Cayama-Coca (4 000 km²) and Antisana Ecological Reserve (1 200 km²) in the Andean mountains. Although both areas are under environmental protection, the watersheds are threatened through several land uses such as agricultural production, extensive livestock grazing with impacts on both water quality and quantity for drinking and irrigation water use, power generation, and recreation. Destruction of forests and grassland (*páramo*) which contributes to the degradation of the high plateau is assumed to affect the stream flow causing floods in winter and drought in summer.

Objective

The main goal of the cooperation agreement is to maintain the stream flow and water quality for drinking water supply of Quito and surroundings through biodiversity protection measures implemented in the two watersheds.

Cooperation agreement, mechanism or instrument

In 1998, the Watershed Protection **Fund (FONAG)** was created in order to initiate and finance environmental conservation measures in the upstream reserves - undertaken either by the municipality or by upstream land users. The conservation measures are undertaken according to a collectively developed **management plan** and adjusted according to the existing Reserve Management Plan (Echavarría, 1999). The fund became operational in 2000, and is managed by a private asset manager. The fund's Board of Directors is composed of representatives of municipality, conservation organisations, hydroelectric company and water users (Koch-Weser and Kahlenborn, 2002). The fund is independent from the government, but cooperation exists with the environmental authority in order to coordinate FONAG activities and the conservation objectives of the ecological reserves.

Participating parties in the agreement

The initiative was started by the Municipality of Quito, the municipal water company. The Nature Conservancy and Fundación Antisana proposed the creation of a fund. The electricity supplier for Quito (Empresa Eléctrica Quito) entered as a constituent in May 2001 as did Cervecería Andina, in March 2003.

Further participating parties that are represented in the Directors' Board of the fund are the hydroelectric company, the water users of Quito, several local NGOs, and upstream land users.

Financing

FONAG received an initial donation from an international donor, i.e. USAID. Constituent contributions vary and run from a fixed amount of 1 percent of potable water sales by EMAAP-Q to an annual fixed amount by other subscribers, with written agreements for the 80 years of the Fund's constitution but which constitute payment schemes carried out by the users on a permanent basis. Currently, the Fund has close to 2 million dollars and investment bonds for the year 2005 are estimated at close to 500 thousand dollars. (Lloret 2005)

FONAG is financing donations, eg. to national park administrations. The calculation of the current contributions to national parks is based on the costs of patrolling the nature reserve, however, it is planned to determine the actual costs of water protection and to solicit further contributions (Koch-Weser and Kahlenborn, 2002). In a second phase FONAG plans to fund investment loans to local organisations specialised in the formulation and execution of projects in the watersheds that supply water to Quito, to implement programmes to ensure the water supply.

Institutional framework (Existing laws, policies, administration)

The environmental conservation measures of FONAG's management plan have been elaborated in correspondence with the environmental management plan for the Ecological Reserves Antusana and Cayambe-Coca (Echavarría, 1999).

Outcomes

Until 2002, the implementation of FONAG has been slow to get up to speed, due to the continuing absence of field activities (USAID, 2002). Statements concerning outcomes in terms of environmental improvement or hydrological returns are not available. However, the fund has been created and is considered to be a promising instrument with a transparent and efficient structure. There are plans to expand the program over the area of the Condor Biosphere Reserve (Hofstede and Albán, 2002; Tognetti, 2001).

4. LA ESPERANZA HYDROPOWER PROJECT, COSTA RICA (SELF-ORGANIZED PRIVATE SCHEME)

Problem structure

Water is a limiting factor for hydropower production of the La Esperanza hydropower station (LEHP). Seasonal variations in river stream flow of the watershed with an area 34 km² are of great concern for LEHP. About 98% of the watershed is covered with forest. LEHP and the upstream land owner of the La Esperanza watershed, a conservation NGO, negotiated an arrangement to reduce the risk associated with changes in land use.

Objective

Main goal of the contract is the conservation of existent forest cover in the upstream watershed reducing the risk of larger fluctuation in stream flow in order to ensure the assumed downstream hydrological services, i.e. regular flow.

Cooperation agreement, mechanism or instrument

A **fully private contract** between an environmental NGO and Hydropower Producer was signed in 1998 for a time period of 99 years, determining **compensatory payments** for the activities of the NGO in order to protect the forest cover of the watershed.

Participating parties in the agreement

There are two participating parties in the agreement: The environmental conservation NGO (Monte Verde Conservation League, MCL) which owns most of the land of the upper watershed, and the LEHP. There was no government intervention.

Financing

The contract determines the amount for the compensation payments. The payment increases during the first five years. From the fifth year onward, the payment is calculated using a formula linking the payment to power production and inflation. The determination of the base value of the hydrological service per hectare is based on the value used in similar schemes implemented by the government. The payments contribute 10 to 25 % to the annual budget of the NGO, and increase the operation and maintenance costs of the power plant by 21 %.

Institutional framework (Existing laws, policies, administration)

Several laws and regulations of Costa Rica deal with the protection of ecosystems that regulate water resources, e.g. the Environmental Law (1995), Forestry Law (1996), and Land Use and Management Law (1998), which imposes restrictions and limitations of land use in forested land to preserve vegetation cover and to avoid pollution. The Ministry of Environment is in charge to ensure the conservation of forest cover, to impose fines, and grants water concessions to the hydropower plant (LEHP). The conceptual framework of the contract is based on the Costa Rican concept of the Payment for Environmental Services (PES), developed in 1996. PES was developed to create economic incentives for the conservation of forest and to compensate land users for the environmental services their land or their land use generates. Several government-sponsored PES schemes exist in the country.

Other prerequisites

A land ownership dispute between the two participating parties revolving around an area of 1.5 hectares was crucial for the establishment of the contract. As building site of the hydropower plant, the piece of land was of great importance for LEHP, although MCL held possession of it. The contract grants land use rights to LEHP for a time period of 99 years, while MCL retains ownership. In case of delayed payments, MCL can revoke the use right of the land including all existing infrastructure.

Outcomes

There is no information concerning the outcomes in terms of improvement of hydrological services or institutional performance of the mechanism. There are no control mechanisms foreseen examining the fulfilment of the services to be provided through MCL. No provisions are made for non-compliance on behalf of MCL.

Source: Rojas and Aylward 2002.