

Payment for Water-Based Environmental Services:

*Ecuador's Experiences,
Lessons Learned and Ways Forward*

Consuelo Espinosa Proaño

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Available from: IUCN Ecosystems and Livelihoods Group Asia, 53 Horton Place, Colombo, SRI LANKA.

Email: iucn@iucnsl.org

IUCN Water & Nature Initiative, Rue Mauverney 28, 1196 Gland, SWITZERLAND.

Email: waterandnature@iucn.org

IUCN Eastern Africa Regional Office, PO Box 68200, Nairobi, KENYA

Email: mail@iucnearo.org

EXECUTIVE SUMMARY

Payment for water-based environmental services is, within a bigger set of instruments for conservation, one that allows the application of the ecosystem approach for basin management.

This document aims to identify the recognition of this potential among three Ecuadorian experiences on the creation and implementation of financial mechanisms designed to increase water flow and improving water quality among river basins.

Although no economic valuation nor cost-benefit analysis were initially carried out for determining the Water Fund FONAG in Quito, the water fee in Cuenca and the Water Fund for conserving environmental services in Pimampiro, its implementation is considered as successful among local decision makers. However, this recognition should be reviewed on the medium and long term, when the impacts of conservation activities, funded by payments for water-based services schemes, can be fully assessed. Hydrological information is needed for this purpose as well as environmental and social evaluation.

Common aspects regarding the implementation of financial mechanism in the three cases can be highlighted: local political support, external institutional support, implementation of complementary activities to reduce environmental threats and local awareness on the importance of the activities developed and on the existence of such mechanisms.

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LIST OF ACRONYMS

CEDERENA	Ecological Corporation for the Development of Renewable Natural Resources
CNP	Cajas National Park
DFC	Forest Communal Development Project
EEQ	Electricity Power Company of Quito
EMAAP	Quito Metropolitan Area Sewage and Potable Water Company
EMU	Environmental Management Unit
ETAPA	Municipal Company of Telecommunications, Potable Water, Sewage and Wastewater Treatment
FIA	Fundación Interamericana
FONAG	Quito Water Fund
IIED	International Institute for Environment and Development
IUCN	The World Conservation Union
PES	Payment for Environmental Services
REMA	Cayambe Coca Reserve
SNAP	National System of Protected Areas
TNC	The Nature Conservancy
UMAT	Environment and Tourism Unit
USAID	United States Agency for International Development
WANI	IUCN Water and Nature Initiative

BACKGROUND

The project “Integrating Wetland Economic Values into River Basin Management” has the overall goal of more equitable, efficient and sustainable wetland and river basin management resulting from the practical application of environmental economics techniques and measures. To help to achieve this goal, its immediate objectives are:

- To increase awareness and capacity among planners, policy-makers and managers to identify and use economic measures for wetland conservation.
- To generate and disseminate practical and policy-relevant tools and examples of the use of economic measures for wetland conservation.
- To assess environmental economic aspects of wetland and river basin management at key sites, including the identification of wetland values, economic causes of wetland loss, incentives and financing mechanisms for wetland conservation.
- To work with local communities, government and non-government agencies and the private sector to integrate wetland economic values into development and conservation decision-making and to pilot concrete economic measures for wetland management.

National, regional and global case studies, policy briefs and technical working papers are being carried out as part of this project. These deal with the practical application of environmental economics techniques and measures to ecosystem and river basin management in different regions of the world, including Africa, Asia and Latin America.

In order to contribute to this effort, the IUCN Water and Nature Initiative supported the development of a first study in Ecuador, which aims to identify national experiences in the creation and implementation of financial instruments as mechanisms to pay for water-based environmental services.

Three case studies are analyzed in this report: Water Fund (FONAG) in Quito, the water fee in Cuenca and the water fund for protecting environmental services in Pimampiro. The report begins with a brief description of the state of water in Ecuador followed by an analysis of the framework in which financial mechanisms are developed. The report then presents and analyzes the three cases, which include an identification of the source of water, the problems that those sources are facing, the local dynamics around the creation of the financial mechanism and the results of its implementation. Finally, it presents the conclusion on the appropriateness of using payment for environmental services schemes in Ecuador and highlights the main factors that allow their implementation.

INTRODUCTION: Water, catchments and conservation in Ecuador

The state of water in Ecuador

It is known that Latin America is a privileged region since it has 26% of the available drinking water in the planet while harboring only 6% of the planet's population. It is the second region, after Asia, with the biggest reservoir of drinking water worldwide. However, it is estimated that 1.7 million inhabitants do not have access to potable water in Latinoamerica, while 1.2 millions do not have access to sewage services. Hence, a regional paradigm exists: being one of the richest regions in the world in water supply, but being so inefficient in managing its hydrological resources and in providing water services to the population (Guerrero and Velasco 2003). Unfortunately, Ecuador is a reflection of the Latin American situation: people have an average of 43,500 m³ of water per year, and the total amount of rainfall per person is three times the world average of 10,800 m³ (CNRH, 2002, quoted in Albán *et al*, 2004). In contrast only 36.8% of the population has access to potable water while on average 41.8% to sewage services. Additional to this shortcoming in offering potable and sewage services, national studies establish that water losses in Ecuador are above 50% (Galárraga, 2004).

The conformation of the hydrological system in Ecuador is determined by the location of the Andes Mountain range, which crosses the country from north to south. The Andes allows the constitution of three different continental natural regions: the Coast, the Andean Mountain range or Sierra and the Amazon. The country is divided in 31 hydrological systems, conformed by 79 river basins. These systems correspond to two hydrological slopes, both born at the Andes but one draining towards the Pacific Ocean (24 river basins) and the other one towards the Amazonia (7 river basins). It is estimated that the national hydrological network contributes with 110 billions of m³ per year from the slope of the Pacific and 290 billions m³ from the one to the Amazonia (*ibid*, 2004).

In 1997 the total water withdrawal was 16.98 km³, 82% of which was used by agriculture -even though only 7% of the cultivated area has some kind of irrigation system, 12.3% to domestic use and 5.6% to industrial sector (FAO, 2004). Among other water users, electricity companies are an important one since 70% of electricity generation is hydraulic. (Galárraga, 2004).

Ecuador almost does not receive any hydrological contribution from the rivers of neighboring countries. On the contrary, there are hydrological resources that leave the country: 5-9 km³/year to Colombia through the Pacific slope; 70-125 km³/year to the Pacific Ocean through the coastal rivers; 9-6 km³/year and 200-300 km³/year towards the Colombian and Peruvian Amazonian river basin respectively. Nowadays, transboundary problems have been identified since the water that drains to neighboring countries is highly contaminated. In fact, the majority of rivers in Ecuador are polluted (Lloret 2000), being the main sources of this environmental problem the indiscriminate use of chemical products in agriculture, oil spills, urban waste and toxic wastes from industries, salinization due to shrimp industry at the coast and contamination with mercury in auriferous zones. In contrast to this scenario, only one city in the country has a treatment plant for sewage— Cuenca, which processes only 9% of its liquid wastes.

On the other hand, it is widely recognized that institutional capacity in managing water issues in the country is very weak. This basically responds to different reasons such the political instability the country has faced along the last decade, to the lack of coordination among the

many institutions managing the resource, locally and nationally, and to the overlap and contradiction among local and national water legislation¹.

Now, if we objectively analyzed the information previously described, it seems that on average Ecuador has an important flow of water, and scarcity of the resource should not be of any concern. Nevertheless, this abundance is relative since water is not equally distributed along the country nor geographically nor temporally². Therefore, this relative scarcity combined with the increasing pressure over the resource from different water users, the constant sources of pollution and the low institutional ability to manage these tasks are in general the main problems that Ecuador face in regard to this resource. Actually, if we add to this the fact that the country has the highest deforestation rate registered in the region, 1,2% of annual loss rate on average in the '90s, the dimension of the problem could be clearly pictured and understood.

In spite of this, there must be recognition that such local and national relative scarcity can somehow be solved if the rate of water loss could diminish. In fact, if this problem were surpassed then pressure over nature would diminish. Having 50% of loss is a luxury that a country as Ecuador should not have, thus objectives towards water management in the country should point to cope this problem, as complement to other activities that are currently being developed.

Development of Payment for Water-based Environmental Services mechanisms in Ecuador

Ecosystems generate a set of biophysical processes or functions, which simultaneously generate a stock of environmental goods and a flow of services for humanity. The nature and magnitude of these goods and services will depend on the type, size, complexity, physical characteristics, state and management of the ecosystem in question (IUCN, 2004). According to the Millennium Ecosystem Assessment, ecosystem services are the benefits people obtain from ecosystems, including provisional services (waterflow, fresh water, fuel, genetic resources, etc), regulating services (air quality, climate regulation, water regulation, etc), supporting services (atmospheric oxygen, soil formation and retention, water cycling, etc) and cultural services (recreation).

Through Payment for Environmental Services (PES) schemes the beneficiaries can stimulate land users to preserve or change their practices of use with the purpose of maximizing the yield of the environmental services in time. PES implementation focuses on the fact that the key to reverting ecosystem services degradation lies in changing land-use practices towards those that allow a constant provision of environmental services.

PES are of great interest among decision-makers since it is a proven way to generate funds for conservation. It is a mechanism that fosters the interaction between users of the environmental service and people that currently live within or close enough to the ecosystem that generates such services. It also induces to local institutions reinforcement and gives evidence that decentralization is worth for environmental management. Nevertheless, its implementation should, on one hand, operate over an important hydrological and socio-economic information in order to facilitate monitoring activities, and on the other should avoid further rectification over the amount charged or in the orientation of conservation activities. Such changes could generate dissatisfaction among users and loss of credibility regarding the mechanism. Other challenges to consider among the implementation of any PES mechanisms are valuation of offered services, identification of beneficiaries and transaction costs related to the sustainability of the payment systems.

¹ For a detailed analysis in water institutionalization in Ecuador please review Echavarrí *et al*, 2004.

² For example, water shortage is an alarming problem in the provinces of Loja (South of Ecuador), Manta (Central Coast), Cotopaxi, Tungurahua and Chimborazo (Central Sierra).

At the level of river basins, such schemes are particularly relevant: whenever downstream water users suffer from any change in the quantity and/or quality of the water that they receive, and they have an interest in receiving a stable and good quality service, there is an opportunity to develop protection activities for water resources involving upstream landowners and downstream users. Such activities are basically related to forest conservation, and in other cases, in developing other activities focused in improving water quality. This is, upstream - downstream relationship can be established by a compensation mechanism, in which payments canalize water user willingness to pay to fund forest conservation activities upstream, in order to ensure water provision in time.

When evaluating payment schemes for water-based environmental services in Ecuador, Vogel (2002) mentions that “paying private landowners for the water services provided by their forests contradicts current legislation. Landowners are not permitted to deforest their land, and even more, they do not own the water that flows from their property.” But deforestation occurs and as previously mentioned, Ecuadorian high rates of deforestation are of concern because it worsens the relative scarcity scenario of water in the country.

Also, Vogel highlights probably one of the most controversial issues in applying PES schemes to water, and that is the property of the resource. Access to water is a human right, thus any attempt to charge for the resource could transform any PES scheme in an excluding tool with extremely high social impacts. Therefore, it is important to clarify that payments for water-based environmental services do not mean paying for the water that flows from the upper to the lower part of a basin, but on the service that the ecosystem is giving in providing that water. Market mechanisms are not meant for privatization processes, and moreover it bad applicability and the lightness on its identification and implementation can generate this kind of distortions.

In general, any market mechanism applied as a conservation tool should aim at improving livelihood conditions of involved actors (in this case upstreamers and downstreamers) while procuring an improvement in local, national or global environmental conditions. This means that any financial mechanism is created over the assumption that its implementation leads to an optimal situation where participants are better off than in the original situation. But this does not come alone with the financial mechanism, they should be implemented within an integrated framework, such as the ecosystem approach.

Few but very well recognized experiences had been developed in Ecuador on payment for water-based environmental services. And even yet there is not enough information about their impacts on local wellbeing and changes on the environment services flow, intentions to replay them are detected within the country and along the region as well.

The present study shows how financial mechanisms were developed in quite different circumstances in three parts of the Sierra region of Ecuador. Differences vary from land tenure, political support, ecological available information, to institutional and legal changes carried out for the implementation of the mechanism. However, beyond these differences the study shows that in Ecuador market based instruments for conservation are being used and there is a clear recognition on the potentiality of its replication.

CASE STUDY: FONAG, the Water Fund for Quito

Quito's water sources

Quito, the capital of Ecuador, has an extension of 12,000 Km² and a population close to 2 million inhabitants. It is located in an Andean valley at 2,800 meters above sea level (m.a.s.l.). Drinking water is provided by the Quito Metropolitan Area Sewage and Potable Water Company (EMAAP for its Spanish abbreviation), which supplies 260,000 homes, about 93% of Quito's population. The city consumes around 7m³ of water per second and water losses are estimated at 50%. Water bills fail to recover distribution and operational costs and indeed in 1998 EMAAP's income from water bills covered only 54% of its costs³.

Water for Quito comes from watersheds located inside and adjacent to protected areas in the Condor Bioreserve. This Bioreserve, located north of the city, begins at an elevation of 762 meters in the Western Amazonia, crosses the Andes and ends at 6,013 meters at the snow-capped of the Cotopaxi Volcano (TNC, 2004). It encompasses 15 ecoregions and four protected areas: Cayambe Coca Ecological Reserve, Antisana Ecological Reserve, Cotopaxi National Park and Sumaco Napo Galeras National Park. About 90% of Quito's drinking water comes from two of the four protected areas within the Condor Bioreserve: Cayambe Coca and the Antisana Ecological Reserves. Also, it is estimated that Quito is the main consumer of the water that comes from the Bioreserve.

Water flow within the ecoregions is coming from two sources: snow that melts from local glaciers in Cayambe, Antisana and Cotopaxi and from precipitation. Due to the dominant type of vegetation in these highlands, water is retained in soil and vegetation ensuring its slow release. Also, water vapor, carried by the wind and evapotranspiration from the cloud forest is an important source of moisture.

Providing water services to Quito is not an easy task since water sources are distant from the city and in some cases a pumping system must be used to transport the water, with the consequent increment of costs. EMAAP operates three main systems in order to provide water to Quito: Papallacta and Salve Faccha Dam for the northern part of Quito, and Mica for the Southern part. The Papallacta System, built in 1990, catches and transports water from the Cayambe Coca Ecological Reserve to the Bellavista Plant. Here, 3,000 liters per second of water are being treated and distributed to the northern sector of the city. In 1998 the Salve Faccha Dam, located 3,900 m.a.s.l., began its operations contributing to Papallacta's with 1,000 l/seg. This dam is the highest in South America and its water is transported to Quito by gravity. Water from this dam has been supplying Quito's northern area demand since the one in Papallacta was polluted by an oil spill last year⁴.

For the southern part of the city, EMAAP has been developing the Mica Project, which ensure water availability at least up to 2025. This project implies catching, pumping and transporting water from the Antisana Volcano and it is projected to provide Quito with an extra 1,700 l/s of potable water.

Water consumption is expected to increase in 50% by 2025 (Southgate, 2001, quoted in Echavarrí, 2002). Therefore, the Municipality together with EMAAP is developing a series of projects in order to ensure the resource availability for the future. In fact, nowadays EMAAP can guarantee water supply until the year 2020, and a project is under study in order to ensure potable water until the year 2050. On the other hand, even no national study is available to

³ Moreover, it is estimated that 30% of the urban consumers are not being charged for the service.

⁴ The pipe that transports oil from the east to the coast of the country passes through Papallacta lake and dam.

estimate the amount of water that will diminish as a result of glaciers reduction located at the Andean volcanoes as a result from global climate change, some educational campaigns are being developed in order to reduce pressure over the resource from urban consumers.

Finally, it is important to mention that water from Papallacta is also used for power generation (15 MW) as a way of optimizing the use of the caudal, saving up to US\$2,5 millions annually in electricity generation. At the same time, the Mica Quito Sur Project will allow the National Interconnected Electrical System to generate 9,5 MW of hydroelectric power.

Environmental and social description of the Cayambe Coca and Antisana Reserves⁵

Cayambe Coca

The Cayambe Coca Reserve (RECAJ from its Spanish abbreviation), with an extension of 37,966.8 ha. is located at the northeastern part of the country. The biggest extension of the reserve lies in the Amazon Basin (Provinces of Sucumbios and Napo) while only 15% is located in the Sierra (Provinces Imbabura and Pichincha). Within its limits four high mountains are located: Cayambe (5.790 m.a.s.l.), Reventador (3.485 m.a.s.l.), Sarahurco (4.725 m.a.s.l.) and Puntas (4.425 m.a.s.l.).

Natural vegetation covers 94.3% of the Reserve while the intervened area and surface covered by snow, lava and piroplastic material represent 4.1% and 1.5% of the Reserve surface respectively. Categories of natural vegetation are: low land evergreen forest, premountain evergreen forest, low mountain evergreen forest, mountain cloud forest, high mountain evergreen forest and *páramo*, which covers the majority of the surface of RECAJ. Among the intervened areas three categories are identified: forest plantations, pasture and crops. The low evergreen forest has mostly been affected due to favorable climate to crops and pastures, to easy access for population and for the use that "colonos" give to wood for house construction.

The mayor pressure to the Reserve comes from the southern and western part of the Reserve because the highway Cuyuja-Baeza-Reventador and the fluvial systems of the Oyacachi, Salado y Aguatico rivers make these areas accessible to colonos.

The most threatened ecosystems in the reserve are the páramos, wetlands of altitude and the Andean spur forest. Páramos cover the western part of the Reserve and it harbors several species of plants and animals, among which some are catalogued as in danger of extinction or very threatened as is e.g. the case for the mountain moose, the Andean Bear and the Andean Condor. *Páramo* generates important functions such as water catchment, retention and slow drain; food and refuge for wild animals, options for recreational and landscape tourism. On the other hand, the wetlands of altitude conform the system of permanent and temporal lakes located in the highlands of the RECAJ, which are considered as water reservoirs. The Andean spur forests are ecosystems covered with natural vegetation, and are located along the territory that descends to the Amazonía. In general they consist of fragile soils. This ecosystem includes vegetational formations as the high mountain forest which are very humid zones, the evergreen forest (including cloud forest, low mountain) which is very important due to its water storage capacity and since it recycle and distribute nutrients. It also regulates water drainings towards low lands and reduces the leaching process of soils.

Social Issues

The Cayambe Coca Reserve has around 7,000 inhabitants dispersed throughout the area and some others are gathered in communities. Human settlements related to the Reserve are classified in two categories: the ones living within the limits of the reserve as Oyacachi y

⁵ The information described in this section was summarized from the Reserves Management Plans.

Sinangüé, and the ones living outside its limits: Cuyuja, Papallacta, Cascabel I and II, El Chaco, Lumbaqui, Chuscuyacu. These last ones can be gathered in what is known as Quijos Valley.

Population in the Quijos valley has increased with 260% during the '70s due to oil exploration and exploitation activities, reaching 4.318 inhabitants in 1982. During the '80s this growth was around 185%, and from 1990 to 1997 a deceleration of the rate was significant, increasing only with 60%.

The main economic activities are agriculture, cattle, silviculture, hunt and fishery. 70% of the economically active population is dedicated to cattle activities. The main threats identified in this zone are population growth and its consequent increase in water demand, in pasture lands, firewood and wood for construction; flower industry; land change due to agriculture and cattle activity expansion; oil exploration and exploitation and electrical power generation.

Regarding the communities settled within the limits of RECAPY, they are ancestral groups that had faced significant changes in their cultures. Oyacachi was established in the XVI century and by the time the Management Plan was being elaborated, population was estimated in 484 inhabitants gathered in 71 families. Their main economic activities are cattle and agriculture. Few people are dedicated to other activities such as the elaboration of cheese, silviculture (trouts) and handicrafts. This community has water pipe network, electrical power, a sewage treatment plant, however solid wastes are discharged in the rivers of the zone.

The Cofanes group, whose traditional territory was located in the Amazon Basin, was displaced due to oil activities in the Ecuadorian jungle. There are only two isolated Cofanes groups: one living near the Zábalo river and the others near the Sinangüé river. Their main economic activity is agriculture and some of its production is commercialized in the Amazon basin. Cattle is not really important for their incomes because animals die for different illnesses or insect attacks. They also use wood for house construction.

Antisana Reserve

The Antisana Reserve is located in the eastern slope of the Sierra, it is dominated by one of the most important volcanoes of the Andes - the Antisana (5.758 m.a.s.l.). It has an extension of 120,000 ha. and altitude ranges from 1,400 to 5,758 m.a.s.l. This reserve is part of the Napo (Amazonía) and Pichincha (Sierra) Provinces. It is surrounded by other protected areas: Cayambe Coca Reserve, Sumaco – Napo Galeras National Park and the Protected Forests of Antisana, Tambo and Guacamayos.

The higher part of the reserve is located between 3,100 and 4,700 m.a.s.l. where the pluvial subalpine páramo and very humid mountain forest are located. The páramo covers one third of the reserve. The lower part, between 1,200 and 3,100 m.a.s.l. represents the other two thirds of the reserve. It is composed by high mountain forest (evergreen mountain forest and cloud mountain forest). It is very well preserved and some areas are almost inaccessible. According to WWF, the reserve is within one of the hotspots of biodiversity.

The Reserve is considered to be a hydrological reserve of importance. One of the main environmental functions that the reserve offers is water generation through the hydrological system that originates at wetlands and lakes located at páramos and cloud forests. The Eastern and Western slope subsystems compose this system. The first corresponds to the Esmeraldas River, while the last is the richest in water production.

Social and economic Issues

The Population within the Reserve is classified in three areas:

- Traditional Andean area, conformed by high communities and neighborhoods from the Píntag, Inga Montserrat and El Tambo parishes;
- Ancient colonization area conformed by Papallacta, Cuyuja, Baeza and Cosanga, and

- Indigenous area conformed by indigenous from the Las Caucheras, Guacamayos, Jondachi and Cotundo sectors.

When the Reserve was just created, several conflicts due to property of land were identified, especially among landowners within and outside the limits of the reserve, among communities and large farmers, and among these last ones and the Ministry of Environment.

One of the main activities developed in the Ecoregion is tourism. Roads and highways have increased the possibility to access to the zone, thus increasing the number of visitants. The main activities developed by tourists are fishing, hunting, climbing and scientific investigation. Papallacta is highly visited since it is considered as a place for recreation and health. It offers thermal water baths, walks through the cloud forest, fishing and hunting. Visits to the ecoregion are partially controlled by private landowners.

Creation of a financial mechanism

The Cayambe Coca and Antisana Reserves belong to the National System of Protected Areas (SNAP from its Spanish abbreviation), therefore its management is responsibility of the Ministry of Environment. The Ministry delegated the elaboration of management plans, for each of the reserves, to a local NGO *Fundación Antisana*⁶ based on environmental and social diagnosis of both of the Reserves. Activities in the plans can be classified under 5 themes: watershed valuation; land purchase or compensation measures; enforcing protection; targeted land management, and sustainable production systems. On the other hand, the Metropolitan Municipality of Quito develops activities under the Integrated Management Plan for Hydrological Resources that focus on: basins and rivers protection, creeks recovery, improvement and enlargement of infrastructure for water distribution and environmental education.

Since activities to be developed under the reserves Management Plans and the Integrated Management Plan for hydrological resources complemented each other, involved institutions in the conservation of the reserves began to work together aiming for a broader impact of the activities they performed. These were the Ministry of Environment, *Fundación Antisana*, EMAAP, The Nature Conservancy (TNC), and others. This alliance also meant the need to look for financial resources in order to implement the planned activities.

The idea of charging for environmental services became an alternative for fundraising, and especially water was a potential option in this case. Tax Systems are the most common mechanism referred to in literature and used in practice as PES scheme. However, even there were no studies regarding the feasibility of applying such financial mechanism in Quito, the authorities claimed it would have had two considerable disadvantages: i) the inefficiency EMAAP has in recovering distributional and operational costs could have been a condition for using collected funds to cover such deficit; ii) Ecuadorians pay up to 100 different kind of fees and taxes, thus any augmentation of a public service bill, due to a tax, would have had very little acceptance among citizens. Hence, the idea of creating a fund had more acceptance among the institutions involved.

Under this context, *Fundación Antisana*, with the support of United States Agency for International Development (USAID), TNC and the participation of Ecodecision -a local environmental organization- worked together developing a suitable fund in order to create a permanent financial source for watershed conservation at the Condor Bioreserve.

After some consultations with different stakeholders, some characteristics were considered as important during the process of the fund's creation: it should allow for private and public participation, it should not create bureaucracy, it should allow a variety of participants, it should be legally feasible, politically viable and ecologically sustainable.

⁶ Regional member of IUCN-SUR.

The criteria to determine the amount that users would have had paid should have had reflected the value they give to the water they use, but since there was no economic valuation study carried out to provide that information, it was suggested that a more practical option was to encourage heavily water users –mainly industries and businesses- to pay a percentage of their monthly sales (Echavarry, 2002).

Under this context, the final proposal was a non-declining endowment fund created by voluntary contributions from water users. The fund's philosophy established that returns obtained from investing the resources of the fund will be used to watershed protection, while the endowment is not spent.

An important fact that allowed the independent creation of the fund from EMAAP or from the National Government, was the change in the National Asset Value Law (Ley Nacional de Mercado de Valores) in 1999. Since then, any governmental organizations can invest in private mechanisms and thus EMAAP could assign resources to a private fund without compromising them to be invested in the Company's regular expenses.

The fund was created with seed funds from EMAAP (US\$20,000) and from TNC (1,000), and in order to motivate users to voluntarily contribute to the fund, the "incentive" of directly becoming part of the Board of Directors was established. In fact, voting power within the Board depends on the amount of money each party gives to the fund.

Under this frame, EMAAP agreed to pay 1% from the sales, expecting a monthly contribution of US\$25,000. Another important consumer of water in Quito is the Electricity Power Company (EEQ for its Spanish abbreviation), and after important negotiations it was agreed that the company would contribute with US\$45,000 annually, beginning the first contribution in September 2001. Later, *Cervecería Andina* (a national beer company) was invited to participate and it committed with an annual payment of US\$6,000. Thus, so far EMAAP is the main contributor and consequently is the member with the highest decision power within the Board of Directors.

The 31st of December 2003 the fund had capitalized an amount of US\$1,5 million and on April 2004 the fund had increased up to US\$1,65 million. FONAG expects to mobilize US\$585,000 during this year for watershed protection projects.

It is important to mention that even though *Fundación Antisana* and the Nature Conservancy presented the idea of creating the fund in 1997 it was not until the year 2000 that it was finally approved by the authorities. The delay on the creation of the fund had more to do with the political instability of the country than with technical problems of the mechanism itself.

Implementation of the Fund

FONAG is ruled by a contract that establishes the terms of the fund, its institutional structure and the resources it can use (Echavarry, 2002). A Board of Directors composed by the fund's contributors manages the fund and supervises the work of a Technical Secretariat. *Fondo Enlace*⁷ is in charge of the financial management of the Fund, and the Technical Secretariat, among other responsibilities, must monitor how *Fondo Enlace* distributes the investment. Although this structure has worked since the fund's creation, currently there is a recognition on the need to change it in order to have a better impact environmentally and socially in the activities the fund would like to support.

Since the fund generates resources only to conservation activities, EMAAP had supported the salary of the Technical Secretariat. Also, TNC gave in-kind support, especially from their Parks-in-Peril Programme and Freshwater Initiative, which supported researches for a better

⁷ Financial institution part of a socially-responsible private bank.

understanding of hydrological relationships in the reserves and the impact that human activities have over those relationships.

Regarding the use of the fund's resources, FONAG's rules established a framework that exclusively allows the support of activities that are already being developed within the ecoregions, and the co-finance of projects that fit under the themes previously identified by *Fundación Antisana's* in the ecoregions management plans. Under this context, FONAG had supported projects since 2002 when their "Call for Proposals Protocol" was created.

FONAG has financially supported a set of activities such as restoration projects at the San Pedro and Pita watersheds; at Antisana, Oyacachi and Papallacta watersheds a project that aimed the improvement of cattle and sheep production practices in order to reduce impacts on soil and water quality; a credit line to foster sustainable agriculture among communities living within the bufferzone of the reserves; and an educational campaign to raise urban consciousness on water consumption developed by the Municipality. .

On the other hand, even though FONAG has not carried out economic valuation studies within the ecoregion, a number of institutions have supported the compilation of such important information: i) Estimation of Papallacta's highland patrol costs, which suggested families in Quito should pay a monthly fee of US\$0.04 in their water bill; ii) Estimation of the willingness to pay for ensuring future water availability at rural communities in the Cotacachi Cayapas and Cayambe Coca Reserves, which suggested an increment of US\$2,45 monthly of rural family's water bill. Both studies were developed with the support of *Fundación Antisana*. iii) GTZ quantified the maintenance costs of protecting the highlands of the Antisana with an integrated patrol system, which suggested a fee of US\$0.07 monthly per family for those users receiving water through the Mica Sur Project.

Even there is not a systematic schedule followed to evaluate the activities supported up today by FONAG⁸, and that mainly, the monitor has focused its attention on the economic progress of the fund, there is recognition that developed activities have supported the objectives of the Reserves and the Integrated Management Plans. Now, even the fund is young in its implementation, FONAG's managers are currently discussing changes in the implementation of the fund.

Under this new framework, but maintaining the principle of co-financing activities, FONAG's managers aim to carry out a proper diagnostic of water resources in the region, over which they can build a strategy that will establish and prioritize the activities to be developed in the future. They also would like to develop a participatory evaluation mechanism which indirectly implies that water consumers in Quito will broadly recognize the existence of the fund and participate and monitor in the activities it will develop.

Nowadays, FONAG together with OIKOS, a local NGO, are developing a project in which citizens of the Metropolitan area are being interviewed regarding their recognition on the importance of ensuring water availability for the future, and identifying ways of materializing such recognition, which includes willingness to pay questions to develop conservation activities in upper forests. This project includes rising people awareness on the relative scarcity of the resource in Quito, which implies working with different actors, different water users, potential water polluters, upper forest communities, local water institutions, among others.

Evaluation of FONAG as a PES scheme

As well as in the other cases presented in this report, FONAG is a very young experience as to assess its successfulness as an instrument for conservation. Specific information is needed for such an assessment. For instance, it is considered important to monitor the impact that supported activities are having over water quality and quantity. For this, hydrological and

⁸ TNC developed an evaluation report on 2002.

ecological studies are needed to build a “base line” of the ecoregion over which further assessments could take place. Likewise, it should be important to determine the efficiency of the fund in terms of the amount of money that is actually being used for ensuring water availability and improvement of its quality, in relation with the amount spent in covering administrative costs. But none of this information is totally collected, therefore no final conclusion can be strictly emitted.

Instead, conclusions can be drawn by analyzing the changes that FONAG is currently facing. The own mechanism evolution allowed FONAG's managers to identify the need of changing the focus of the activities they have been supporting, in order to guarantee the fulfillment of the objectives by which the fund was created.

Being the reserves protected areas, the chosen PES scheme was created to raise funds for implementing activities under their management plans. But being a water fund the scheme used, such activities should be focused on protecting water sources, ensuring water quality among users downstream and diminishing pressure over the resource. Thus, it could be said that activities under the reserves management plans oriented on fulfilling the three main objectives just described should be prioritized. But, are such activities a priority within the protected area plans as a whole? Should the use of PES schemes only be oriented to protect the environmental service, or should it provide extra resources to develop other conservation activities considered under the management plan? In this specific case, it seems that the management plans were not the best frame for prioritizing the activities that should be supported by FONAG, and therefore in fact, it managers aim to build their own strategy to guide future fund's investments in conservation activities.

Now, analyzing the process followed to create the fund, it is important to highlight the participation of the government and the different civil society actors. The political instability combined with the macroeconomic and financial crisis the country faced since 1998, demanded the constant support from institutions entailed with the conservation of water sources in order to create the mechanism. Luckily, since EMAAP has common objectives with other institutions in regard to the protection of water sources in the Biocondor Reserve, it was possible to strength alliances around such objective. This alliance allowed the consolidation of a group of different actors that endorsed the creation of the fund until it could became a reality. Thus, even the acceptance of the proposed mechanism was delayed due to the political and economic scenario, the constant support of this key non-governmental institutions and organization was an important factor to ensure the current existence of FONAG. This does not mean that local governments can be excluded from the process of creating a PES scheme, in contrary, their participation is crucial since they are the actors that can allow changes in the corresponding legislation to guarantee the existence of any financial mechanism.

The third set of actors in this participatory analysis is water users. Due to the nature of the chosen mechanism, none representative social consultation⁹ among water users was carried out, since there were not **direct** beneficiaries being paid nor **direct** users being charged for the environmental service. However, the necessity of including water users in the process stands over the need of having people's acceptance regarding the chosen mechanism, especially due to the fact that any success expected from any PES as a conservation instrument, requires a strong participation from water users in order to diminish pressure over the resource. Yet, it is important to question whether or not the current nature and structure of FONAG guarantees such participation.

Having the voting power directly linked to the size of the “voluntary” financial contribution eliminates any possibility of local participation in decision-making processes since not all water users are contributors. But this not only stands over the fact that probably they do not want to contribute, but over the fact that they are not aware about the existence of the fund. Thus the mechanism, as it is today, discharge any possibility of having representative public participation

⁹ Which includes any economic valuation study.

in the activities that should be supported by FONAG. Also, since one the biggest contributors is EMAAP, the concern that the institution can use its decision power within the Board to canalize collected resources for covering its operational deficit remains. In fact, overcoming the inefficiency in collecting water bills requires of a totally different strategy than using a PES mechanism. Finally, having a fund based on voluntary contributions could turn out to be a “perverse” incentive to have participation of the industry sector. If they become the biggest contributors, their power on decision-making processes could, for any reason, be biased towards their interests, which not necessarily could be the reserves’ conservation. Even the last two threats mentioned have not happened, FONAG’s managers aim to change the fund’s structure, looking for a more participatory mechanism, which directly implies changing the nature of decision power within the Board.

If any will to change the “voluntary” nature of the fund and to increase the number of participants exists, economic valuation studies should be carried out. As previously described, pieces of valuable information are available, but further efforts are needed if there is a real intention of improving the Fund’s mechanism.

An important event that allowed the existence of FONAG, as it is today, was the change in the National Asset Value Law. With out it, the use of collected funds for conservation activities would have been difficult to ensure or, even worse, the money collected could not have been used at all.

Now, considering the implementation process, being a non-declining fund implies having an important amount of money as capital, otherwise no activities could be developed at all. Therefore, once again, more contributions are needed in order to ensure the development of any conservation activity.

Regarding the sustainability of the Fund, having less than 5 partners in FONAG is not very convenient since any income contraction could jeopardize the existence of the mechanism. Therefore once again the need to increase water users’ contribution is highlighted.

Finally, it is important to recognize that FONAG is facing important changes as institution, trying to transform it to a more participatory mechanism, which implies among other things: changing the incentive for acquiring more voluntary contributors, working in strengthening local water institutions, working with water users, working with communities that live within or at the buffer zones of the Reserves and creating a dialogue system among different actors.

CASE STUDY: The Water Fee in Cuenca

Cuenca's water sources

Cuenca, at 2,530 m.a.s.l., is located at the south center of the country and has a population of 277,000 inhabitants. It is considered as the third most populous city in Ecuador. Water is provided by the Municipal Company of Telecommunications, Potable Water, Sewage and Wastewater Treatment (ETAPA for its Spanish abbreviation). The company offers telecommunication services and drinking water, manages sewage services and a treatment water plant for Cuenca and for other rural areas. Also, nowadays is responsible for managing the Cajas National Park CNP and other microbasins (Corporación Municipal PNC, 2004).

Estimations made by ETAPA suggest that 98% of the population in Cuenca have access to potable water, while in the rural areas this percentage is around 62% (Albán *et al*, 2004). It is also estimated that urban water bills cover about 82% of operational, administrative and distribution costs of the service (Dominguez, 2002b quoted in Echavarrí *et al*, 2002), thus the provision of water service is subsidized by the ETAPA's communications business. Furthermore, sewage water treatment is not yet charged to users through water bill, nor by any other mechanism.

Water for Cuenca comes in its 60% from the lacustrian system placed within the CNP (Corporación Municipal PNC, 2004). Cuenca has four main watersheds: Machángara, Tarqui, Yanuncay and Tomebamba. These four rivers flow into the Cuenca River, which drains into the Paute River and latter into the Amazonas. Nowadays, the two main watersheds, Machángara and Tomebamba provide 17.5 m³ per second of water to Cuenca (Tomebamba provides 40% and Machángara 60%), while there are future plans of transporting water from Yanuncay as well. The Machángara watershed also supply 120 industries (50% of city's industrial park), generates electricity and provides water for cattle ranching and fish production activities (Echavarrí, 2002).

Environmental and social description of the Cajas National Park¹⁰

The park occupies the territories of the Western Cordillera of the Southern Ecuadorian Andes. Its altitude range between 3,150 and 4,450 m.a.s.l., and it has an extension of 28,544 ha. The area includes the high basins of Llaviuco, Mazán and Soldados rivers, which drain towards the Atlantic and of the Luspa, Sunincocha, Atugyacu, Yantaguhayco, Jerez and Angas rivers, towards the Pacific.

During the time of the deglaciation, in the highs, valleys in shape of "u" and staggered lakes in shape of boxes ("cajas" in Spanish) were formed. Throughout the Western Mountain range, the "glacier tongues" had hollowed into the dry lava creating deep valleys of flat bottoms and steep walls, which are known as glacier "boxes". This characteristic gave the name to the Park. Latter, water rain and underground water filled those boxes creating the lacustrian system of the Park. A key feature of this area is that the soil formed by a delicate layer of volcanic ash has the ability to retain water, easing the formation of lakes. Hence, a lacustrian system of 235 lakes of glacial formation expands between the North (Patul) and South (Soldados) sectors of the park. Even this lacustrian ecosystem is very common in the Andean Region, the CNP has a record on density in the number of lakes: 1.4 lake per Km². The number of lakes grows up to 300 at specific times of the year when precipitation increases, and most of the rivers originated in this ecosystem have permanent flows, even though diminution of water flow occurs on specific times of the year as well.

¹⁰ Most of the information described in this section was obtained from the Management Plan.

Ramsar International Convention notified in February 2003 that the CNP was accepted in its Wetlands List of International Importance. In Ecuador 10 wetlands have been accepted in the Ramsar list, but the CNP is the only Andean wetland in the country with that distinction (Corporación Municipal PNC, 2004). Also, the CNP has asked for the title of Humanity Heritage Site at UNESCO.

The park is covered in 90.6% by a herbaceous *páramo* ecosystem, with the exception of small areas located at the southeast (Mazán) and west (Canoas), covered by cloud forests (TNC, 2004). Therefore, water retention and slow drain increases the hydrological importance of the area.

By the time of the Incas civilization, the area was used to trade products between the Cuenca - Azogues Hole (Hoya) and the southern coast of the country, being this area in fact the shortest route for regional interchange between the Sierra with the Coast regions. Also, the existence of lakes ensure water for irrigation and direct consumption, which gave the site a sacred character, since fertility of lands downstream and constant water availability allow the permanence of populations through time.

Nowadays there are 9 communities living around the park with a total population of 755 inhabitants. Rates of population growth has decrease, and in fact this region is recognized as the zone in Ecuador with the highest rate of migration to Spain, social phenomena that became more evident after the dolarization of the economy in 1998.

Communities located at the bufferzones generate enormous pressure over the park since the main economic activities developed are cattle, agriculture and natural fertilizer production. Also, communities use tress for firewood. Another environmental mayor problem currently affecting the park is a highway that crosses the area, connecting Cuenca with the coastal region of the country (Corporación Municipal PNC, 2004).

Creation and implementation of a financial mechanism to fund conservation activities

ETAPA prepared in 1980 the Municipal Master Plan for Water, which included three main strategies: water supply, rational water use and wastewater treatment. Latter in order to coordinate the plan's activities it created the Environmental Management Unit (EMU).

Regarding wastewater treatment, Cuenca is the first city in Ecuador that has built and treated urban and industrial effluents, enforcing also industrial pollution control regulations. ETAPA also foster the creation of the Machangara Watershed Council with the participation of different water users in order to provide an adequate legal framework to ensure the good quality of the river.

For water supply, ETAPA focused its attention on conservation of the CNP, as the main source of water for Cuenca. The main strategy used for conservation was the acquisition of lands within the limits of the park. Thus, since 1980 ETAPA bought 7,253 ha. of páramo, 1,410 ha. of restored land, and 96 has of pasture (Lloret, 2000, quoted in Albán *et al*, 2002). Also, activities focused on reducing pressure from local communities living within the park and at bufferzones were developed with the support of the Municipality. Such activities were the promotion of productive activities compatible with conservation objectives of the park, communitarian tourism and environmental education, which in fact was part of to the second strategy of the Master Plan.

The Park was created in 1977 as a Recreational National Area and it was not until 1996 that its status changed to a National Park. In March 2000 the Ministry of Tourism and Environment¹¹ subscribed a Decentralization Agreement with the Municipality of Cuenca for the local management of the park. On April 2002 the Municipal Council resolved to delegate this responsibility to ETAPA

¹¹ For one occasion the Ecuadorian Ministry of Environment was part of the Tourism Ministry. Nowadays both are independent governmental agencies.

and in order to ensure a participatory management of the Park, ETAPA created the CNP Municipal Corporation. Therefore, Cajas National Park is the only Park within the National System of Parks that is being managed by a local governmental agency. This means that any conservation activities are of complete responsibility of ETAPA, and more specifically of the Corporation.

The main objective of the Corporation is the conservation and restoration of the park's ecosystems in order to maintain a constant flow of environmental services. However, the first activities developed by the Corporation had focused only on watershed protection, trying thus to ensure current and future provision of water to Cuenca. Besides, the Corporation build the CNP Management Plan in order to define other conservation strategies, classifying activities under 4 key areas: tourism management, education, control and patrol, and research. And since there were no population living within the limits of the park, because all properties were bought by ETAPA, the Corporation focused its activities in diminishing the pressure that communities at the bufferzone were developing over the park.

The Corporation funds its activities through financial resources transferred by ETAPA, and tourism was the first funds raised by the park. However, other financial sources were needed in order to finance activities of the management plan. Thus ETAPA established the possibility of charging a fee over water users and after some consultations and negotiation with local authorities, a fee of 1% over water bill was established as a payment for the water service the CNP was providing to Cuenca. Once again, no economic valuation study or cost-benefit analysis was carried out.

In the year 2003, the Corporation budget was about US\$700,000. Water fee allowed the collection of US\$100,000 and tourism entrance fee a similar amount, meaning that ETAPA covered a US\$500,000 budget deficit. In addition, 50% of this budget is spent on administrative matters, leaving the other 50% for actual conservation activities.

Now, in order to increase financial resources, the management plan already considers an increment of the water fee rate up to 4%, again, with no background economic study. The decision of increasing the water fee also responds to the need of ensuring the existence of the Corporation in the future. On the other hand, the management plan also includes the idea of charging for other environmental services that the CNP offers to society and external donations as alternative sources for the park.

Activities implemented so far by the Corporation are those related to increase water user's awareness regarding the importance of the Cajas National Park on water supply; promotion of sustainable livelihood along the buffer zones which are directly linked with the development of alternative economic activities, and others in order to equip the park with basic infrastructure to foster tourism.

Analysis and conclusions

Once again, through this case the creation of a PES corresponds to the need of financing the management plan of a protected area, with the difference that the CNP is managed locally. The use of the PES thus has the secondary objective of ensuring a constant flow of financial resources for the Corporation to develop general activities, and in fact, to guarantee its existence as institution.

The creation of the Corporation counts to the need of having an institution in charge of the park's conservation, since ETAPA has other activities, more profitable, to take care of. However, the controversial issue in this case is if the revenues from the PES scheme should be directly used for conservation activities in general, or for conservation activities focused on water sources only, or to support administrative costs of the Corporation. The final decision must stand over the fact that other probable mechanisms used to develop such conservation activities would be less effective and thus more expensive. If this is true, then the existence of the Corporation is justify, but there is

a clear need to generate further revenues to develop other conservation activities considered by the management plan, as well as to cover administrative costs.

Managing a decentralized protected area is not necessarily an easy scenario. Beyond the difficulties of financing planned activities, the Corporation has to face bureaucratic problems related to the fact that decentralization does not mean total liberty or autonomy in decision-making. For instance, when hiring personal, the Corporation needs to follow public procedures, which have become a real problem since it delays the development of activities. Also, any changes on water or entrance fees need to go through the approval of the Municipal Council and even through the one of the Ministry of Environment in Quito. Since this is the first experience of a decentralized protected area in the country, the Corporation has to search for new and creative ways to overcome such difficulties.

Now, since the Corporation can not directly change the water fee nor the tourism entrance fee, the negotiation to increment both payments, is going to be tough. If a previous study of economic valuation had been developed to the determination of the tax, then probably the increase of that payment would not be necessary today. A change of the magnitude of the environmental tax, as well as of the service being charged for, will have to be carefully implemented since it probably would have to face rejections from the environmental service's users, as well as from the local government representatives.

Participation from different civil social actors, as well as from the local government, has been very important in the creation, acceptance and implementation of the PES scheme. For instance, the acceptance of implementing the water fee among urban citizens is based over the strong promotional campaign carried by ETAPA and later by the Corporation, regarding the importance of the CNP in providing water for Cuenca. In fact, people in Cuenca are highly aware of the ecological and environmental importance of the park on providing water to the city.

Also ETAPA was very successful in negotiating the approval of the mechanism with the local government. This should be highly recognized since they created an instrument, very new among the ones used for managing national protected areas. On the other hand, the Corporation recognizes that empowerment and participation of local communities located at the bufferzones, eased the change in people's behavior toward the use of the water, soil and the application of specific agricultural techniques. Still, the Corporation recognizes the importance of strengthening monitor and control activities within the bufferzone and to complement this with strong penalty mechanisms for illegal activities carried out within the park.

Now, a global evaluation regarding the impact of the activities that has been supported so far by the water fee, requires hydrological and ecological baseline information in order to monitor changes in water flow and quality. Even this information is not collected, thus again no conclusion can be stated in this regard.

Finally, it is important to mention that the sustainability of the Corporation is not necessarily ensured, not only because of financial matters but also because of political ones. There are concerns regarding the next change of Mayor, which will be next August, because the decision of having the Corporation as an independent organization for implementing the CNP's Management Plan will totally depends on his/her perception whether or not this is necessarily. On the other hand, as part of ETAPA, the Corporation has an important pressure to generate enough resources at least to cover its management and operational costs. Therefore, even the PES scheme required the creation of an institution, which could develop conservation activities, the implementation of the mechanism have not strength the Corporation as institution.

CASE STUDY: Pimampiro Environmental Services Fund

Pimampiro's water sources

San Pedro de Pimampiro is a small municipality located in the Imbabura province, in the valley of the Chota River at the northern part of the country. It has four parishes: Pimampiro, Mariano Acosta, Chugá and San Francisco, and has a population of 17,285 inhabitants (6,311 live in the urban zone while 10,974 in the rural). The Chota, one of the largest rivers in the province of Imbabura, has four tributaries: the Escudillas, the Chamachán, the Blanco and the Pisque. The town of Pimampiro is located in the watershed of the Pisque River, specifically in the Palaurco sub-watershed.

The Municipality provides drinking water for Pimampiro and it is estimated that it consumes 12 lt./s of water, which represents the demand of 1,331 families. But a quarter of the population have limited access to drinking water services (Guerrero, 2002, quoted in Albán *et al.*, 2004) and since 2001 Pimampiro receives only four hours per day of this important resource¹². It is estimated that in order to fulfill Pimampiro's supply, the volume of water should increase up to 20 lt./s (Albán *et al.*, 2004), thus water shortage in the areas has always been a problem.

Water for Pimampiro comes from the upper forest located at the eastern mountain range of the Andes between 2,900 and 3,950 m.a.s.l., approximately 32 km Southeast from Pimampiro (Lascano, 2002). This forest is located in the buffer zone of the Cayambe Coca Ecological Reserve (Fundación Antisana, 2004). However, the water actually consumed does not come from that forest (Yaguache, 2004) due to infrastructure deficiency. Therefore, in order to increase in 60 l/s the volume of the system, the local government had financed the construction of a 1 km. length tunnel, which still is under work. Once the tunnel is finished, it is expected that one third of the caudal will be driven to Pimampiro, while the difference will be used for irrigation activities (Albán *et al.*, 2002).

Since 2001, the Municipality treats the water before distributing it to the city. For this, water from the Puetaqui stream (4 lt./s) and the Del Pueblo irrigation canal (8 lt./s) are used¹³ (*ibid*, 2004). The treatment plant has a capacity of 50 lt./s but it currently operates only at its 24%. Before the construction of the plant, water for Pimampiro was obtained from the Puetaqui drain.

Environmental and social characteristics of the upper area

Pimampiro is located in the highlands at an altitude between 1,600 and 4,000 m.a.s.l. It has four types of vegetation: lowland evergreen montane forest (1,300 - 1,800 m.a.s.l.), cloud forest (1,800 - 3,000 m.a.s.l.), highland evergreen montane forest (3,000 - 3,400 m.a.s.l.) and herbaceous *páramo* (3,400 - 4,000 m.a.s.l.) (Sierra, 1999 quoted in Albán *et al.*, 2004).

National statistics show that Pimampiro had faced an accelerated deforestation process having in 1985 a surface of 19,000 ha. covered with primary native forest, extension that had decreased to 7,000 ha. in 1994. After clearing the forest, land was used for agriculture or was abandoned. With this background, different organizations involved in the area developed programs oriented to reduce the high rates of deforestation in the zone. Attempts went from trying to implement forest sustainable management schemes, to non-forest commercialization products, but none of them appear to have the expected results on avoiding changes in land

¹² Information regarding water shortcuts vary among sources.

¹³ This water come from the Chamachán, a neighboring watershed from the Pisque river.

use. Also, activities under the Forest Communal Development Project¹⁴ (DFC for its abbreviation in Spanish) focused its activities in reducing deforestation problems.

In 1985, forty forest landowners got together to create the Nueva América Autonomous Association for Agriculture and Livestock with the objective to formalize the group's tenure of land as a process to give sustainability to the activities developed in the area. The Association is located 32 km south of Pimampiro upstream, in the parish of Mariano Acosta and within the Palaurco watershed. After its creation, some landowners sold their lands and currently Nueva América has 24 members. Only four families live permanently in the forest, while the rest live in different settlements in the lowlands (Albán *et al.*, 2004).

Nowadays Nueva America gathers 638 ha. from which 61% are covered with forests, 26% with *páramo*, 12% dedicated to agriculture and pasture for cattle ranch, and less than 1% is considered as a degraded area. The extension of land per family fluctuates from 12 to 119 ha., with a media of 43 ha. per member of the Association (*ibid*, 2004). The main economic activities developed by farmers are cattle ranch, agriculture and trade, being the first two the ones that provide families with better incomes, although they generated large environmental problems due to traditional practices –overgrazing and the use of chemicals in agriculture.

Families upstream have an average of six children and it is estimated that 78% of them are poor, 51% of this subset are considered as extremely poor. It is also estimated that only 45% of the population have any level of education and 42% have access to health services. They do not have electricity supply or sewerage service. These conditions induce young inhabitants to migrate to cities to work in domestic activities and in the construction sector.

Creation of an economic mechanism to diminish deforestation

Farmers in Nueva America had recognized that deforestation is a problem that generates environmental consequences as well as economic and social ones. They had also recognized that due to forest destruction and degradation, environmental goods and services had already started to be scarce. For these reasons and as a result from the work developed in the area by different local, national and international organizations, farmers showed interest in identifying alternative productive activities compatible with forest conservation.

In 1994, the DFC Project worked with the Nueva America Association developing management plans for their lands, which included activities such as agroforestry, soil management, selective exploitation and plantations enrichment techniques. In 1996 other activities started to be developed in the area such of commercialization of orchids, environmental education among others (*ibid*, 2004).

Through the Decentralization and Social Participation Law passed in 1997, local governments in Ecuador were encouraged to promote environmental actions. Under this context, the Municipality of Pimampiro, with the support of the DFC created in 1998 the Environment and Tourism Unit (UMAT), institution that had played an important role in the development and implementation of the payment for water-service scheme in Pimampiro, as it is explained below. In the same year, The Ecological Corporation for the Development of Renewable Natural Resources (CEDERENA for its abbreviation in Spanish) was founded with the aim to support

¹⁴ This is a project developed along the Andean Communities in Ecuador, with the support of FAO, the Netherlands Government and the Ministry of Environment. During the pilot phase (1989 to 1993) it developed activities oriented to strength rural families with small land properties; during its first phase (1993-1998) the project aimed to improve Andean peasant livelihoods, especially women; during its second phase (1999-2003) the project aimed as well to improve livelihoods, but through a communal forestry development. The main components of the projects were improvement of forest techniques, strengthening of local communities and on the later stage, strengthening gender equity.

the management of community natural resources and the evolution of local institutions (*ibid*, 2004).

In 1999 the Municipality of Pimampiro signed an agreement with CEDERENA to develop the project Sustainable Management of Pimampiro's Renewable Natural Resources for the Maintenance of Water Quantity and Quality. The project had the financial support of the Fundación Interamericana (FIA for its abbreviation in Spanish) and the technical assistance of the DFC. The Sustainable Management Project focused its activities toward the conservation of Pimampiro's natural resources and the strengthening of UMAT. The same year DFC finished the first phase of its activities thus their participation and presence in the area decreased.

Under the framework of the Sustainable Management Project, Nueva America together with the Municipality of Pimampiro and CEDERENA worked in a program for "environmental services protection" as an alternative to manage and conserve the 638 ha. of forests and páramos that belong to the Association. Even the design of a financial mechanism to incentive the conservation of environmental services in the upper forest was the center of this program, it took almost two years of negotiation with members of the Nueva America Association and with the local government to come up with the final proposal.

Meanwhile, other activities under the scope of the Sustainable Management Project were developed. Their main focus was the design and development of alternative economic activities oriented to reduce pressure over forest and *páramo*. One of the main initiatives developed was a local company of forests medicinal plants, which involved a group of women from the Association who were in charge of collecting, cleaning, drying, packaging and trading the medicine plants at local and regional markets. Another initiative developed was a communitarian ecotourism project, which was supported by the Program of Small Donations of United Nations (PPD) and the Municipality. This project financed the construction of a shelter and several footpaths for environmental education activities and for tourism with the participation of communitarian guides.

Downstream, the Municipality begun an educational campaign among different actors in Pimampiro in order to raise the importance of the forest, and its connectivity to water availability. A set of different events helped in raising awareness among citizens, such as the identification of the local ecological symbol, the identification by urban citizens of water sources in Pimampiro, the alternatives available to overcome water shortages and the recognition that water tariffs being paid were very low. As a result, people in Pimampiro felt a big responsibility in conserving upstream forest, easing in this way the future interaction between the urban population and owners of the forests.

Hence, under the frame of the environmental services protection Program, the financial mechanism proposed was a water tax, paid directly by urban water consumers in order to create a conservation fund, which would be later distributed among landowners for them to conserve the forest. Non economic study was developed to identify the amount to be paid to landowners not to identify the amount to be charge to water users. However, CEDERENA and UMAT analyzed the payment capacity of the Municipality through the water bill, and divided that amount by 500, assuming that averaged the total of hectares that belong to Nueva America and that a payment of US\$1/ha would have been a good amount to begin with. This is how the first proposal of increasing the water bill in 40% was established, however negotiations allowed only an increment of 20% of water bill, which is directly linked to water consumption.

In February 2001, the Municipality approved an ordinance that established a Water Regulation allowing Payment of Environmental Services for Forest and *Páramo* Conservation. This ordinance authorize the creation of the "Fund for environmental services" and in general, the use of incentives to conserve forest and *páramos*.

In order to collect enough money to ensure first payments until the water fund could sustain itself, FIA and DFC created a seed fund with a contribution of US\$10,000 and US\$5,000

respectively. Collected money (seed funds and water fee) is transferred to an account of the National Development Bank, an Ecuadorian Bank property of the National Government. It is expected that the Environmental Services Fund could be capitalize monthly by water taxation, and in other time basis, other resources generated within the Association and from external participants.

The Fund is managed by a Committee, composed by the Mayor of Pimampiro, the municipality's Financial Director, the Director of the UMAT, the President of the Municipality's Environmental Commission, a representative of CEDERENA and the President of Nueva America. This Committee is also in charge of managing agreements with landowners, authorizing quarterly payments previous UMAT authorization, penalizing law infringements and analyzing fund's sustainability.

Implementation of the mechanism

From the way the mechanism was generated and payments estimated, information regarding land use situation of every 24 members of Nueva Americas was required for further payments calculations. Thus in order to determine the amount to be paid to each family, UMAT verified property titles and inspected the condition of the land. They used GPS to map the zone, which allow them to build the baseline information and to monitor the application of land management plans. Once the baseline information was collected, the Municipality signed individual agreements with each family, in which the payment was determined, depending on the extension of specific land categories.

The payment categories, as detailed in the following table, was build with the aim to induce families to conserve primary forest and *páramo*, as well as to have as less human intervention as possible, to change agriculture and livestock land to forest and to restore degraded land.

Table 1: Monthly Payments scheme by category

Payment categories	(US\$/month/ha)
Páramo where no human activity has taken place	1.00
Páramo where human activity has taken place	0.50
Primary forest	1.00
Primary forest where human activity has taken place	0.50
Mature secondary forest	0.75
Young secondary forest	0.50
Agriculture and livestock	0
Degraded land	0

Source: CEDERENA 2001, quoted in Echavarrí *et al*, 2004

UMAT is in charge of monitoring the fulfillment of farmer's agreements. This activity is developed quarterly and after verification the institution authorize, or not, the corresponding payments. Landowners who violate¹⁵ the forest conservation agreement have their payments suspended for one quarter. If the violation is repeated, the suspension lasts for two quarters, and if one more violation is committed, the participant is excluded from the payment system. UMAT has been reporting violations to the Ministry of Environment so that sanctions are imposed in accordance with the Forest Law (CEDERENA 2002, quoted in Albán *et al.*, 2004).

In 2002, twenty members from *Nueva América* received payments for environmental services, meaning that 4 did not fulfill their management plans. Nevertheless, after almost 4 years of having implemented the mechanism, and even no exact information exists, UMAT has register that no important clearing forest had occurred since that year. Thus the incentive has, indeed diminished the pressure over forests and halted deforestation processes.

¹⁵ Penalizations are established if farmers perform any slash-and-burn practices, unauthorised selective timber extraction and soil and undergrowth extraction.

It was estimated that water fee would have amassed US\$4,791 per year. However, only 60% of the water billed was actually paid, thus the amount given by the Municipality to the fund is less than expected. On the other hand, from available information in 2001, payments for 25 families would have represented US\$4,219 (*ibid*, 2004), thus the inefficiency in collecting water bills jeopardizes the sustainability of the fund. In 2002 the amount needed to pay landowners decreased since there were more penalized families and since there were less families subscribed in the Association, but this should not correspond to the usual situation.

At a micro level, families received in average a monthly payment of US\$21 for conserving the forest. This income, according to a social assessment study developed by IIED, was used to cover part of family's basic needs like feeding, health and education. However, the same study estimates that families require an income of US\$61 in average to cover their basic needs (*ibid*, 2004).

Having different amounts of payments for different families generated discomfort among members of the Association. Also, during the process, the Municipality recognized that not all of the farmers saw payments for environmental services as an incentive for forest conservation, but rather as an obligation that the local government had with farmers. Therefore, at the beginning of the process some farmers threatened the municipality in destroying their forests if they did not receive the payment. Nowadays, even when this perception has changed among families, there is a generalized feeling that payments should increase in order to halt deforestation in the area.

Several economic studies had been developed in the area once the mechanism was established, in order to supply information to the Commission, CEDERAN and UMAT (Wilson 2001, Lascano, 2002, among others, quoted in Vogel, 2002). Wilson's study estimated the opportunity cost of land in the upper forest. The study focused on five environmental services provided by forest, and estimated, by people's perceptions, the percentage of the importance of each service. With this methodology, the total opportunity cost was estimated in US\$42/ha., and considering that water provision had a qualification of importance of 18%, it is considered that in this case, landowners should receive approximately US\$8.

With this information, and since landowners recognize the importance of other environmental services, they are already asking for increments of their payments based on the real value of the opportunity cost of their lands. However, they are already receiving resources from the ecotourism activities they perform in the area.

Lascano (2002) estimated the importance of water for the irrigation sector. Through this study it was established that water local organizations "Juntas de Agua" should pay for this environmental service and water tariffs should be raised from US\$0,5/ha/year to US\$4,17/ha/year. However, up today, it has been really difficult to involve this water users due to difficulties in negotiation and political viability.

On the other hand, from the social study carried out by IIED in 2003, it was shown that people downstream is willing to pay more than what is actually charged, in order to guarantee water provision in the future. Also it was shown that people have the perception that the incentive has not changed the awareness regarding environmental limitations. However, very few of them believe that payments do not foster forest conservation. The study also shows that landowners are interested in developing alternative economic activities, as they are already doing. Finally, people really believed they could change their land use in the future.

Regarding institutional strengthening, the same study reveals that people believe that the Association is not better organized than before the payment scheme was implemented, even though this could respond to a change in land tenures, from a communal to an individual one.

In the same study, Vogel with the group of research economists evaluated the transactional costs of the mechanism. They recognize that identifying the real value of these costs is not an easy task since a lot of institutions cooperated in the development of the mechanisms thus a lot of costs are classified as hidden. Nevertheless, they came out with a value that represents three times the value of the first year payment.

Evaluation of the mechanism

The experience in Pimampiro is considered as successful due to a combination of factors: farmers' acceptance in using economic incentives to conserve forest and in exploring and implementing, at the same time, alternative economic activities to increase their income and thus decreasing pressure over forests and *páramos*; the positive impact that the educational campaign had in urban population which allowed to raise awareness regarding the importance of forest and the link with water availability; the political decision from the Municipality of Pimampiro to foster the use of financial and economic instruments for conservation; and finally the continuous technical and financial support from CEDERENA, DFC, FIA, among others.

Therefore, from the three cases presented in this report, only this one resembles an experience where all actors involved had a strong participation in the creation and implementation of the PES scheme. This is, there are clear "buyers" and "sellers" for the environmental resource, the ones that are very aware of the importance of their participation, as water users and as landowners; the institutions that foster the use and implementation of the mechanism as negotiators with the local government and with landowners; and the local government, which political will on accepting economic instruments for conservation and on developing educational campaigns with water users materialized the PES scheme.

Since this is a mechanism, which directly involves water users downstream and forest owners upstream, it is important to rescue the final objective of the mechanism –forest conservation- but not losing the positive impact it has had socially. The instrument used is a clear example of resources transference, among users and "sellers" through as the payment has generated extra income to landowners. Thus, the economic instrument has created positive indirect benefits beyond the conservation ones.

No hydrological or economic valuation study was carried out, neither to determine family payments nor to define the water tariffs increment. Instead payments are based over the belief that there is a positive relationship between forest conservation and provision of water. Nevertheless, the calculation used to determine payments has allowed changes in deforestation patterns, even though changes on this behavior has been detected since 1994. Therefore, it should be important to analyze UMAT's quarterly reports in order to estimate the impact of the financial mechanism in this pattern.

Another particular issue in this case is the fact that people are paying for a service that they are not yet enjoying. They are paying in advance to ensure the availability of the resource once the tunnel to transport the water is finished. The impact of the educational and awareness raising campaign had a lot to do with this, not usual, possibility.

Designers of the mechanism highlight the importance that alternative productive activities have had in the conservation objective. This clearly recognizes the fact that since current payments do not cover the totality of the opportunity cost, it is necessary to "transfer" this money from other sources. Thus once again, the implementation and successfulness of the mechanism is based in the fact that it has been implemented in a broader context.

Several social and economic studies have been developed in the area after the implementation of the scheme, and the raised information allowed monitoring the process that the population has faced during the first years of application of the mechanism. Using some external information, Lascano compares the financial mechanism used with two conservation

alternatives: buying lands and creating a municipal police for forests, and the results ratify the decision followed by the Municipality for halting deforestation in Pimampiro through a PES mechanism.

Finally, as in the other cases, there are concerns regarding the sustainability of the fund, not only due to the need for including the heaviest water users in the zone –irrigation sector, but as effectively generating an impact on future water availability. Thus, inclusion of Water Boards in the mechanism is necessary for increasing revenues for current payments and for identifying the possibility of expanding the scope of forests that are being protected.

CONCLUSIONS:

Lessons learned on the use of payment for environmental services in Ecuador

This report presents three cases in which different financial mechanisms were designed as payment for water-based environmental services. In each case, different relationship between upper forest owners and downstream water consumers were established, eventhough only in the case of Pimampiro, this relationship is very clear and strong.

Also, clear differences can be identified regarding the environmental problem around the creation of the PES mechanism. In the case of Cuenca and Quito, the financial mechanism was established in order to prevent water shortages in the future, but in the case of Pimampiro, payments are done to overcome a real water scarcity problem.

The structure built to operatize the PES scheme was different in each case. FONAG is a fund created by voluntary contributions from heavily water consumers, and activities to be developed are financed by the returns generated by the fund and not necessarily proposed by FONAG. In the case of the CNP Corporation, a water fee is charged to urban water consumers and collected by ETAPA, the company that provides water services to Cuenca. Resources are transferred to the Corporation in order to develop activities under the Park's Management Plan. Finally in the case of Pimampiro, even urban water users are charged with a water fee as in the case of Cuenca, money is directly transferred to landowners for them to develop forest conservation activities.

One of the main common factors in these three cases, is that the implementation of the PES scheme was done with the development of other complementary activities in different areas: conservation, environmental education, increasing the participation of people living within the forest or at the bufferzones, among other. This is, in all cases presented in this report, the financial mechanism is part of a bigger set of activities meant for conserving the upper forest.

In fact, the success that the financial mechanism could have in conservation depends heavily on the development of these "complementary" activities. Therefore, it is possible to identify experiences were the implementation of PES schemes were under the ecosystem approach, even that in the presented cases, few principles are identified.

However, it should be important to include among the other activities developed in each case, one that could deal with water loss, since this could definitively reduce pressure over nature.

Now, the implementation of the PES mechanisms did not necessarily meant strengthening institutions in charge of it. For instance in the case of Cuenca, mechanism led the creation of the Institution, but this is not strong enough as to ensure its existence. In the case of FONAG, interesting changes are being detected, which necessarily will imply the fortification of FONAG as a key social actor in the conservation of water sources for Quito.

However, these cases reveal that local governments, due to decentralization processes, have been exploring a variety of instruments for environmental conservation and natural resources management. Local forests and protected area Management Plans leaves open the possibility to use economic instruments, not only to influence on people's behavior, but as a way to generate financial resources to fund conservation activities. Thus, the application of such instruments for ensuring a better quality and quantity of water has been demonstrated and, even though the experiences require more information to evaluate the accomplishment of their objectives, its implementation have been successful.

Since these cases have not much time implementing conservation activities, it is not possible to evaluate if there is a difference regarding the effectiveness on the activities developed and the actor that in fact received the money for its use. This is, it should be interesting for future studies to analyze whether direct payments to landowners is better or not regarding the impacts that conservation activities are having on water provision¹⁶. Also, it should be interesting to evaluate if there is a difference on social impacts regarding this money assignation difference.

Regarding legal changes, all three experiences show that the adoption of any financial mechanism requires changes in local regulation in order to consent the collection of money from water users for financing conservation activities. This means that the implementation of any payment for environmental service scheme needs the complete support from local governments, otherwise, no legal changes can be made.

All three experiences recognized the importance on developing hydrological and ecological studies in order to monitor de impact the activities implemented are having in water availability and quality. Also, it is important to develop economic valuation studies in order to provide “water market” actors with reliable information of watershed value. Nevertheless, not all of them have enough resources to carry those studies out. Thus there is a belief that a well-conserved forest provides more quantity of water, in fact, all of the PES schemes analyzed in this report were built over that assumption.

Finally, the analysis developed within this report allowed to identify that IUCN South America, through the Water and Nature Initiative WANI, has an important niche in developing economic valuation studies for identifying suitable financial instruments in payment for water based-environmental schemes. Also, following its role in providing local and regional negotiation platforms, IUCN could contribute to the creation of such spaces to foster negotiation among stakeholders in the identification of suitable financial instruments and institutional mechanisms for basin management.

¹⁶ It should be clear that any direct payment for landowners is for *protecting* the environmental services, and not for providing the services by themselves.

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Gustavo Chacón. Corporación Municipal Parque Nacional Cajas, Management Plan Coordinator.

Max Lascano. Economist research.

Pablo Lloret. FONAG's Technical Secretariat.

Mario Anazco, CARE Ecuador

Robert Yaguache. Project Director in CEDENA

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IUCN -The World Conservation Union brings together States, government agencies, and a diverse range of non-governmental organizations in a unique partnership. As a Union of members, IUCN seeks to influence, encourage and assist societies throughout the world to conserve the integrity and diversity of nature and to ensure that any use of natural resources is equitable and ecologically sustainable.

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This project aims to develop, apply and demonstrate environmental economics techniques and measures for wetland, water resources and river basin management which will contribute to a more equitable, efficient and sustainable distribution of their economic benefits at the global level and in Africa, Asia and Latin America, especially for poorer and more vulnerable groups.

For more information about IUCN's economics activities under the Water and Nature Initiative, please contact:

Africa:

IUCN Eastern Africa Regional Office
PO Box 68200, Nairobi, KENYA
Email: mail@iucnearo.org

Meso America:

IUCN Oficina Regional para Mesoamérica
Moravia, Apartado Postal 0146-2150, San José,
COSTA RICA
Email: correo@orma.iucn.org

Asia:

IUCN Ecosystems and Livelihoods Group Asia
53 Horton Place, Colombo 7, SRI LANKA
Email: iucn@iucnsl.org

South America:

Av. De Los Shyris 2680 y Gáspar de Villarroel,
Edificio Mita-Cobadelsa, Penthouse, PH, Casilla
17-17-626, Quito, ECUADOR
Email: samerica@sur.iucn.org

Global:

Water & Nature Initiative
IUCN - The World Conservation Union
Rue Mauverney 28, 1196 Gland, SWITZERLAND
Email: waterandnature@iucn.org

