

MECHANISMS FOR WATERSHED CONSERVATION

CASE STUDIES

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**VOLUNTARY PROTECTION OF WATERSHEDS
BY AGRICULTURAL USERS
IN VALLE DEL CAUCA, COLOMBIA**

COLOMBIA

The Rio Cauca Valley is an inter-Andean valley between the central and western ranges of Colombia. The soil quality, climatic conditions and the availability of water make it an excellent agricultural region where fruit, sugarcane, sorghum, soy, cotton and rice are grown.

In 1959, the Autonomous Regional Corporation (Corporacion Automona Regional) of Rio Cauca (CVC) was created to develop the region and protect its natural resources. The CVC designed a holistic strategy to regulate the river, drain flooded areas for agriculture, and protect the watershed.

PROBLEM

As the area has developed, the valley's population has grown to 5 million people. Despite the overall availability of water, some areas experience a deficit at certain times of the year. The farmers in the region, conscious that the water requirements of the growing population threatened their water supply, began working with the CVC to seek solutions. Unfortunately, the CVC's limited resources hampered results.

SOLUTION

A group of rice farmers from the Guabas River watershed stepped in and created the Guabas River Water User Association (Asoguabas). The farmers' idea was to acquire parcels of land in the upper watershed where geological instability made preservation of the vegetation important. To raise the necessary funds, they agreed to pay a fee per liter of water allocated to them.

As the association developed, other water users within and outside the region became interested. The Association of Sugarcane Growers (Asocana) and the Association of Sugarcane Suppliers (Procana) supported and promoted the concept at a regional level. Eventually, additional water user associations were formed by users of the Amaime, Desbaratado, Bolo, Frayle, Palo, Jamundi, Tulua and Morales Rivers. In other locations, the idea was modified to meet local needs of the area, resulting in the formation of similar but distinct entities, such as the Bitacoes Foundation and the River Daguas Corporation.

ACTIVITIES

While actions taken by the associations are indepent, they are generally coordinated with the CVC's Management Plans for each watershed. Activities undertaken by the associations include:

Purchase of Land

Initially, the water users determined that the best way to protect the watershed was to purchase land to protect the water source from inappropriate agricultural practices. Over time, however, they realized it was necessary to develop more integrated and community-based approaches. Land acquisition is one option, but only when other alternatives have been exhausted or when it is necessary to isolate critical or unstable areas that cannot be rehabilitated in any other way.

Construction

Some public works were necessary to control erosion and stabilize the watershed. The CVC identified the sites and designed the projects, but did not have the resources to carry them out. The associations filled the gap, typically in a more efficient and cost-effective manner. The associations also work with the CVC to encourage municipal governments to undertake certain complementary activities.

Identification and Protection of Water Sources

Springs and threatened streams and rivers have been identified and protected. One method of protection is putting up wood or barbed wire fences to prevent livestock and people from entering sites and contaminating or interfering with the water. One municipality located in the heart of the coffee-growing region initiated a program called “the yellow ribbon” in which water sources were marked with a plastic yellow ribbon so that the surrounding community could ensure that no one entered those areas.

Environmental Education

The associations and the CVC organize meetings and promote public participation in events that raise community consciousness about natural resources and the need to conserve them.

Community Development

The CVC and the associations realized that no initiative is viable over the long run without community involvement. To accomplish this, the communities must be organized and motivated to collaborate through an understanding of the benefits that will accrue to them. For this reason, the watershed management plans contain a large social component, which includes activities such as the creation of women’s groups, community gardens and training courses.

Mechanism

The process of establishing these entities begins when users decide action is necessary. The interested parties first meet with the head of the watershed’s CVC to determine the viability of creating a users association. Larger meetings are then held with other water users, community leaders and local authorities. Finally, all water users are invited to a general meeting at which the community is informed of the group’s plans. Consequently, a general assembly is held to develop the association’s statutes and to form

a legal entity. The assembly also names a board of directors and a treasurer and determines the fee to be paid by water users to the association.

In addition to the rate paid to the CVC for use of the water, the associated users pay a rate per liter per second to the association. The fee varies between \$.48 and \$2.81, with an average of \$1.54 per liter per second. This payment is made every trimester (four payments per year). The CVC and the association bill associated users simultaneously but separately, and the user deposits his payments in two separate accounts.

From the beginning, the participation of certain entities such as Asocana and the sugar mills has been key to success. They have supported the process throughout, helping develop statutes, coordinating meetings, and providing logistical and administrative support. This type of support can make or break an association, particularly in light of operating costs including transportation, administrative supplies and telecommunications. Asocana periodically convokes meetings of the various user associations to exchange ideas and experiences and to identify needs.

RESULTS

In Colombia, there are currently 9 water user associations, 3 water management foundations and 3 river corporations. These entities cover an area of about 1 million hectares with a population of more than 97,000 families. Water allocation is more than 98 m³/s and annual user fees amount to approximately \$600,000.

Unfortunately, no cost-benefit analysis of the associations' work has been done. However, general opinion in the area is that the associations are a useful vehicle for community participation in the management and protection of natural resources. From the perspective of the CVCs, these entities have been useful in bringing additional resources to environmental management. Small, local entities seeking to protect watersheds and promote environmental conservation have continued to form, strengthening the regional movement towards this type of management. A Colombian Federation of Water Users is being formed, which will facilitate establishment of similar entities in other areas of the country.

For more information:

Guillermo Hurtado
General Director
CORPOCUENCAS
Edif. Gobernacion, Piso15
Cali, Colombia
FAX 57 2 889 6480

Luz Stella Brown
Director, Department of
Environmental Management
ASOCANA
Calle 58 N #3 N-15
Cali, Colombia
FAX 572 664 5888
lsberon@asocana.com.co



**MECHANISMS FOR FINANCING
ENVIRONMENTAL SERVICES IN
COSTA RICA**

COSTA RICA

PROBLEM

Until the late 1980's, Costa Rica had one of the highest deforestation rates in Latin America, with forest loss much higher on private lands than in protected areas. As a result, the Costa Rican government began to consider mechanisms to reverse the trend and to encourage reforestation.

At the same time, as part of the growing international environmental consciousness, the country was concerned with the conservation and sustainable management of natural resources and the environment, with emphasis on environmental services.¹ The government took the position that the responsibility for environmental management should be shared between the public and private sectors. It was decided that the existing system of compensation for environmental services, including tax deductions and preferential credits established earlier as forestry incentives, was not financially sustainable due to rising costs. As such, the government proposed to establish payment for environmental services, linking economic tools to services provided by forests or reforested areas to provide incentives for reforestation and conservation.

Through the Ministry of Energy and Natural Resources, studies were done to evaluate possible mechanisms for economic valuation of the country's natural resources.

SOLUTION

The evolution in policy led to the establishment in April 1996 of a mechanism for compensating landholders for the environmental services provided by forests. Forestry Law (La Ley Forestal) No. 7575 defined environmental services in the following manner:

“Environmental Services: Those that forested areas provide and that directly influence the protection and improvement of the environment. They are the following:

1. Mitigation of greenhouse gases (sequestration, reduction, storage, absorption)
2. Protection of water for urban, rural or hydroelectric use
3. Protection of biodiversity (for conservation and sustainable scientific, pharmaceutical, investigative and genetic use), of ecosystems, of ways of life and of natural scenic beauty for tourism and scientific purposes.”

The government determined that funds for the environmental services program would be channeled through the National Forestry Office and the National Fund for Forestry Financing (FONAFIFO). The program is financed through fuel taxes (5% of fuel sales), sale of forestry bonds, sale to foreign partners of carbon sequestration services (through the Costa Rican Office of Joint Implementation), fines and transaction fees collected by the Ministry of Environment and Energy (MINAE), and contributions from national and international organizations.

¹ “Sistema Integral de Retribucion por Servicios Ambientales: Foro Nacional de Concertacion. <http://www.casapres.go.cr/concerta/ambinete.htm>

The payment for forestry environmental services currently reimburses three types of actions by landholders: reforestation; sustainable management of forests; and forest preservation. There are also provisions for a fourth; forest regeneration. Payments were initiated in 1997 and are designed to be paid over a five-year period. In return, landholders cede their carbon and other environmental service rights to FONAFIFO for five years. Afterwards, they are presumably free to renegotiate the prices, or sell the rights to other parties. However, they promise to manage or protect the forest for a period of 20 years (15 years in the case of reforestation). This obligation is noted in the public land register and applies to future purchasers of the land.² Prices paid are the following:

- Certificate of Forestry Payment for Reforestation: \$492 per hectare per year
- Certificate of Forestry Payment for Natural Forest Management: \$329 per hectare per year
- Certificate of Forestry Payment for Forest Preservation: \$49 per hectare per year

The Program supersedes earlier incentive programs, which included tax deductions, loans and tradable tax credits for reforestation.

The system of national conservation areas (SINAC) was established in 1995 under MINAE. SINAC must prioritize applications for payment according to a broad list of criteria, including hydrological importance of the land, presence of significant species, location near an existing protected area, carbon sequestration potential and others.³

The system of environmental services was expanded by the Biodiversity Law that reorganized the institutional structure for the management of incentives to allow for the payment of services as well as private sector and community organization participation in setting policies and administering the incentives through FONAFIFO.

RESULTS

The establishment of the Integral System of Payment for Environmental Services has been instrumental in expanding the area covered by the program, as illustrated in the table below:

YEAR	HECTARES
1994	15,596
1995	23,713
1996	24,741
1997	97,398
1998	55,000 (Est.)

The reduction in 1998 is due to the increased emphasis on paying for reforestation, which is the most expensive service being compensated.

² Chomitz, Brenes, Constantino, 1998. "Financing Environmental Services: The Costa Rican Experience and its Implications"

³ Chomitz, Brenes, Constantino, 1998. "Financing Environmental Services: The Costa Rican Experience and its Implications"

Unfortunately, hydrological information is not available to enable the quantification of benefits provided by increased forest cover in terms of water quantity and quality.

The environmental services program works well due to several factors:

- A national consciousness and the institutional structure necessary to undertake this type of program;
- A national recognition of the importance of forests and a public willingness to internalize the costs of these services; and
- An existing demand on the part of landholders for this type of program.

At the same time, the mechanism still has a series of disadvantages to overcome:

- The tendency to favor large properties;
- Dependence on national government financing (primarily through the fuel tax), which limits the resources available for the program; and
- The absence of a direct link between the environmental service and the beneficiary, meaning that the benefits are not discernable to the majority of the population.

In the future, it is evident that the mechanism for internalizing the costs of the environmental service of water will be water charges covering the different types of uses (domestic, industrial, agricultural, hydroelectric, flood control). Currently, water charges continue to reflect the cost of delivering water to the user. However, the Biodiversity Law incorporates the concept of payment by water users for the environmental services provided by ecosystems. The Public Services Law also establishes environmental sustainability as criteria for setting rates and tariffs. Through this mechanism, the Ministry of Environment and Energy contracted a study on the domestic sector's ability to pay for water and found that charges for environmental services were feasible. (Barrantes y Castro, 1998)

For more information:

FONAFIFO: Tel (506) 257-8475

Carlos Manuel Rodriguez

Ministry of Environment and Energy (MINAE)

Tel (506)233-4533/257-0922/223-2124/257-1417

Adalberto Gorbitz

Costa Rican Office of Joint Implementation (OCIO)

Tel (506)299-2846



NEW YORK CITY WATERSHED AGREEMENT

NEW YORK CITY

New York City receives 1.4 billion gallons of drinking water to supply the needs of 9 million inhabitants (8 million in NYC and 1 million in surrounding suburbs). Water comes from a system of 19 reservoirs in a watershed of 1,969 square miles. Only 10% of the water that supplies the city comes from local sources, while 90% comes from water 6 reservoirs located in the Catskill, Delaware and Croton watersheds in upstate New York about 125 miles from the city. The three watersheds cover an area about the size of Delaware, and a portion of eight counties, 60 towns, and 11 incorporated villages. The Catskill/Delaware watersheds cover approximately 1,600 square miles with a population of around 77,000 year round. There are approximately 350 farms in the Delaware and Catskill watersheds, a majority of which are dairy.

Average annual demand for water per family is about 100,000 gallons per year, at a cost of \$1.20 per 100 cubic feet of water (\$160/year).

PROBLEM

The city's dependence on water from outside its jurisdiction had resulted in conflicts with communities in the zone around its sources. The growing demand for water generated resentment on the part of landowners in the watersheds who were uncompensated for the service the water on their properties provided to the city. The result was a long history of legal complaints.

The main stresses to the system include phosphorus, microbial pathogens, and polluted runoff. The primary sources of the pollution are wastewater discharges, and runoff from urban and agricultural sources. Concerned about the quality of drinking water, EPA had notified NYC that it would be required to construct a filtration plant at a cost of about \$4 billion.

SOLUTION

In 1991, EPA granted a conditional filtration waiver to the City of New York, which was reissued in 1993. In an effort to comply with EPA's requirements and protect the city's water supply and the rights of the residents in the upstate counties, the governor formed an ad hoc committee to negotiate an agreement. A key issue was whether the city could work with the upstate communities to avoid having to filter the Catskill/Delaware system - a costly proposition. In addition, there were controversies associated with the costs of complying with regulations and how land would be acquired for protection. The committee was composed of representatives from New York City, New York State, communities of the watershed, environmental interests and the U.S. EPA, and employed a consensus-building approach to negotiating an agreement.

An agreement was reached in January 1997 where EPA is expected to extend the city's filtration waiver to December 1999. In return, the city will take several actions including upgrading wastewater treatment facilities and instituting rules and regulations in the watershed. The city will also acquire land and support upstate/downstate partnership programs (water quality investment, economic development fund, and a regional water

shed partnership council). The communities upstate will have the opportunity to sell property if they so choose. In addition, they will participate in the regional watershed partnership council, which will also be composed of state, city, and downstate consumers.

The agreement called for an investment of \$1.4 billion over the next ten years, of which the city would pay \$660 million in the first five years. The investment would go towards guaranteeing the quality of water resources for human consumption. For this service, the water users of New York agreed to a gradual increase in their water bills. It is estimated that a \$400/year water bill will rise to \$435 by 2002.

Several components of the watershed protection program funded by the city were established in the early 1990's: upgrading the nine upstate sewage treatment plants the city owns and operates (approximately \$232 million); rehabilitating and upgrading city-owned dams and water supply facilities in the watershed (approximately \$240 million); and implementing the Watershed Agricultural Program (approximately \$35 million).

Other components were:

Land Acquisition Program

Under the Agreement, the State Department of Environmental Conservation (DEC) issued a 10-year permit (with a 5-year renewal option) to enable the city to acquire, through outright purchase or through conservation easements, interests in undeveloped land near reservoirs, wetlands and watercourses, or land possessing certain other natural features that are water quality sensitive. The city is committed to spending \$250 million on land acquisition in the area of the Catskill/Delaware system (potentially increasing to \$300 million) and \$10 million in the Croton watershed. The State will invest an additional \$7.5 million in Croton watershed land acquisition. The city will not use condemnation to acquire land under this program. The Agreement provides for a local consultation process to ensure that the city is aware of and considers the interests of watershed towns and villages when it proposes to acquire property within their jurisdictions.

While the city is not required to purchase a specific amount of acreage, it must contact the owners of more than 350,000 acres of eligible land in the area of the Catskill/Delaware system. Specific acreage milestones are identified for each of four priority areas. The Agreement defines and ranks these priority areas based on a number of factors, including their proximity to reservoir intakes and their distance from the city's distribution system. The Agreement also sets out a multi-year schedule for the city to make contact with landowners over the 10-year term of the permit.

The Agreement allows towns and villages to exclude certain parcels from acquisition by the city through outright purchase (but not through conservation easements). West of the Hudson River, towns may exclude a scheduled amount of acreage in certain identified population centers. A village may exclude all of the land in that village. Towns may also reserve and exclude from acquisition up to 50 acres in certain priority areas for commercial or industrial use, as well as certain tax map parcels located within one-quarter mile of a village, abutting defined road corridors. East of Hudson, the city cannot acquire more than five percent of the commercially zoned land in a town or vil

lage unless the town or village passes a resolution allowing for a higher percentage to be acquired. The city undertook to buy lands, prioritizing undeveloped and environmentally sensitive land such as wetlands near reservoirs and water distribution systems.

Watershed Protection and Partnership Programs

The Agreement also calls for the creation of a Catskill Watershed Corporation, a locally based non-profit entity that administers much of the approximately \$240 million the city has committed to water quality and economic development programs west of Hudson. East of Hudson, the city will spend approximately \$70 million on water quality planning and infrastructure improvement projects through direct agreements with Westchester and Putnam Counties.

These partnership programs include: septic system inspection and rehabilitation; construction of new, centralized sewage systems and extension of sewer systems to correct existing water quality problems; stormwater management measures; environmental education; improved storage of sand, salt and de-icing materials; and stream corridor protection projects.

The Agreement also creates the Catskill Fund for the Future, a \$60 million economic development “bank” that will issue loans and grants to support responsible, environmentally sensitive projects in the western Hudson watershed. The Fund, managed jointly by the Catskill Watershed Corporation and the State Environmental Facilities Corporation, will help sustain economic growth and stability in the region, while ensuring that the projects it funds are compatible with the Agreement's water quality goals.

New Watershed Regulations

The Agreement set forth the process by which a new set of watershed regulations, also negotiated as part of the Agreement, was submitted for public review and adopted. Parties to the Agreement with litigation against the city challenging the city's proposed regulations or other aspects of the city's watershed protection programs agreed to withdraw the litigation. In addition, all parties agreed to forgo future challenges contesting the validity or enforceability of the city's program, including the issuance of a new filtration waiver by EPA to the city; promulgation of the new watershed regulations; and implementation of a land acquisition program consistent with the Agreement.

The 1997 watershed regulations replace outmoded, 44-year-old standards and will dramatically improve the protection of the city's water supply while permitting responsible development and community revitalization in existing population centers. The new regulations, among other things, establish standards for the design, construction and operation of wastewater treatment plants; set design standards and setback requirements for septic systems; and require the implementation of stormwater control measures for a variety of commercial, residential, institutional and industrial projects. The regulations also provide for city review and approval of certain activities having a potentially adverse impact on water quality, with strict time frames for review and decision-making, expedited procedures in case of emergency and rights of appeal.

Watershed Protection and Partnership Council

A Watershed Protection and Partnership Council (the Council) was created as a permanent, regional forum to aid in the long-term protection of drinking water quality and the economic vitality of the Watershed communities. The Council will represent a broad-based, diverse group of interests that share the common goals of protecting and enhancing the environmental integrity of the Watershed as well as the social and economic vitality of the Watershed communities. The Council will also be a forum for discussion and review of water quality concerns and related Watershed issues, and will make recommendations on future actions to be taken by the city, federal government, and state to enhance Watershed protection.

RESULTS

The Agreement is a success in that it focuses on areas of agreement and moves the city and state beyond the controversy in which they were stuck for so many years. Because of the Agreement, regulations will be issued, land critical to the health of the watersheds will be purchased, and wastewater treatment systems will be upgraded. In addition, New York City's drinking water consumers will benefit from the cost savings of avoiding filtration.

As of October 31, 1998, DEP has accomplished the following:

Land Acquisition — The city exceeded the MOA's Year One goal by soliciting more than 56,609 acres, and is on target to meet the Year Two goal of soliciting 51,266 acres. The city has acquired more than 4,079 acres of watershed land and has an additional 8,256 acres under purchase agreement. Under the MOA, the city agreed to solicit the owners of 355,050 acres of watershed land within ten years.

Enforcement of Watershed Regulations — One of the primary mechanisms for protection of the city's drinking water supply is the revised and enhanced Watershed Rules and Regulations. Since the promulgation of the new regulations, DEP has reviewed applications for over 1,400 new septic systems, 110 stormwater pollution prevention plans and nearly 525 other projects. Over 700 regular inspections of watershed wastewater treatment plants have been conducted and 47 compliance conferences were held when inspections uncovered operational problems.

Also, DEP's Protection Unit has issued over 170 Notices of Violation, as well as an additional 925 Notices of Failure. Notices of Failure are issued when a failing septic is identified and repair of that septic may be eligible for inclusion in the Septic Rehabilitation and Replacement Program, under which over 300 failing septic systems in the Catskill and Delaware watersheds have been repaired or replaced since the signing of the MOA. The watershed police have issued over 340 Environmental Conservation Law or Penal Law summonses and 652 Notices of Warning. In addition, police staff have logged over one million patrol miles throughout the watershed since May 1, 1997.

Programs — In accordance with the terms of the MOA, the city made more than \$88 million in first payments on April 21, 1997 to the watershed communities and programs

outlined in the Agreement. Since then, regular payments have continued for a number of programs as required by the MOA. *Other program highlights include:*

-- The city has agreed to fund the upgrades of over 100 municipal and private wastewater treatment plants in the watershed. This program has achieved two significant milestones - all eligible facilities have agreed to participate in the upgrade program and all plants have provided schedules for bringing their facilities into compliance with the watershed regulations. All upgrades will be completed by May 2002.

-- To date, the Watershed Agricultural Program has secured farmer participation agreements with 317 of the approximately 350 Catskill/Delaware farms. 55 best management practices were implemented on farms in the past quarter. In addition, the city has entered into a Memorandum of Agreement with the U.S. Department of Agriculture (USDA) and New York State to implement a Conservation Reserve Enhancement Program. This program will allow farmers to enter into 10 to 15 year contracts with the USDA to retire environmentally sensitive farms lands from production.

Education and Outreach — Under the MOA, the city provided funding for a watershed museum that will include exhibits on the character of the Catskills and the city's reservoir system. DEP has provided a variety of training programs, ranging from information sessions on the revised watershed regulations for local elected officials, to training on stream bank stabilization for heavy equipment operators.

For further information about the New York City Watershed Protection Program, please call 718-595-5371 or contact Mr. Erin Crotty, Director of Environmental Programs, Office of the Governor, Room 242, Capitol, Albany, NY 12224 www.ci.nyc.ny.us/dep



**CONSERVATION OF WATERSHEDS IN PARANA,
BRAZIL**

BRAZIL

PROBLEM

The metropolitan region of Curitiba contains 1.5 million inhabitants who consume one-third of the state of Parana's drinking water. Parana's Environmental Institute estimated that 83% of the state's territory had been covered by forest a century ago, but by 1992, the forested area had decreased to about 5%. The figures starkly highlighted the need for conservation of remaining forest.

SOLUTION

The state of Parana decided in the early 1990's to include environmental criteria in determining distribution of income from the state value added tax (ICMS*). The idea was to compensate municipalities for the environmental service they were offering through long-term conservation of natural areas.

Complementary Law No. 59 (known as the Law of the Ecological VAT), adopted by the state's Legislative Assembly in October 1991, provided that 5% of the ICMS be redistributed to municipalities in the following manner:

- a) 50% for those municipalities that maintain watersheds supplying public water supply systems; and
- b) 50% for those municipalities that establish within their territories "environmental conservation units," which are broadly defined as public or private areas of environmental preservation, ecological stations, parks, forest reserves, woods, wildlife refuges, natural tourist sites, or indigenous areas.

MECHANISM

The Environmental Institute of Parana (IAP), the technical entity responsible for the natural and hydrological resources of the state, developed an environmental index that evaluates the quality of the conservation units. The basic criteria for rating the quality of the units include: location (urban or rural); area; population density; water quality; existence of a management plan; infrastructure; financial management capability; and existing level of protection. Every year, each municipality must provide record of its public and private conservation areas. The IAP verifies the information and rates the areas according to above-listed criteria. This information is used to determine the amount of tax to be distributed to the municipality. As a positive financial incentive, the higher the quality of a municipality's water, the higher the amount it receives. The process is simple and documented in such a way that with only a calculator and a briefing by the IAP, any municipal employee can estimate the amount of funds to be received.

RESULTS

The system has generated clear benefits. Foremost, the mechanism has provided an important incentive for increased investment in conservation statewide. In 1996, 190 conservation units had been formed, which represented an 800% increase since the program began. In ten years, the IAP will have created a statewide system of conservation units. The amount redistributed to the states was \$19 million in 1994 and \$30 million in 1995. The program's incredibly low incremental administrative costs, which were \$32,000 in 1995, attest to its efficiency (Vogel, 1996). The program's effect on water has been significant as municipalities have undertaken conservation measures, with improvement estimated at 68% in 1995 (Vogel, 1996).

In the process, new Municipal Environmental Councils have been created. The councils develop proposals to be funded by redistributed tax receipts and use those funds as leverage in seeking additional sources of financing. The mechanism has also had the effect of redistributing more resources to small municipalities, since adding the environmental criteria reduces the weight of other, more traditional criteria such as population and production.

The system has its limitations. Resources received by the municipalities are not always correctly applied to environmental protection. There are cases in which funds have been rerouted to other social services such as education, transportation and health. While the resources undoubtedly provide benefits to the community, they do not necessarily benefit conservation of water or natural reserves.

However, the system has operated well enough that it has inspired other states to develop similar mechanisms. The state of Minas Gerais has initiated a system in which half of the incentive funds go to municipalities that provide for better wastewater treatment. According to a 1994 study by the National Secretariat for Public Administration, if every state had such a mechanism, Brazil would generate \$500 million per year for conservation of biodiversity (Loureiro 1996).

For more information:

Wilson Loureiro
Director of the Department of Conservation Units
Environmental Institute of Parana
Rua Pedro Rolim de Moura, 45
CEP:80.030-250-Curitiba-Parana-Brasil
FAX: 55 41 222 2850

* Imposto sobre Circulacao de Mercadorias e Servicos



**WATERSHED CONSERVATION FUND IN QUITO,
ECUADOR**

ECUADOR

Although numerous watershed conservation initiatives have been launched, there are very few that incorporate protection of water resources as well as conservation of an area of great ecological importance. Protected areas in South America cover about 18 million square kilometers, which represent about 20% of the continent's surface area. Unfortunately, the current level of investment is insufficient to guarantee conservation of valuable ecosystems. For that reason, The Nature Conservancy has worked with local partners to develop a mechanism designed to promote water resources protection and ecological conservation.

ECUADORIAN EXPERIENCE IN THE CAYAMBE-COCA AND ANTISANA RESERVES

Quito, the capital of Ecuador, and its neighboring populations are supplied with water from the high plateaus located in protected areas of the Andean Range, including the Cayambe-Coca and Antisana Ecological Reserves.

A number of diverse ecosystems that provide important ecological services are found within the 400,000 hectares of the Cayambe-Coca Reserve, from the snow-capped mountain known as Nevado Cayambe at 5790 meters above sea level to the Amazonian plains at 600 meters above sea level. Cayambe's glaciers alone are estimated to store a water volume of approximately 1.4 cubic kilometers. Many lakes and wetlands and eleven major rivers begin in the subalpine rain plateau, which is characterized by semi-permanent cloudiness.

The 120,000 hectares of the Antisana Ecological Reserve also include high plateaus and snow-capped volcanoes, where extensive sheep and cattle grazing occur, along with hunting, fishing and tourism. Water is taken from the Tumiguina and Blanco Chico rivers for the large Papallacta water system. The La Mica-Sur water system is under construction around La Mica Lake, which will supply drinking water to 600,000 people in Quito.

PROBLEM

Although in good condition and abundant in these areas, this water does not enjoy unlimited or permanent availability. The Cayambe-Coca Reserve is inhabited by 7,000 persons dispersed throughout the area who require water for crop and vegetable cultivation and use the plateau for extensive livestock grazing. In the adjoining region, approximately 20,000 inhabitants live in tenant farmer cooperatives, indigenous communities and as private landholders. Activities in the area include raising of dairy cattle, controlled harvesting of wood, poor agricultural practices such as overgrazing and burning of scrubland, oil exploration, irrigation, and hydroelectric generation. The unregulated influx of tourists drawn to the area's natural beauty may also cause damage to the area.

Unregulated development of these activities threatens the ecological balance of the reserves, as well as the long-run viability of the activities themselves. The degradation of

water quality affects the water supply reaching Quito and its neighboring communities. Erosion causes sedimentation in water flows and reduces power generation capacity. Unfortunately, the lack of resources for the operation and protection of the reserves threatens the long-term conservation of these vital ecosystems.

Hence, the urgent search for alternatives to support the efforts of various environmental entities and the Ecuadorian Forest and Natural Areas Institute (INEFAN) in the management of these protected areas.

SOLUTION

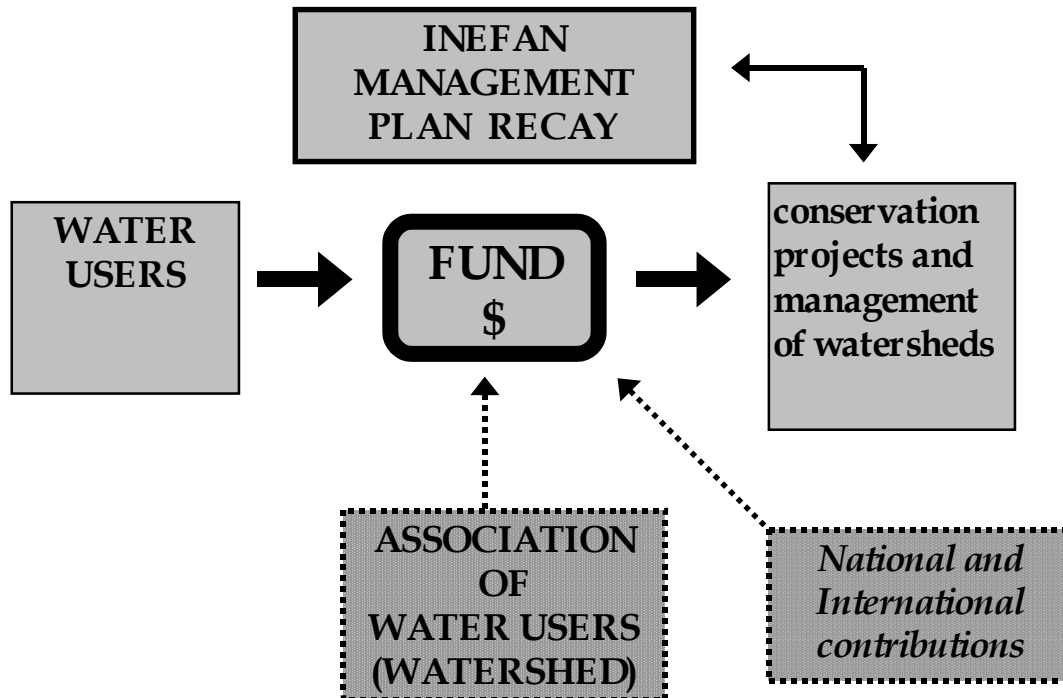
The Nature Conservancy and the Fundacion Antisana, a non-governmental organization, with support from USAID, proposed the creation of a water consumption fee to fund conservation projects and improved management of the watersheds located in the two reserves. The proposal called for the Fund's resources to be managed by an experienced asset management company to ensure financial stability. In addition to funds collected from water users and the water authority, the Fund would eventually solicit additional support from national and international entities. Projects carried out by conservation entities with Fund resources must be closely coordinated with the reserves' management plans to complement, not duplicate ongoing efforts.

The proposal enjoyed the strong support of the manager of the water entity as well as former mayor of Quito (and current president of Ecuador) and was formally launched at a ceremony in April 1998 as the Water Conservation Fund (FONAG). The current mayor of Quito has also lent enthusiastic support to the Fund, and is working hard to ensure implementation in 1999.

In the early stages, the program will include the Cayambe-Coca and Antisana Reserves. However, this experience should eventually be expanded to encompass the remainder of the "Condor Bioreserve," which includes these two reserves in addition to the Sumaco Napo Galeras National and Cotopaxi National Parks.

HOW DOES THIS TYPE OF FUND OPERATE?

The final objective of the Fund is to collect a small fee from all those who draw water from the watershed, whether for agricultural, industrial or residential purposes, to be used for the protection of that watershed (as shown in the chart below).



Differentiated fees can be charged to users, with discounts for non-extractive uses (such as electricity generation and recreation) and higher fees for consumptive uses (drinking and irrigation).

Upon creation of the Fund, the users themselves will define the criteria for managing the Fund. Such criteria could include:

- The Fund’s resources will be used exclusively for activities intended to manage and conserve the watersheds in the ecological reserves;
- These activities must be coordinated with the environmental authority, based on the guidelines established in the respective management plans;
- The execution of these activities will be implemented through specialized conservation entities;
- Activities should include the active participation of surrounding communities;
- A percentage of the resources may be earmarked for projects that provide alternative income sources to the region’s inhabitants;
- The financial administration of the fund will be assigned to a private financial entity, through the formation of a trust;
- The fund seeks to be as efficient as possible, limiting the percentage of resources allocated to administration to 10-20%.

To guarantee the participation of users and entities working in the area, a Board of Directors would be formed of 3-7 representatives, who may be selected from:

- Water utilities
- Electric generation utilities
- Private users (agricultural, industrial, household, and recreation operators)
- The national protected area authority
- Non-governmental organizations working in the area
- Local governments
- Local community representatives

In addition, the Board of Directors could include a number of permanent observers such as specialized conservation organizations working in the area.

STEPS FOR THE CREATION OF A FUND FOR WATERSHED PROTECTION

Stage One: Link the Users

To make the idea a reality, water users should be identified and energized to participate in the creation of the fund.

Current water usage should be determined in order to set a fee that will allow conservation work to begin. Those users who are able to pay should make initial contributions. Other users should eventually be brought in until all users are participating.

With initial funds, a trust should be established through a private financial entity to maximize the potential of available resources.

Stage Two: Lay the Foundations

The Fund should be legally registered. At this stage, the operational guidelines of the fund should be defined.

Stage Three: Seek Other Contributions

When the Fund is up and running, voluntary sources of contributions may be sought from national or international persons or entities committed to the protection of watersheds.

WHAT CAN BE ACCOMPLISHED WITH THIS FUND?

The creation of the fund would allow for greater coordination of the individual initiatives undertaken in the region. The links established with other entities, including those specializing in conservation, would permit access to their strengths and capabilities. This joint work would provide the transparency and continuity that are required for successful conservation; in this case the maintenance of a clean and abundant source of water.

The fund would make resources available for the development of the following types of programs, depending on the needs of the watersheds:

Compensation for Land Possession: Since conflicts regarding land ownership continue to exist in the region, it might be necessary to purchase lands in critical and priority zones to protect water sources.

Control and Supervision Program: A permanent and stable supervision system is required to conserve the upper regions of the river basins and prevent their deterioration, controlling access to water springs and sources and controlling hunting, fishing, burning and dumping of wastes.

Watershed Protection Measures: Projects such as the enclosure of springs to prevent trampling by livestock and the digging of trenches to control erosion and stabilize banks may be required to recover water production capacity.

Valuation of Environmental Services: Scientific and economic data must be gathered in order to estimate the value of hydrologic productivity and the effects of human intervention and to determine the value of the services provided by a watershed. The most concrete initial component of valuation to date has been the cost of patrolling.

Sustainable Economic Activities - Education and Training: In order to reduce pressure on natural ecosystems, efforts must be made to work with inhabitants of the reserves and neighboring areas to modify agricultural practices and generate productive alternatives that do not diminish the watershed's productive capacity. The control of indiscriminate hunting and the burning and disposal of refuse also require continual educational efforts.

Evaluation and Follow-up Programs: Periodic evaluation of the results of the fund's programs and projects is needed to ensure that objectives are met. Indicators such as changes in ground cover and variations in water quality and flow permit evaluation of the projects' success or failure and the implementation of corresponding corrective measures.

These activities must be the result of short, medium and long term multi-institutional planning for the complete management and conservation of the watershed. If the watershed is located in a protected area or reserve, activities should also be coordinated with the corresponding reserve management plan.

LET'S BEGIN NOW!

This proposal requires the decision by the parties involved to move forward. Details will need to be worked out, but the interest and the will to proceed will allow the idea to move forward. Since each situation is unique, various existing models should be examined to determine the elements that may work the best in each particular area.

While there is no single model, the Fund should include the following elements:

- Economic valuation of water resources;
- A multi-sectoral mechanism that includes the participation of the public and private sectors, local communities and non-governmental organizations;
- Development of a financing plan for sustainable income.

For more information:

The Nature Conservancy
Latin America and Caribbean Region
Conservation Finance and Policy
4245 N. Fairfax Drive
Arlington, Virginia 22203
PHONE: 703-841-4187
FAX: 703-841-4880



THE FRENCH SYSTEM OF MANAGING RIVER BASINS

FRANCE

In France, water belongs to the “patrimoine commun de la nation” (public trust) and the state is custodian of the resource. An important aspect of the French system is that water resources are managed at the river basin level. As a result of the 1964 Water Act, six river basin committees (Comites de Bassin) and six basin agencies (Agence de L’Eau) have been formed, and their territories closely correspond to the major catchment areas. They specialize in water resource management (planning and macro management), which they have performed efficiently for twenty-five years. The river basin committees facilitate coordination among all the parties involved in managing water resources. These committees have become the center for negotiations and policymaking at the river basin level. To formulate action plans, the basin agencies generate and use extensive data on the current and targeted quality and quantity of water and industrial effluents. A center of technical expertise and knowledge about water resources used by government agencies and other interested parties, they have become the primary planning institution for river basins.

The committees approve the long-term (twenty to twenty-five year) schemes for developing water resources. Every five years they vote on action plans to improve water quality. In addition, they vote annually on two fees to be paid by water users within the river basin: one fee based on the level of water consumed and the other one on the level of pollution at each point source. These two fees encourage environmentally sound behavior in water use and provide resources for financial incentives (grants or soft loans) to invest in improved water purification and development to achieve the five-year action plan. The committees are composed of 60 to 114 persons, who represent interested parties: the national administration; regional and local governments; industrial and agricultural groups; and citizens.

The water agencies implement the policies set by the committees in their basins. They, in turn, propose the long-term scheme to develop water resources, the five-year plan, and the level of water fees and incentives. They also collect fees, extend grants and loans, make midterm plans, collect and process data, conduct studies and finance research programs. The agencies are directed by an Administrative Council, composed of water users, persons elected by the Committees, and government representatives. Agency directors are appointed by order of the Ministry of Environment.

Under French law, communities have the power to create and manage water distribution and sewage services provided to the public. Communities also have the legal right, when they feel it necessary, to delegate all or part of their task to a private operator through a management, lease or concession contract.

FEES

Under French Law, anyone who pollutes, abstracts or consumes water is subject to a fee. This includes essentially:

- Towns and urban centers that abstract and consume large amounts of water and produce pollutant loads;

- Industries that, in general, abstract and consume little water but cause many different types of pollution;
- Farmers;
- Inland waterways;
- The French Electricity Board (EDF)

The water boards distinguish two types of fees: the pollution fee, related to discharges into the natural environment; and the resource fee, related to abstraction and consumption.

Pollution fees are based on the volume of pollutant load discharged into the natural environment. For domestic pollution, the fee is based on the total population. Each inhabitant contributes to the cost by means of surtax on the price of water, which is then transferred by the water utility to the water board. For nondomestic pollution, the amount of pollution is either measured or estimated in terms of a lump sum on the basis of the activity concerned. The fees are gross fees and correspond to the gross pollutant load before any purification treatment. When waste treatment plants have been installed, the community or industry is awarded a purification bonus, which is deducted from the gross fee levied to obtain the net fee.

Resource fees are used to cover part of the program for quantitative water management – to finance storage reservoirs, water distribution systems, and irrigation structures. The fee is a combination of two fees – one determined according to the volume of water abstracted, measured or estimated, and the fee determined by a coefficient, depending on water usage, applied to the net consumption. Like the pollution fee, the resource fee is collected as a surtax on the price of water and is transferred by the water utility to the water board.

KEY ELEMENTS OF THE FRENCH MODEL:

Well-defined laws and regulations: The Water Acts of 1964 and 1992 are the foundation of the French system. The earlier law establishes specific quality objectives and regulations for pollution control, while the later act is designed in part to meet stricter European directives on water management.

Hydrographic basin management: The system is organized around six major hydrographic basins, with appropriate national policy oversight. These correspond to the country's four main catchment areas and to two areas of dense population and intense industrial activity.

Comprehensive management, decentralization, and participation: Each of the six basins has a basin committee and a corresponding executing agency, a water board. The basin committee, also known as a “water parliament” because of its representation and powers, reflects regional – rather than central – government control and is designed to promote the roles and responsibilities of different interest groups in the basin. The water boards, while executing the committee's directives, are also responsible to the central government for certain technical matters (such as upholding national standards). Water and

sewerage services are provided by either public or private firms (increasingly through competitive bidding) and are chosen by communities.

Cost recovery and incentives: The companies and entities operating water services deliver a portion of the charges they collect to the basin agencies. In addition, a “pollution fee” (a penalty) is collected by the basin agency. Most of these revenues are reinjected into the system to provide technical assistance and to help the public or private sector ensure that water is safe and purified.

Supporting research: About 14% of the water board’s expenditures in 1992-96 were budgeted for research and development. Each water board operates rainfall and flow-gauging networks and databases, which provide them with detailed knowledge of the basin. The water boards conduct individual and joint studies and research projects in certain fields related to their activities, such as nitrate and pesticide pollution, rainwater management and accidental pollution. The water board also provides assistance and expertise, particularly with regard to the training of water management personnel.

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