



WATERSHED ECONOMICS

One reason for imbalance in upstream/downstream exchange is that watershed environmental services are often treated as pure “public goods”. Unlike other watershed resources, such as timber, livestock products or minerals, the value of these services is seldom expressed in monetary terms and there are no markets where they can be bought or sold. Nevertheless, upland water, sediment, hydropower, vegetation cover, and disaster prevention services have quantifiable market values, even though none of these are fully taken into account in upstream/downstream financial exchanges. The market value should include the opportunity costs borne by upstream stakeholders for limiting their use of critical resources (e.g. land, forest), or for their disadvantaged living conditions (e.g. lack of roads, distance from marketplaces). Watershed environmental services are therefore better addressed as environmental “externalities” — values that the market fails to include — rather than as pure “public goods”.



Top: An irrigation scheme in arid northern Senegal

Bottom: Selective timbering for sustainable forest use in Belém, Brazil

Opposite page: Mountain freshwater discharge has a major economic value

WATERSHED MANAGEMENT AND GLOBAL TRADE: THE PANAMA CANAL

For each transiting ship, 200 litres of freshwater are needed to operate the locks of the Panama Canal. Every year, 14 000 ships pass through the canal, and freshwater demand has become unsustainable for the canal watersheds, which are highly degraded. Scientists at the Smithsonian Tropical Research Institute in Panama think that reforesting the watersheds would help regulate the water supply and decrease the amount of sediment

and living matter in the canal's engineering. More trees would trap sediments and nutrients and regulate the supply of freshwater. The effect of reforestation around the Panama Canal would be comparable to those of conventional engineering works such as reservoirs and filtration beds.

Every year, 192 million tonnes of cargo and 700 000 people are transported along the Panama Canal. If the canal has to stop operating because of inadequate

watershed management, the costs of transporting people and cargo around South America will increase, and there will be significant increases in the prices of goods throughout much of the world. Viewed this way, sustainable management of the canal watershed is an investment in world trade infrastructure.

Source: Based on Environmental economics: Are you being served?, *The Economist*, 23 April 2005.

Right: One of the Andean lakes that supply water to the city of Cuenca, Ecuador

Opposite page: Forest protection sign at the entrance of the capital town of Himachal Pradesh, India



KEY TERMS

Payment for Environmental Services (PES) schemes are direct compensation mechanisms by which environmental service providers are paid by service users for the provision of a given environmental service. PES schemes in watersheds usually involve the implementation of market mechanisms to compensate upstream landowners for maintaining or modifying a particular land use that positively affects the availability and/or quality of downstream water resources.

Environmental public goods are environmental goods (e.g. air, water or landscape) that are available to everybody on a non-rivalry (i.e. use does not diminish access for other users) and non-exclusion (i.e. use does not prevent other users from benefiting from the good) basis.

Externalities occur when a fraction of the economic value of a good is not captured by its market price. For instance, water tariffs seldom include the costs of conserving the forested watershed from where the water comes.

Recovering these “externalities” is essential to ensure a steady and continued source of financing for watershed management programmes. In affluent countries, public sector subsidies and incentives are made available to upstream stakeholders as compensation for their environmental services. But economic and political constraints prevent most developing countries from delivering subsidies. Direct payment for some of these services has been successfully tested, particularly for the provision of drinking-water supply. Watershed trust funds have also been created, with bonds sold to private investors and parts of the profits used to operate watershed works.

Payment for watershed environmental services is affected by technical, cultural and political factors. At the outset, there is a major difficulty in estimating the actual value of watershed externalities. Site-specific assessments are necessary to identify the benefits that are provided in a specific social and economic context, and the scales at which they can be detected and have economic significance. Next, the capacity and willingness of lowland beneficiaries to pay should be assessed and promoted. A legal and administrative mechanism should be put in place to control the quality of the services provided, collect payments and ensure that benefits are eventually transferred to watershed management activities. This complex process needs sensible and competent local governance.

A MUNICIPAL WATERSHED INVESTMENT FUND

Most of the water supply for Ecuador's capital Quito originates in two watersheds in the ecological reserves of Cayama-Coca (4 000 km²) and Antisana (1 200 km²) in the Andes. Although these are both protected areas, their watersheds are threatened by agricultural production and extensive livestock grazing, with impacts on both the quality and the quantity of water for drinking, irrigation, power generation and recreation. The destruction of forests and grassland contributes to degradation of the high plateau and is assumed to affect the stream flow, causing floods in winter and drought in summer.

In 1998, the Watershed Protection Fund (FONAG) was created to finance the environmental conservation of upstream reserves by municipalities and upstream land users. Conservation measures are implemented according to a collaborative management plan, which is adapted to the environmental plans of the two ecological reserves.

Since 2000, FONAG has been managed by a private asset manager. Its Board of Directors comprises representatives of the municipality, conservation organizations, the hydroelectric company and water users.

The fund is independent of the government, but cooperates with the environmental authority so that FONAG activities are in line with the conservation objectives of the ecological reserves.

FONAG received an initial donation from the United States Agency for International Development (USAID). User contributions vary: for example, the water supply company pays 1% of potable water sales, and other subscribers pay annual fixed amounts. Currently, the fund has nearly US\$2 million, and investment bonds for 2005 are estimated at about US\$500 000.

