PAYMENTS FOR WATERSHED SERVICES

USAID PES Brief 2.2

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Approach to watershed management

A watershed is an area that drains to a common point, making it a useful unit for managing water resources. The key characteristic of watersheds, from a human perspective, is that water generally flows downhill, so that upstream land uses affect downstream conditions through hydrological linkages. All over the world, watershed management efforts aim to influence this upstream-downstream relationship. They do so by encouraging upstream land-use practices that are consistent with maintaining the watershed so that it yields water that is unpolluted, low in sediment, buffered against flash floods, and with minimal fluctuations in dry-season and groundwater flows (Swallow et al., 2004). Local conditions determine what is possible and how best to achieve it. The basic scientific challenge in managing watersheds is to understand how upstream land-use practices affect natural resource conditions downstream, while the basic socioeconomic problem is to encourage people in an upper watershed to adopt those practices even though the benefits will accrue downstream – in other words, how to encourage them to deliver this environmental service.

Watersheds are the focus of a growing number of PES and PES-like arrangements. Four examples help demonstrate what is happening with payment for watershed services and provide some early lessons on the opportunities and pitfalls for further expanding this approach to watershed management.

New York City. In the 1990s, the U.S. Environmental Protection Agency informed the city of New York that it would have to build a filtration plant to ensure clean drinking water supplies. Instead of spending $4 billion to $6 billion on the plant, the city negotiated with landowners in the Catskill-Delaware watershed, the source of much of the city's water, to help them invest in whole-farm plans to reduce pollution. The plan succeeded because it emerged from shared visioning by all parties and because it was possible to develop land-use management approaches that improved farmers' bottom line while also protecting against water pollution. The resulting arrangement helped save more than $1 billion annually for the city by preserving its filtration avoidance permit

Heredia, Costa Rica. Heredia is a city whose municipal water authority serves almost 200,000 people with water that originates in micro-watersheds in the hills above the city. In recent years, the city's water quality has been threatened by changes in the watershed, including deforestation, urban growth, and livestock. In 2000, the water authority initiated a program to pay landowners to conserve and reforest lands in the upper watershed, both to limit further degradation (by eliminating cattle ranching and dairy operations close to the stream) and to rehabilitate degraded areas (through reforestation). To pay for the program, each customer of the water authority is charged a small fee, called the hydrological

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tariff, attached to the monthly water bill. Payments to landowners amount to $100 per hectare annually for conservation under a 10-year contract and $1,000 per hectare annually over five years for reforestation. To date there are 23 PES contracts covering about 1,200 hectares. Water consumers pay about $0.05 per cubic meter for the environmental service.

Sumberjaya, Indonesia. In Sumberjaya, the objective of watershed management is to protect against siltation and deliver a consistent flow of water to a run-of-the-river hydroelectric plant at the mouth of the watershed. Most of the 80,000 hectare watershed consists of Protection Forest, a category of government land that is to be protected to preserve watershed functions in support of downstream interests. Most of this area has been deforested and is inhabited by recent migrants who grow coffee on the land as squatters. When the hydroelectric plant was first planned in the early 1990s, the government evicted many farmers based on the belief that their land use would be bad for the power plant. Ultimately the eviction program was ineffective, and in 2000 the government established a new community forestry program in which farmers could remain on the land as long as they grew coffee in a way that was viewed as maintaining the watershed's hydrological function while protecting the remaining natural forest. In this arrangement, secure tenure is the reward for providing the environmental service. Land users form groups that apply jointly for the community forestry permit, which is good initially for a five-year probationary period, followed by a 25-year extendable permit. In Sumberjaya, 10 groups covering several hundred hectares currently benefit from the program, with another 10 groups in the process of obtaining permits. Performance is judged for the group as a whole, which is responsible for policing its members. ICRAF is conducting research in the region to determine whether these new land use practices have improved the hydrological services for the downstream users.

Sukhomajri, India. In the village of Sukhomajri in northern India, a program was devised to build small catchment ponds to provide irrigation water to the agricultural lands below. To keep the ponds functional they needed to be protected against siltation that resulted from erosion in the denuded watershed above them. Rehabilitating the watershed required revegetation, which in turn depended on eliminating grazing by goats. However, landless people living in the village stood to lose from this arrangement because they had no land to irrigate, and grazing their livestock in the upper watershed was the source of their livelihoods. When the first pond was built, they refused to abandon the upper watershed, and silt quickly filled the pond and eliminated its irrigation capacity. Villagers devised an ingenious mechanism to ensure that all inhabitants gained from protecting the watershed. All farmers were required to pay a fee for using the irrigation water, with the proceeds shared among all households regardless of whether they farmed. This way even landless people earned income from irrigation, and they agreed to protect the watershed. The village economy was transformed, as stall-fed crossbred dairy cattle replaced grazing goats and local cows, high-value irrigated crops fetched high prices and raised the demand for labor, and the upper watershed became a lush forest.

These four cases show that watershed service agreements can operate in diverse settings and take several forms. Reward mechanisms include cash payments, technical and financial assistance, secure tenure, and a share of the benefits generated by watershed protection. Despite the apparent success of the four cases, however, watershed service agreements remain scarce. The New York case is unique among large cities worldwide; the Heredia case is mirrored by a few similar cases in Latin America; the Indonesia case is quite new, so it is too soon to know how well it will work; and the Sukhomajri model was replicated successfully in only a few small watersheds in India despite a nationwide watershed development program that spent billions of dollars for watershed development on hundreds of thousands of hectares.

Characteristics of watershed service payment mechanisms, lessons learned

Localized markets. Unlike carbon sequestration, which benefits people worldwide, watershed services are localized. Changes in upstream land use only affect people living downstream in the same watershed.

Threshold effects. Watershed services have threshold effects such that a minimum percentage of the watershed must be protected to deliver the service. In the New York watershed arrangement, for example, the city insisted that, although the arrangement was voluntary, it would be valid only if at least 85% of landowners in the watershed area joined. In Sumberjaya, groups of farmers must apply for the HKm permit to make sure that a larger area is covered. For carbon sequestration, on the other hand, the service is incremental, and it is the same whether it is provided from a single concentrated area or from small, isolated places around the world.

Science must be right. There are numerous incorrect assumptions about the science of watershed hydrology. For example, it is often assumed that trees in the watershed will increase water yield, but many trees are large water consumers, thus their presence would decrease water availability in the lower watershed, not increase it. It seems reasonable that an environmental service agreement will likely fail if it is based on a faulty understanding of the relationship between a given upstream land use and its effects on downstream natural resource conditions. Moreover, not all parts of a catchment may contribute equally to watershed benefits downstream. Science can help in locating the critical source areas that can be targeted for the most cost effective management.

Benefits must be high and attributable to watershed protection. Potential watershed services vary across locations depending on agro-climatic and other biophysical conditions, including the topography, soil types, climate, and the nature of the desired service. If benefits are high, developing a mechanism to reward those who provide the service is easier than if the benefits are low. Benefits also must be easily traceable to watershed protection, or potential watershed service buyers will be hesitant to pay for them. In Sukhomajri, for example, the benefits were very high and easily traced to watershed management, generating support for the arrangement and making it feasible to share benefits among all watershed inhabitants. Efforts to replicate watershed development across India faced challenges because in most locations benefits were much lower or could not easily be traced to watershed interventions.

Costs must be manageable. It is not only the benefit side that determines whether a watershed service agreement is feasible. If costs are too high they may exceed benefits. Costs include the payment to upstream land managers (which must be high enough to exceed their opportunity cost of giving up existing land use practices), and the various transaction costs associated with organizing and executing the agreement. Transaction costs arise among potential watershed service buyers, among watershed service providers, and between buyers and sellers. As with many environmental services, transaction costs are highest when there are multiple, small scale service providers and users. It is not surprising that the cases of New York City, Heredia and many others are characterized by a single large buyer. Similarly, although it would be most unusual in a developing country context to find just a single buyer, many of the successful cases are characterized by low population density in the service providing area, with a small number of service providers. In Heredia, for example, only 21 contracts are needed to cover 1,191 hectares.

Once an agreement is made, it may be that individual payments are made to each land manager, or else that a single payment is made and the sellers must divide it up. Where payments are made in cash, there may be concerns about whether everyone gets their fair share. Payments in kind or in the form of secure property rights as in Sumberjaya may be indivisible and thus not face this problem.

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October 2007