CASE STUDY - Kulekhani Watershed, Nepal

The Kulekhani watershed is located 50 km southwest of Kathmandu and is the source of water for the Kulekhani reservoir, which supplies water to two hydropower plants ($120 million total investment). When the reservoir was completed in 1982, it had a 100 year design life based on projected sedimentation rates. Unfortunately, due to high erosion rates and landslides in the watershed, the dead storage zone in the reservoir was filling at a rate 6 times faster than expected in the early 1990s, and the dead zone was projected to fill by 1999 or 85 years earlier than projected. An additional $40 million was required to decrease sediment loadings to the reservoir via upstream sediment trapping dams and the water intakes were modified to permit more sediment accumulation without blocking the intakes. These investments were projected to increase the life of the project by 50 years.

Nationalization of forests in the 1950s initiated deforestation processes in the Kulekhani watershed between the late 1970s and early 1980s when the Kulekhani hydropower plants were built. In the mid-1980s, the government and donor agencies launched participatory watershed conservation programs in Kulekhani watershed to encourage upland people to form community forestry users' groups, which gave the communities control of forest resources subject to approval of forest management plans. Forest cover declined between 1978 and 1992, but by 2001, forest cover rebounded to pre-1978 levels as trees planted in the mid-to-late 1980s began to mature. Analysis indicated that rates of sedimentation to the Kulekhani reservoir were declining by the late 1990s. Analysis of dry-season water-flow also indicated that water-flow to the reservoir increased as the forest cover increased.

In Nepal, the central government shares 12% of its electricity revenue royalties with local districts housing the hydropower plants. In early 2006, an Environmental Management Special Fund (EMSF) was established, which in turn receives 20% of the district's hydropower royalty (about US$55,000 per year) to support conservation and development programs proposed by upland community forest users' groups of the Kulekhani watershed.

The total area of the watershed is about 12,500 hectares, with 53 percent of the watershed in forest. About 45,000 people live in the watershed and there are approximately 8,000 households. Fifty percent of the Kulekhani watershed inhabitants live below the poverty line.

Case Study Questions:

1. Does the described NRM case seem suitable for PES? Why or why not?
2. If not suitable for PES, what type of program might you try to address this NRM problem?
3. What are the potential environmental services that might be involved?
4. Who are potential PES sellers?
5. Who are potential PES buyers and what services might they be interested in?
6. How would you determine if the service is being delivered (conditionality)?
7. How long do you think it would take for environmental services to be delivered in an economically significant way?
8. How could this program be made pro-poor?

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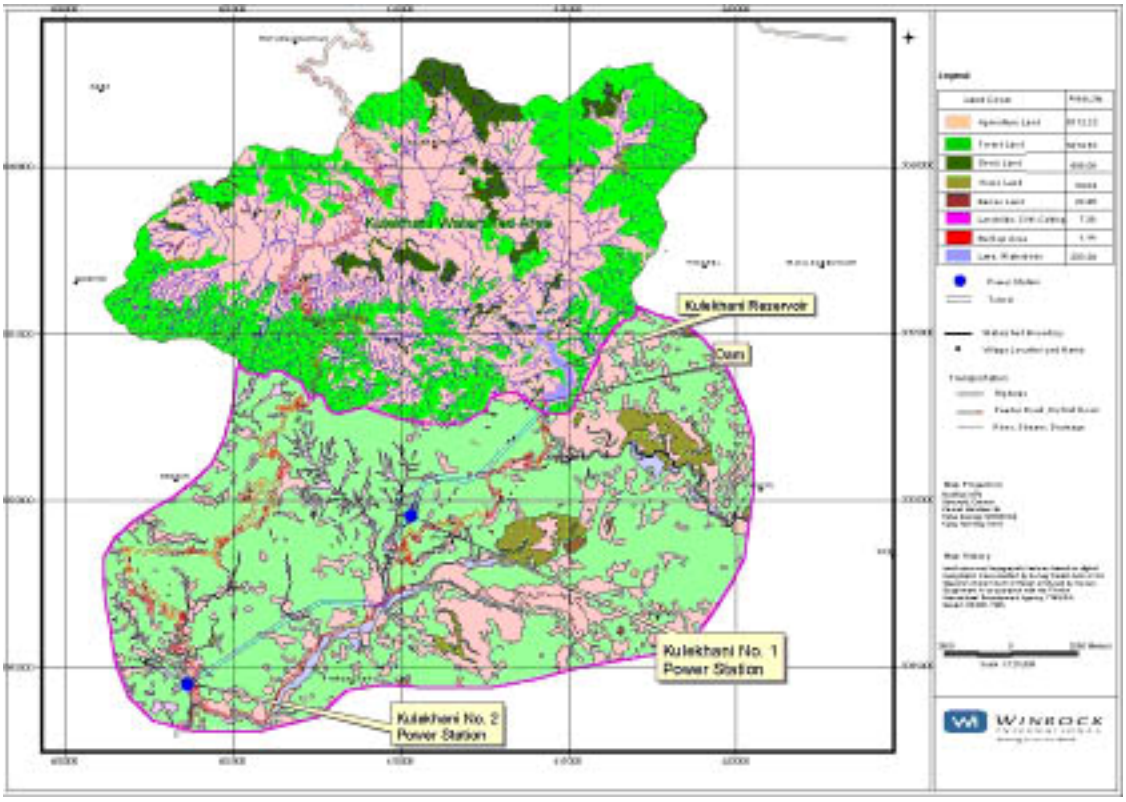
SANREM CRSP Working Paper No. 06-07. OIRED, Virginia Tech, Blacksburg.

CASE STUDY
Kulekhani Watershed, Nepal

Introduction

Located about 50 Km southwest of Kathmandu, the Kulekhani watershed is the source of water for the Kulekhani reservoir, built in the late 1970s, which supplies water to two hydropower plants located further downstream. Figure 1 illustrates the location of the watershed and reservoir. The total area of the watershed is about 12,500 hectares, with 53 percent of the watershed in forest. About 45,000 people live in the watershed.

Figure 1: Kulekhani Watershed, Reservoir, and Hydropower Plants



By conserving forests and undertaking other conservation activities, people residing in the Kulekhani watershed are supplying valuable environmental services. There is evidence that forest conservation has reduced the rate of sedimentation to the reservoir. Evidence also suggests that forest conservation has increased dry-season water-flow to the reservoir. These environmental services provide more water to the reservoir, which in turn increases electricity revenue and reduces maintenance costs of the hydropower developer (Nepal Electricity Authority). These environmental services also add to the revenue of the government of Nepal as the hydropower company pays taxes and royalties to the central government.[1]

[1] See Upadhyaya (2003).

Until recently, the people of the Kulekhai watershed received no benefits for providing these services. In the past, the government of Nepal and donor agencies provided incentives to upland people to undertake conservation activities. The termination of those programs and the high level of poverty among upland people are threatening to reduce these environmental services. The RUPES program is working with upland people and the beneficiaries of these environmental services to develop a mechanism to reward upland people for continuing to provide and enhance environmental services.

PES Mechanism

One of the first tasks of the RUPES program was to establish a relationship between land management patterns and flow of environmental services. Similar to other parts of Nepal, the nationalization of forests had already initiated deforestation processes in the Kulekhani watershed. Deforestation accelerated between the late 1970s and early 1980s when the Kulekhani hydropower plants were built. In the mid-1980s, the government and donor agencies launched participatory watershed conservation programs in Kulekhani watershed. These programs encouraged upland people to form community forestry users' groups. The results were encouraging. Analysis of land use patterns showed that forest cover declined between 1978 and 1992, but by 2001, forest cover increased compared to both 1978 and 1992 levels. Forest cover increased by 2001 because trees planted in the mid- to late 1980s began to mature by the late 1990s. The analysis of sedimentation patterns also indicated that rates of sedimentation to the Kulekhani reservoir had declined greatly by the late 1990s. The decline in the rate of sedimentation corresponds with the increase in forest cover. Analysis of dry-season water-flow also indicated that water-flow to the reservoir increased as the forest cover increased.

The next task in developing a PES program was to identify potential buyers. The Nepal Electricity Authority (NEA), central government, and local government appeared as be potential buyers. The 1992 Electricity Act requires hydropower developers to pay a certain percent of their electricity revenue as a royalty to the central government. The Local Self-Governance Act (1999) requires the central government to share 12 percent of such royalty with the local government of the district housing the hydropower plant, Makawanpur District Development Committee (Makwanpur DDC) in this case.[2] RUPES worked with Makwanpur DDC and local communities of Kulekhani watershed to establish an appropriate PES mechanism.

In early 2006, Makwanpur DDC and the local government body of the district housing Kulekhani I and II hydropower plants established an Environmental Management Special Fund (EMSF). As per the decision, EMSF receives 20 percent of the hydropower royalty received by Makwanpur DDC from the Kulekhani hydropower plants, amounting to about US$55,000 per year. The fund will be used to support conservation and development programs proposed by upland people of the Kulekhani watershed.

Characteristics of PES Mechanism

Voluntary - As a buyer of environmental services, Makawanpur DDC has some flexibility to walk out of the deal although it may have to face political pressure from upland communities.

[2] See Upadhyaya (2003).

Upland people also have some flexibility in that they may as a group choose not to join the PES scheme and use forests in a way that does not preserve environmental services. However, the law does not allow them to deforest the area completely. If the upland people as a group decide to commit to PES agreement, individual households in the watershed would have to face group pressure for not complying with the agreement.

Conditionality - Makawanpur DDC has prepared guidelines for the use of the EMSF fund. The guidelines have two conditions for the use of EMSF fund. First, the projects to be funded by EMSF should enhance or at least not diminish environmental services. Second, priority should be given to poor and disadvantaged groups while selecting EMSF projects. The impact on environmental services could be measured both at the input and output level. At the output level, the Nepal Electricity Authority (the owner of Kulekhani I and II hydropower plants) has a system in place for monitoring daily inflow of water to the reservoir and also for annual measurement of sedimentation in the reservoir, which will provide indicators for monitoring the long-term impact of EMSF projects on environmental services. In the short run, the effectiveness of EMSF projects will be assessed by measuring and comparing forest cover and quality with baseline scenario conditions, and quantifying implementation of erosion-control activities, such as terracing of sloping lands, gulley control, and construction of check dams. The RUPES program has helped to prepare indicators for monitoring the impact of EMSF projects on poverty and livelihood of the suppliers of environmental services.

Supplier Initiated – In the Kulekhani case, suppliers approached the buyers and asked for payments for environmental services, which were being supplied for free. Past conservation efforts by upland people were successful in rehabilitating degraded forests. At present, the forest condition is relatively good and there is no pressing demand from buyers to change conservation behavior of upland people although there is always scope for enhancing environmental services. Pagiola (2000) argues that PES mechanisms that are initiated by the buyers of environmental services have a better chance of success. It remains to be seen whether the PES mechanism in Kulekhani is sustainable in the long run.

Large number of suppliers - About 8,000 households live in the watershed and are the environmental service providers. Given the limited size of the reward and the large number of suppliers, cash payment to individual households did not appear as an attractive option and people opted for reward in the form of conservation and development projects.

Lessons from Kulekhani for Designing New PES Mechanisms

Role of Research: Research played an important role in establishing the Kulekhani PES mechanism. In Kulekhani, Winrock International and other organizations conducted socio-economic and bio-physical research to establish a relationship between land use pattern and environmental services and to identify potential buyers.

Property Rights: A well defined property right is often considered a pre-requisite for the development of a PES market. Forests in most Asian countries are owned by the state. The government ownership of forest poses a problem in developing forest-based PES mechanisms.

However, the Kulekhani case illustrates that it is possible to develop PES mechanism over common property resources as long as people have user rights over such resources.

Prior to the 1950s, local communities in Nepal were free to manage and use forests in their vicinity. People considered forests as their own property and took good care of it. In the late 1950s, the government of Nepal nationalized forests, established pillars to demarcate forest area, and employed forest guards hoping to increase forest cover and quality. The result was quite the opposite. The following few decades experienced massive deforestation in Nepal. Many government officials entrusted with the responsibility of protecting forest engaged in corruption as nationalization created an opportunity for them to get rich quickly. The local community no longer considered the forest as their own property and started competing with each other to destroy more and more forest areas, setting a "tragedy of commons" scenario in motion.[3]

By late 1970s, the government of Nepal realized that its policy was not working. Subsequently, the government introduced the concept of community forestry and granted limited management and user rights of forests to local communities. Under this concept, a number of households formed a Community Forest Users' Groups (CFUGs) to manage a particular patch of forest which they traditionally used. The CFUGs then prepare a management plan and submit it to the district forest office for approval. If the management plan meets conditions specified by the district forest office, then the forest would be registered as a community forest. Community forestry grew rapidly in the following decades. The 1993 Forest Act and regulations formally recognized this concept.

Community forests are not substitutes for private property. The government has put many restrictions on what the community can and cannot do in community forests. In general, it is considered as unreasonably protection oriented. Nevertheless, community forests have been effective in regenerating forests, especially in the hills of Nepal.

More than 95 percent of forests in Kulekhani watershed are community-owned. The buyers of environmental services recognize that community forestry allows local people the right to manage forests in a way that could increase or decrease environmental services. Communities could also recount deforestation experience of 1960s and 1970s to warn buyers of environmental services what could happen if they do not pay them for good forest management.

Role of Intermediary Organizations - There is a role for intermediary organizations such as non-governmental organizations in the initial stage of PES mechanism development. Suppliers of environmental services are not often aware of the value of environmental services. Intermediary organizations are also needed to facilitate the negotiation process between buyers and suppliers of environmental services.

Transaction Cost - There are costs involved for activities such as identification and valuation of environmental services, awareness building, social mobilization, negotiation, and monitoring. In the case of Kulekhani watershed, given the large number of suppliers and few potential buyers, it was not feasible to have one-to-one negotiation between buyers and sellers. Sellers needed to be organized for collective action and social capital needed to be built for that. Buyers and sellers

[3] See Upadhyaya (2006).

needed to be brought together for negotiations. All these activities involved costs, which the buyers and suppliers of environmental services were believed unlikely to bear. Additional investment was and is still needed to make the Kulekhani PES mechanism sustainable. Once the PES mechanism is established, there will be additional annual operation and management costs. Buyers or sellers of environmental services must be willing to bear these operation and management costs.

References

ICRAF. 2007. Site Profile - RUPES Kulekhani. The World Agroforestry Centre (ICRAF), Bogor, Indonesia. http://www.worldagroforestrycentre.org/Sea/Networks/RUPES/download/SiteProfiles/RUPES-Kulekhani-FINAL.pdf

Upadhyaya, Shyam K. 2006. "Compensating Upland Communities of Kulekhani Watershed for Ecosystem Services," Paper presented at the Asia Regional Workshop on Compensation for Ecosystem Services, Centre for Ecological Economics and Natural Resources, Institute for Social and Economic Change, Bangalore, India, May 8-10, 2006.

Upadhyaya, Shyam K. How can hydropower royalty lead to social equity and environmental justice? Equitable Hydro Working Paper 2, Winrock International, Nepal, January 2003.

Upadhyaya, Shyam K., 2005. Payments for Environmental Services: Sharing Hydropower Benefits with Upland Communities. RUPES Working Paper 1, Winrock International, Nepal.

Upadhyaya, Shyam K. Characteristics of Environmental Service Providers in Kulekhani Watershed, Nepal: Implications for the Development of EPS Mechanism," Insight: Notes from the field, RECOFT, Bangkok, Thailand, 2007 (forthcoming).