Relevance of Payments for Environmental Services (PES) for Watershed Management in Northern Laos

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Abstract

In this paper we discuss the main results of a feasibility study for the implementation of Payments for Environmental Services (PES) in a small watershed of northern Laos. The aim of the work was to assess the relevance of such a scheme as a way to control both the quality and flow of a small mountain stream. We found that the PES concept, with some adaptations, may offer interesting avenues as a means to maintain water quality through an improved control of soil erosion in the upper catchment: Willingness-To-Pay (WTP) within the sampled population was approx. USD 0.3/month/household which would be sufficient to abate the negative impact of soil erosion. At the whole catchment scale, major impediments to the immediate implementation of a PES scheme were i) the lack an unequivocal relationship between environmental services, users and providers, ii) insufficient WTP to maintain water quality along the stream through waste management and iii) absence of a critical mass of buyers. A precondition of successful implementation of PES in the area is to increase the awareness of environmental issues in the concerned communities.

Introduction

Environmental Services (ES) are benefits that humans obtain from natural and cultivated environments (Wertz-Kanounninoff, 2006). For example, hydrological services can be obtained through river flow regulation, flood control or protection against soil erosion (Wunder, 2002; Wertz-Kanounninoff, 2006). ES are threatened worldwide, in a variety of ways, by human activities. In response to such threats, the concept of Payments for Environmental Services (PES) has been proposed as a simple scheme to reward land users who adopt practices that generate ES, hence promoting sustainable land use (Mayrand *et al*., 2004). The aim of this study was to assess whether this concept could offer new perspectives for managing the hydrology of a small river basin of northern Laos. The major steps in our approach were designed to follow the guidelines of the FAO electronic forum on payment schemes for environmental services in watersheds (FAO-REDLACH, 2004), as detailed in Figure 1. Data required to carry out the successive steps of this approach were collected by i) a survey of the local population's perception of water issues , ii) a critical analysis and compilation of pre-existing biophysical, socio-economical and geographical information and iii) field measurements.

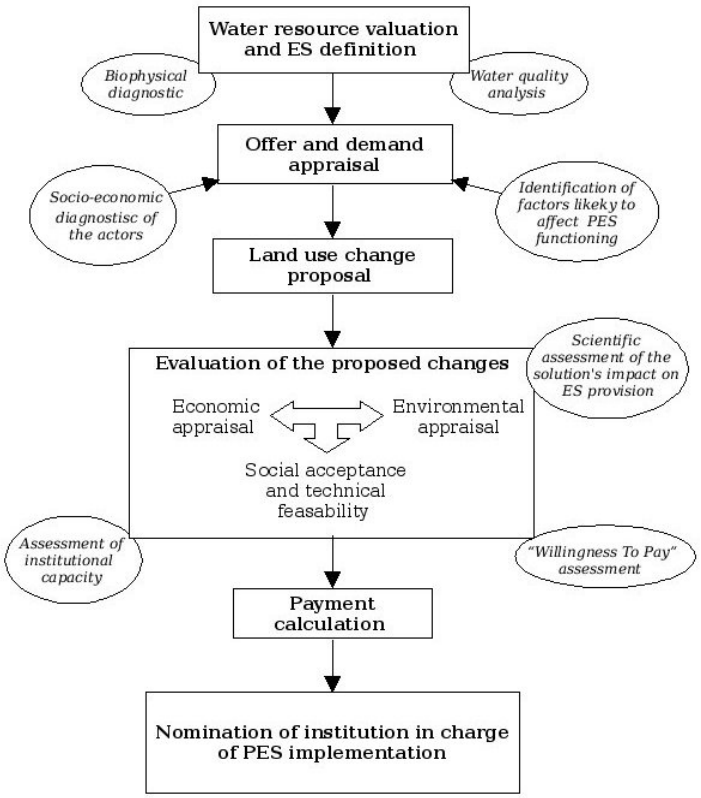

Figure 1. Represention of the 6 major steps of the PES feasibility study. Baloons specify some of the methods used to complete the different steps.

Location and characteristics of the study site

The Houay Xon watershed is located in the Luang Prabang province, in northern Laos, (Figure 2), south of the UNESCO World Heritage city of Luang Prabang. The studied watershed (Figure 3), covers 22 km^2 and includes 7 villages located along the Houay Xon stream. The stream runs for approximately 15 km and has three main tributaries. The average annual rainfall is 1403 mm (average of the last 30 years), and the mean annual temperature is 25°C. Two distinct seasons characterize the study site: a wet season from April to October, and a dry season from November to March. This catchment's maximum elevation is 584 m a.s.l., near the headwater area (Chaplot *et al*., 2005).

The study area encompasses a population of 6251 inhabitants mostly of the *Lao Lum, Khmu* and *Hmong* ethnic groups. Farming activities are located upstream, in the Houay Pano headwater catchment. In downstream villages, the population is dominated by government employees and agricultural activities are limited to small scale vegetable gardening and fish breeding. Over recent years, the Houay Xon catchment has been subjected to increasing environmental pressure which resulted in degraded water quality and reduced flow. In addition, extreme climatic events, such as the flood of September 2006, have reportedly caused increasingly severe damage to infrastructure essential to the community.

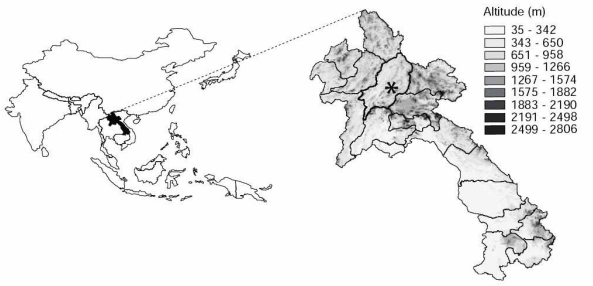

Figure 2. Laos and the Luang Prabang province (after Chaplot *et al.,* 2005)

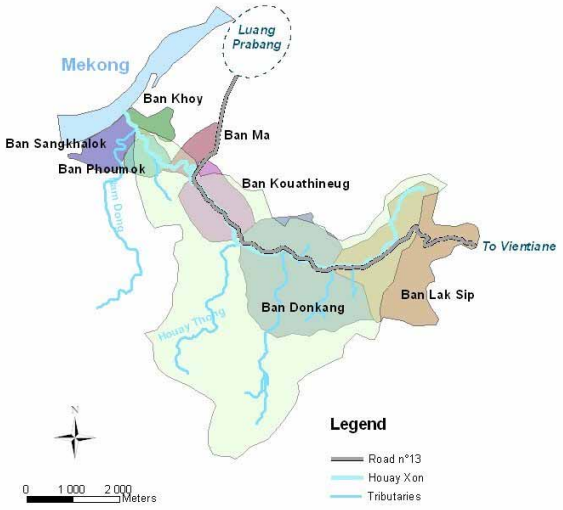

Figure 3. Map of the watershed and location of villages

Survey design and implementation

To estimate the supply and demand for hydrological services in the Houay Xon catchment, we selected a sample of 67 people who were interviewed over a period of one month. People included in this sample represented the five main categories of water users identified along the Houay Xon: farmers from upland and downstream areas, gardeners, tradespeople and villagers who only use the Houay Xon water for domestic purposes. Not all categories are represented equally in the sample because not all categories encompass equal numbers of people and some individuals were not willing to participate. All these users, who are scattered along the stream, potentially contribute to water pollution and/or flow decrease. Therefore they are potential buyers and suppliers of hydrological services since they participate in water extraction, transformation and discharge. The questionnaire was designed to document interviewees' socio-economical background and that of their dependants, their awareness of water flow and quality changes, their perception of the causes behind these changes, their ability and willingness to participate in a payment scheme and their understanding of institutional and governmental support. This original data set was combined with information previously collected by public and private institutions and biophysical data monitored by IRD since 1991.

Results

In Table 1 we have summarized the information collected during this feasibility study. The need for improved water quality and more constant stream water flow in the Houay Xon catchment was clearly identified. These results can be used to define an ES, such as, for e.g. a guaranteed minimum water flow with precisely defined bacteriological and chemical quality.

Table 1. Main results of the survey

Characteristics of the community	
Socio-economical background	Low average income (USD500/yr/household). Consumption of self-produced food dominates. Most villagers need more than one job. Lack of private property: land use entirely depends on land allocation by the Government of Laos (GoL).
History	Forced relocation (under GoL policy) but newcomers seem attracted by better life conditions in the area (proximity of Luang Prabang is seen as an asset).
Space allocation and management	Population along the stream is increasing. There is no planning of new developments. Farm plot size is decreasing.
Observed water use	
Water extraction	Main form is distributed water extraction. Farming and fish breeding use less water than gardening and domestic activities distributed along the stream. Other sources of water (piped spring and ground- water, bottled water) are used for daily household and production activities.
Water quality	Main form is distributed contamination. Farming and fish breeding contaminate the stream with chemical fertilizers and organic matter. Villagers are responsible for non point source pollution all along the stream (solid wastes and grey water).
Perception of water use	
Water extraction	Decrease in water quantity widely acknowledged but flow still deemed sufficient by many.
Water quality	Unsatisfactory water quality with steady deterioration over years.
Damage related to stream degradation	Economic damage difficult to quantify. Most significant damage ascribed to floods: huge impact of Sept. 2006 floods.
Prospect for change	
Accountability	Villagers are believed to be responsible for water quality degradation. No clear opinion re. changes in water quantity.
Willingness to implement change	Population is ready to pay for waste collection system but not to invest in upstream land use change although WTP sufficient to abate soil erosion.

However, we also identified several obstacles likely to impede a straightforward implementation of a PES scheme along the Houay Xon. First, the binary concept of user *vs* supplier is poorly suited to the situation studied because water extraction and contamination are diffuse along the stream. Figure 4 illustrates this lack of relationship between the location of users along the stream and the way they use water.

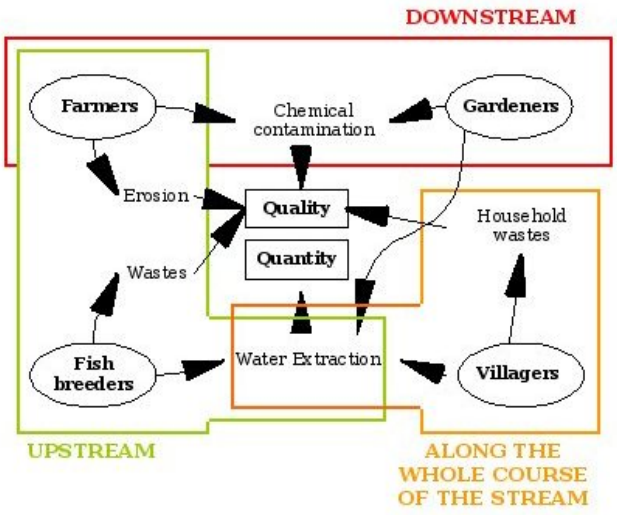

Figure 4. Complex users- water use relationships in the Houay Xon watershed.

In addition, the current land allocation system makes it difficult, if not impossible, for farmers to alter land use (National Growth and Poverty Eradication Strategy, cited in NAFRI, 2005), while it is a basic principle of the PES concept that land use can be altered with a certain flexibility so as to ensure delivery of ES. The population relocation policy initiated in the 1970's by the GoL (Lestrelin *et al.,* 2006), also contributed to the emergence of conditions rather adverse to the immediate success of a PES scheme: it resulted in the cohabitation of several ethnic groups within small communities, often inducing tensions, and fell short of establishing good communication between villages and between villages and local authorities. A side effect of the relocation policy was also that displaced populations did not fully bond with their new environment. This resulted in limited awareness of environmental issues and unsustainable use of the natural resource base by the community, naturally leading to a lack of WTP for ES among many.

In spite of these obstacles, the MSEC (Management of Soil Erosion Consortium - http://msec.iwmi.org/ -), program clearly established that alternative farming practices and careful management of sensitive areas (e.g. riparian areas) opens new avenues for the improvement of water quality by reducing sediment delivery (Van Breusegem, 2005; Valentin *et al.*, 2006; van der Helm, 2007). WTP within the sampled population was approx. USD 0.3/month/household which, if put in practice through a PES, would suffice to abate significantly the negative impact of soil erosion on water quality. However, at the whole catchment scale, this would not warrant good water quality as it would not be enough to maintain the waste collection system essential to abat the observed distributed contamination of the stream. Therefore, one of the preconditions of successful implementation of PES in the Houay Xon watershed is to increase the awareness of environmental issues in the concerned communities to increase their WTP for ES, as at the moment, they fail to recognize the cost of producing these ES.

Acknowledgements
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