# Rewarding Communities for Keeping Rivers Clean? First Steps in a RiverCare Program in West Lampung- Indonesia*

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## Introduction

Around 10% of the electricity produced in Indonesia is supplied by hydropower (EIA, 2004). Most of the hydroelectric plants depend on the regular supply of water from the surrounding watersheds. Storage lakes regulate the water flow and hydropower production. The active storage volume of many storage lakes is threatened by sedimentation. Thus, low sediment loads of the river are in the interest of hydroelectric companies. But, are these companies willing to pay for the service of keeping rivers clean?

Payment for environmental services (PES) is a new paradigm in conservation where 'landowners and/or managers' are compensated by outside beneficiaries for the environmental services they provide (Wunder, 2005). In the tropics, most PES mechanisms for watershed functions are based on the assumption that trees can provide more water but without clear proof of what are the specific services being provided.

Also in the upper Way Besay Catchments (West Lampung, Sumatra, Indonesia) the National Electricity Company (PLN) exploiting a hydropower dam (PLTA) is worried about the often high sediment load and supposedly high siltation of the lake. In order to assess and reduce sediment load in the Way Besay and its tributaries, a river care program was started as collaborative activity between ICRAF, upland farmers and local government officers. The aim is to develop and implement a payment mechanism for upland farmer groups that are able to reduce the sediment level of the river.

## Study area

The elevation of the 41,500 ha upper Way Besay Catchments ranges between 720 and 1831 m. The population was about 87,350 people in 2004, with a density of 161 people.km$^{-2}$ (Biro Pusat Statistik, 2004). About 40% of the sub-district is classified as "protection forest" and about 10% as National Park. Nevertheless, coffee gardens, also known as multistrata coffee, now cover about 70% of the total area (Verbist, et al. 2005).

Electricity generation at the Way Besay hydropower dam started in 2001, with a maximum capacity of 90 MW. On average this dam contributes 15% of the electricity for southern Sumatra (Kompas, 2001) and 60 % for the Province of Lampung (PLN, pers. comm.).
The peak sediment load in the Way Besay can be as high as 3 kg/m$^3$/second, largely caused by land slide and erosion. Continuous turbidity measurements during three months in the wet

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season in 2006 show that about 50 % of the suspended sediment remains in the hydropower reservoir, causing (a) reduction in water level for turning turbine, (b) damage to reservoir filter, and (c) higher cost for cleaning the reservoir. All of these directly affect the actual capacity of electricity production.

**RiverCare program and conservation activities**

As a pilot project, a RiverCare group, consisting of 70 households, was formed in a 160 ha subcatchment of the Way Lirikan. The 670 ha Way Lirikan sub-catchment was identified earlier as a large sediment contributor to the Way Besay (Verbist, et al. 2006).

Diagnostic walks, baseline sediment monitoring and many meetings and discussions were organized with the community to assess possible causes for the high sediment level in the Way Lirikan and identify potential erosion hot-spots (Fig.1).

This all led to an agreement with the community and the start of a RiverCare group, as seller of environmental services (ES) and ICRAF as the buyer. Upon successful results it is foreseen that the PLTA will be the buyer, while ICRAF's role will be reduced to be the broker in further negotiations. The current agreement stipulates that the community receives $1,000 to cover project set-up costs. After one year the reward will depend on the reduction of the sediment load in the river:

- Full payment ($1,000) for reduction of sediment load 30% or more
- $700 for reduction of sediment load between 20 – 30 %
- $500 for reduction of sediment load between 10 – 20 %, and
- $250 reduction of sediment load of less than 10%.

Following remedy activities were agreed upon with the RiverCare group:

- Landscape elements like public footpaths with a visual erosion problem and direct connectivity to the river will be treated with drainage ditches, culverts and regular maintenance (Fig. 2).
- The high streampower in particular river segments causing streambank collapse will be mitigated with flow velocity reducing measures like check dams (Fig. 3)
- Recent gullies will be treated with sediment traps and better drainage.
- Overall a better infiltration of excess water in non-hazardous parts of the landscape will be encouraged.

Relevant extension activities were also organized with the RiverCare group: training on river water monitoring, improved coffee cultivation, garbage handling, nursery development, planting of multi purpose trees and grass for livestock, rehabilitation of riparian areas.

Figure 1. Activities with members of the RiverCare group: (a) Transect walk discussing streambank collapse as a sediment delivery hotspot; (b) Measuring sediment load using a transparency tube

Figure 2. Simple structures to reduce runoff and trap sediment on public footpaths

Figure 3. Simple check dams to reduce sediment load and flow velocity. Some of the water is used for micro hydropower station

**Monitoring Activities**

Monitoring was carried out on three aspects: infrastructure, institutional aspects and actual sediment reduction in the river. Infrastructure monitoring relates to the quantity and quality of the new structures. The institutional aspects evaluated the functioning of the RiverCare group and the active participation of its members. Monitoring sediment levels in the river is of crucial importance, as it is expected that the hydropower dam will only be interested in becoming the buyer if a meaningful reduction in sediment yield is achieved. Baseline data were collected in order to quantify current sediment levels before project activities: A sediment rating curve was developed, relating sediment load with discharge. Sampling was also done at various sites along the river to identify the largest sediment contributing areas and erosion hot spots In the future samples will be taken approximately every 2 weeks during a rainfall event from September 2006 – October 2007 to assess changes in sediment load..

River water samples are taken using a depth integrated method. Samples are dried and the sediment is weighed in a field lab. Direct readings of visual clarity are made with self constructed "transparency tubes" that are based on the Secchi disc principle (Fig. 1b). This visual clarity (or Secchi disc visibility), is converted to sediment concentration after calibration with the field lab results.

**Future Challenges and Opportunities**

The RiverCare program addresses fundamental issues of transparency and conditionality in PES. We need clarity on what the service is and how it will be evaluated. Some PES-schemes were rather paying for 'perceived environmental services', because the monitoring was not measuring the service, but another variable as e.g. tree cover, if there was a monitoring scheme at all. We expect that payment mechanisms based on clear and measurable environmental services will be attractive to the real buyer, and that the approach will be adopted and implemented. The goal of these pilot projects is to show to the electricity company that buying the environmental services can be a cost-effective way for them to reduce the sediment load of the river. We have an ongoing dialogue with the electricity company, to share what we learn. In a year's time, we'll get the real test when the electricity company needs to decide, if they will continue and scale out the scheme.

Adoption of this mechanism by the Hydroelectricity Company would not only improve the environment – and probably be more sustainable and be at a lower cost, than current envisaged measures like dredging - it would also enhance community welfare and reduce the risk of an electricity crisis.

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