

**Chapter 5: Developing Payments for Environmental Services
in the Abuan Watershed**

By

Edgardo E Tongson
Sr Consultant on Water Resources
WWF-Philippines

Abstract

Watersheds provide important environmental services to society, including flood regulation, water retention, soil formation, nutrient cycling, landscape beauty, carbon sink and as habitat for biodiversity. Payments for Environmental Services is a market-based tool linking buyers and sellers of environmental services in order to generate sustainable financing for watershed management. The Abuan watershed, with its flood regulation and water retention features, has the potential to generate at least 3.3 MW of hydropower, irrigate 1,025 hectares of rice paddy, and supply domestic water to 130,000 population in the town of Ilagan. With reforestation of 2,146 has of open grasslands and arrest of illegal logging activities, the watershed can generate carbon credits of 21,250 CO₂ tons and 718 CO₂ tons from CDM and REDD respectively. The scenery and clean water also offer opportunities for river-based eco-tourism such as boating, kayaking, white water rafting and rappelling. The total economic output from these environmental services can reach USD 9.3 Million a year, of which USD 715,329 (or 7.7%) can be realized annually through voluntary and involuntary PES schemes and provide sustainable financing for watershed protection. If we remove payments from carbon credits, the annual payments through PES amounts to USD 539,580 or the equivalent of USD 9.50/hectare. Examples of model PES schemes and institutional design to implement PES in Abuan are presented.

1. Introduction

Watersheds provide a host of services beneficial to society. Unfortunately, society attaches no value to these services. As such, this results to their further loss and degradation. Watershed values, when realized, have the potential to generate significant economic activity that will benefit the watershed communities.

Beneficiaries of these services pay for activities that enhance these services. Part of these values may be captured and monetized as part of Payments of Environmental Services (PES) schemes. PES schemes are growing in popularity because they provide sustainable financing to defray the cost of watershed activities.

In relation to the Abuan watershed, four types of services stand out:

1. Watershed protection (e.g. hydropower companies and water utility pay upland farmers for avoiding deforestation, soil erosion, pollution, flooding risks)
2. Landscape beauty (e.g. tourism operator paying local community not to cut trees and pollute river that are used to enhance visitor experience)
3. Carbon sequestration and storage (e.g. Foreign power company paying farmers in tropical countries to plant or maintain trees)
4. Biodiversity protection (e.g. conservation groups paying local community to restore areas to create biological corridors).

1.1 Emergence of PES as a Conservation Tool

Land use activities can produce both positive and negative impacts to the hydrology of a watershed. PES is a tool to provide incentives to encourage sustenance of positive impacts and to minimize the negative effects. These activities entail costs such as conduct of patrols to stop illegal logging, sustainable upland farming, reforestation and provision of alternative livelihoods to logging-dependent communities.

While the conventional way of funding watershed activities is through government budgets, PES schemes diversify sources of funding by capturing payments from private users of water for different types of watershed services. Compared to the use

of public resources such as taxes, PES schemes offer a more direct, efficient and more equitable allocation of resources. PES schemes mimic market transactions between buyers and sellers. Buyers of watershed services, such as end users, will continue to make voluntary periodic payments for watershed activities as long as watershed functions and services are well-defined and maintained.

The theoretical framework of PES is derived from the *Coase* theorem (Coase 1960). The theorem states that, in free markets without transaction costs, buyers and sellers will reach an equilibrium in which externalities are internalized through payments, entitlements or transfers made in either direction. Voluntary, conditional and periodic payments for a well-defined Environmental Service (ES) describe the nature of PES schemes (Wunder 2005).

1.2 Cases and Best Practices in PES world wide

There is growing literature presenting cases and examples of its application world wide (Landell-Mills & Porras 2002, Pagiola 2002). Similar experiences were documented for the Philippines (Padilla et al 2005). Some examples of water payments through self-organized deals are presented in **Figure 5-1**. The cases include a well-known water company (Vittel) who acquired upstream farmlands at the beginning and gave incentives in the form of PES later on. In Ecuador, the hydroelectric companies contribute to a fund, called FONAFIFO, to compensate landowners residing in watersheds for land use activities. In Colombia, irrigators' groups pay upstream land owners to control erosion in springs and waterways.

(Water-related Ecological) Service Provided	Supplier	Buyer	Instruments	Intended Impacts on Forests	Payment
France: Perrier Vittel's Payments for Water Quality					
Quality drinking water	Upstream dairy farmers and forest landholders	A bottler of natural mineral water	Payments by bottler to upstream landowners for improved agricultural practices and reforestation of sensitive filtration zones	Reforestation but little impact because program focuses on agriculture	Vittel pays each farm about US\$230 per hectare per year for seven years. The company spent an average of US\$155,000 per farm or a total of US\$3.8 million.
Costa Rica: FONAFIFO and Hydroelectric Utilities Payments for Watershed Services					
Regularity of water flow for hydro-electricity generation	Private upstream owners of forest land	Private hydroelectric utilities, Government of Costa Rica and local NGO	Payments made by utility company via a local NGO to landowners; payments supplemented by government funds	Increased forest cover on private land; expansion of forests through protection and regeneration	Landowners who protect their forests receive \$US 45/ha/yr; those who sustainably manage their forests receive \$US 70/ha/yr, and those who reforest their land receive \$US 116/ha/yr.
Colombia: Associations of Irrigators' Payments (Cauca River)					
Improvements of base flows and reduction of sedimentation in irrigation canals	Upstream forest landowners	Associations of irrigators; government agencies	Voluntary payments by associations to government agencies to private upstream landowners; purchase by agency of lands	Reforestation, erosion control, springs and waterways protection, and development of watershed communities	Association members voluntarily pay a water use fee of \$US 1.5-2/ litre on top of an already existing water access fee of \$US 0.5/litre. The total investment was over US\$ 1.5 billion between 1995-200.

Figure 5-1. Examples of Water Payments (UNEP 2008)

The payments from PES for land use activities can range widely. In PES cases compiled in Costa Rica, the payments range from USD 10 to 45/ha-year (Figure 5-2).

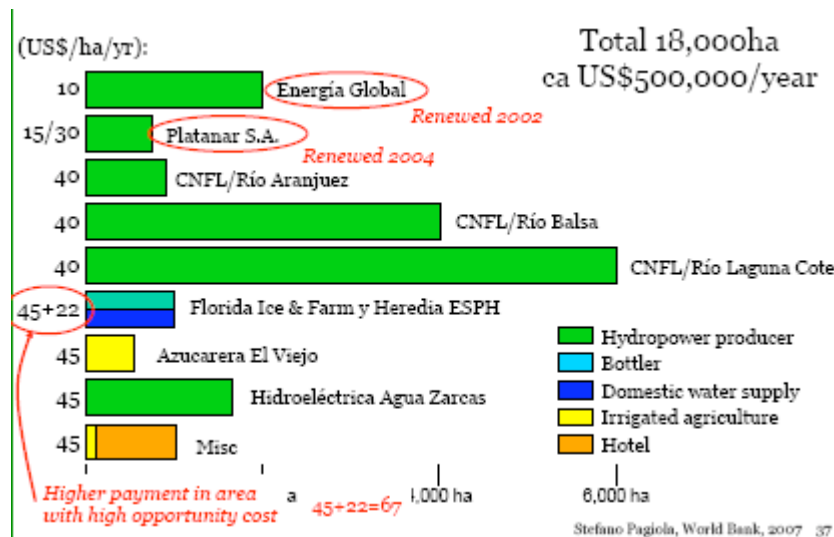


Figure 5-2. Range of payments for Forest Services in Costa Rica (Pagiola 2007)

To conserve 18,000 ha of watersheds in Costa Rica, hydropower companies, bottlers, hotels and irrigation farmers pay a total of USD 500,000 a year (Pagiola 2007). The higher payments reflect higher opportunity costs such as when forests are near urbanizing areas, or where there are competing alternatives, e.g. rubber, oil palm, soya, logging, etc.

1.3 Watershed Services from Abuan Watershed: Use it or Lose it.

The hydrology of the Abuan watershed offers a range of benefits that could be harnessed for conservation and development. The potential economic values from watershed services in Abuan will come from the clean and abundant year-round surface water that can be delivered by gravity to different users, such as hydroelectric power plants (through runoff-river schemes), river-based tourism, irrigation and domestic water supply.

The watershed generates high levels of surface run-off estimated at 1,234 Million m³/year (Rojas 2009). A large drainage area (63.79 sq km), steep slopes and thin soils underlain by semi-permeable pyroclastic materials contribute to high levels of surface runoff. Sixty-seven (67%) percent of the annual precipitation of 2900 mm is converted to surface run-off. Water absorbed as soil moisture results in interflow that find their way into channels and into Abuan river. The soil, however, is vulnerable to erosion as ninety percent (90%) of the watershed areas have slopes exceeding 30% (Evangelista 2009). The study site has low groundwater potential with ground water recharge limited to just 5% of annual rainfall (Rollan 2009).

The baseline scenario shows that we will lose the forest and the watershed services to destructive activities. The recent campaign against illegal logging in Abuan in 2008-2009 yielded half a million board feet of timber valued at P 8 Million pesos (Ly 2009). This paper argues that the economic gain from logging is small compared to potential gains from protecting the forest. However, unless the watershed services of Abuan basin are utilized by Ilagan town and by society at large, these gains will not be fully realized.

The objective of this study is to determine the feasibility of setting up a PES program in the Abuan watershed.

This paper will present the potential uses of watershed services in Abuan, potential economic contribution, indicative amounts that can be captured through PES schemes, identification of buyers and sellers and a conceptual arrangement of instituting a PES system.

2. Methods

PES requires clear definition of land use activities that would lead to hydrological effects that are important for investors, or “buyers”, in different economic sectors – whether irrigation, hydropower, domestic water supply, agriculture or tourism. It will require the understanding of the socio-economy and farming practices of watershed communities, site geomorphology, soil profiles and erosion, land use trends, hydrology, hydrogeology and economics. This emphasizes the need for interdisciplinary research and expertise that will be involved in the design and operation of PES schemes.

The preceding studies by Rojas (2009), Rollan (2009) and Evangelista (2009), provide background information on the hydrology, hydrogeology, soils and land use activities respectively. These studies assessed the conceptual feasibility of a run-off river hydropower facility, irrigation and domestic water supply. Carag (2009) assesses the tourism potential for river-based ecotourism.

Figure 5-3 describes the pathways in preparing a business case for PES. It starts from understanding the science and economics, charging services users, paying services providers and establishing the institutional framework.

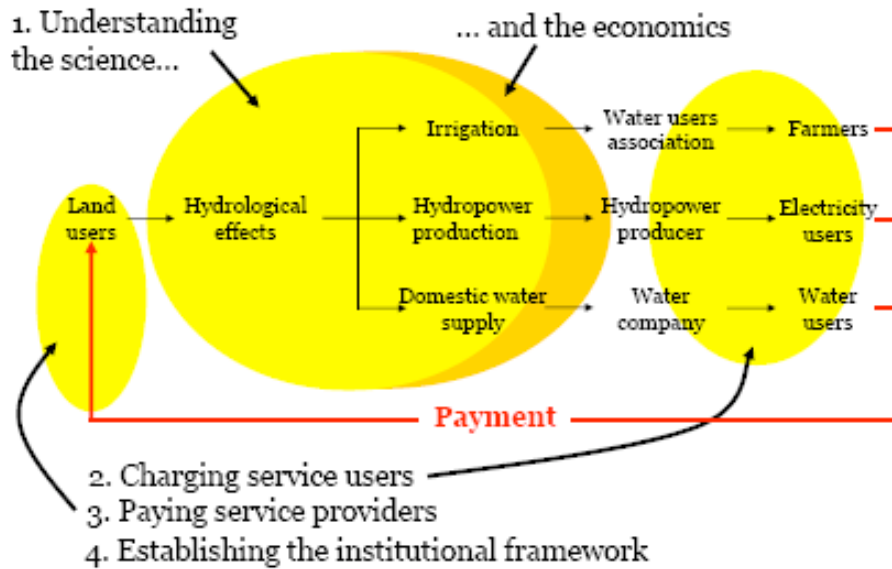


Figure 5-3. The Multi-Disciplinary Nature of PES Schemes (Pagiola 2007)

The first step is developing the business case for investors and buyers to pay for environmental services¹. The business case will outline the opportunities for PES by identifying the environmental service(s), understanding their linkages to land use activities, measuring the hydrological impacts, estimating opportunity costs of buyers and sellers, designing contractual agreements and designing an institutional framework for collection, disbursement and monitoring of payments to upland communities.

The methodology of developing a business case for a PES scheme in the Abuan watershed is enumerated as follows:

1. Defining ecosystem services in Abuan Watershed and measuring economic output
2. Identifying prospective buyers
3. Identifying sellers, and Watershed Protection Services
4. Assessing legal and policy context for PES
5. Prospective PES amounts per sector
6. Surveying available PES support services, organizations and institutional arrangements

¹ There are no current investments in Abuan for water-related operations. This paper lays the empirical basis for exploring combined and integrated schemes to maximize its natural endowments beneficial to society,

The next section presents the results from the research. The findings are organized following the methodology outlined above.

3. Results

Defining ecosystem services in Abuan Watershed and measuring economic output

In the Abuan watershed, regular and year-round stream flows are the primary watershed service that have the potential to generate significant economic benefits to the town of Ilagan and province of Isabela. Flow regulation, as a watershed service, can be measured using a hydrograph which shows the discharge or stream flows against time during a rainfall event.

There are four (4) hydraulic controls –size of river basin, vegetation, slope and soil type - that influence the flood performance of a watershed. Of these, vegetative cover and soil type can be altered by human activities, while the rest are beyond human control. **Figure 5-4** illustrates the effect of changes in soil and forest cover on discharge rates and flooding.

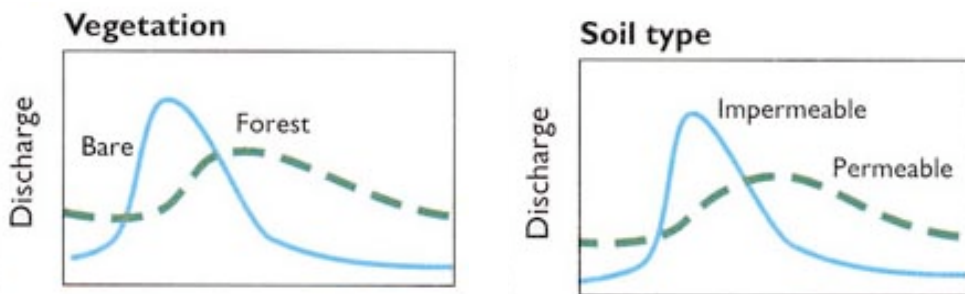


Figure 5-4. Soil and Vegetation Effects on Stream Hydrograph

In forested watersheds, the hydrograph shows a gradual rise, a later peaking of floods and a gradual recession of stream flow (green line). When forests are removed, the graph shows a higher and quicker peak flood and a steeper recession curve (blue line). The mean amplitude as measured by the distance between peak and base flow is wider for deforested or impermeable watersheds.

The conversion of soils from permeable to impermeable surface material due to land developments is commonly found in urbanizing watersheds. Soil conversion has the same effect on the hydrograph as a deforested watershed. Soil compaction or surface paving results in higher run-off, quicker peak floods, lesser infiltration and diminishing base flows.

With forest cover still at 89%, the Abuan basin retains about 33% of a 10-year 24-hour storm with a cumulative rainfall of 308.8 mm and about 25% of a 50-year storm with a cumulative rainfall of 389.2 mm (Rojas 2009). The forests and its soils are largely responsible for water retention, storage and flood peak attenuation.

Intact forests retain water as it is caught in the branches and leaves of the trees and never hits the ground and a lot is soaked up by the leaf litter, grass and other organic material on the forest floor. This material protects the soil from erosion, reduces compaction from the impact of heavy rains and conserves moisture. If the forest is removed, the ground is exposed to higher rainfall with higher intensities and to solar radiation resulting in higher evaporation, less water infiltration, higher soil erosion, quicker and higher volume of floods.

The conversion of permeable soils to impermeable surfaces such as establishment of built-up areas will exhibit the same impacts as a deforested watershed i.e. higher volume of run-off and quicker flooding downstream. The loss of soil due to erosion results in lesser interflow and diminished base flows during the dry months.

The flow duration curve is a tool that measures the percentage of the time that flow rates equal or exceed the various flow rates during the period of study. Rojas (2009) developed a flow duration curve (**Figure 5-5**) which shows an 80% dependable flow of about 15 m³/second or 1.3 Million m³/day and a 95% dependable flow of about 9.5 m³/second or 0.8 Million m³/day.

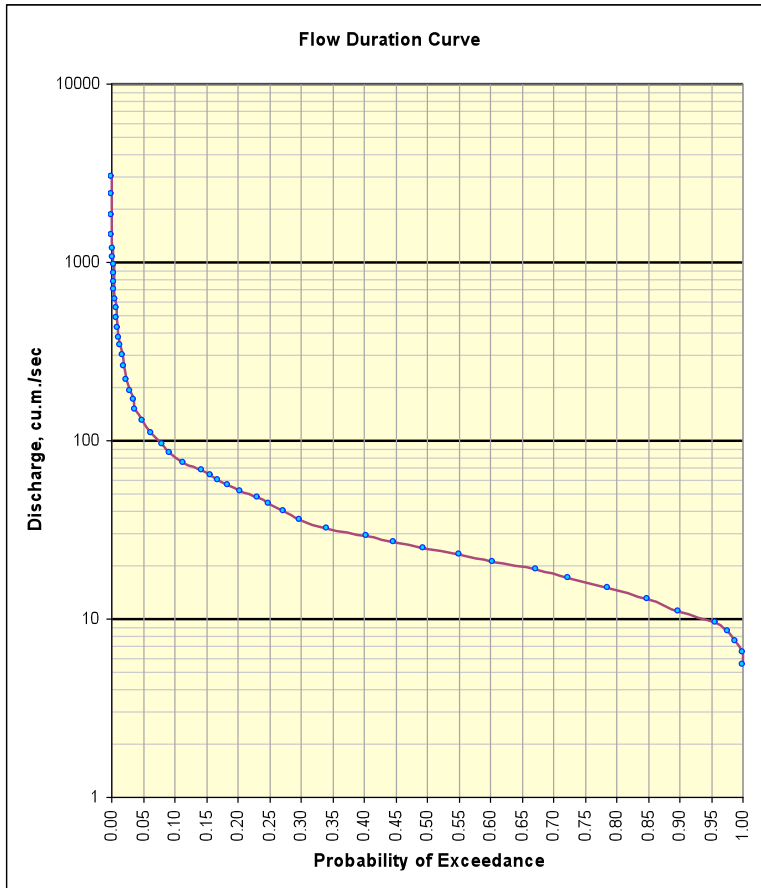


Fig. 5-5. Flow Duration Curve (FDC) of Abuan River for Hydropower and Irrigation Development

For the conceptual hydropower/irrigation scheme (**Figure 5-6**), about half of the 95% dependable flow estimated at 4.65 m³/second will be used. The other half of the flows is left to maintain the river and its ecological processes.

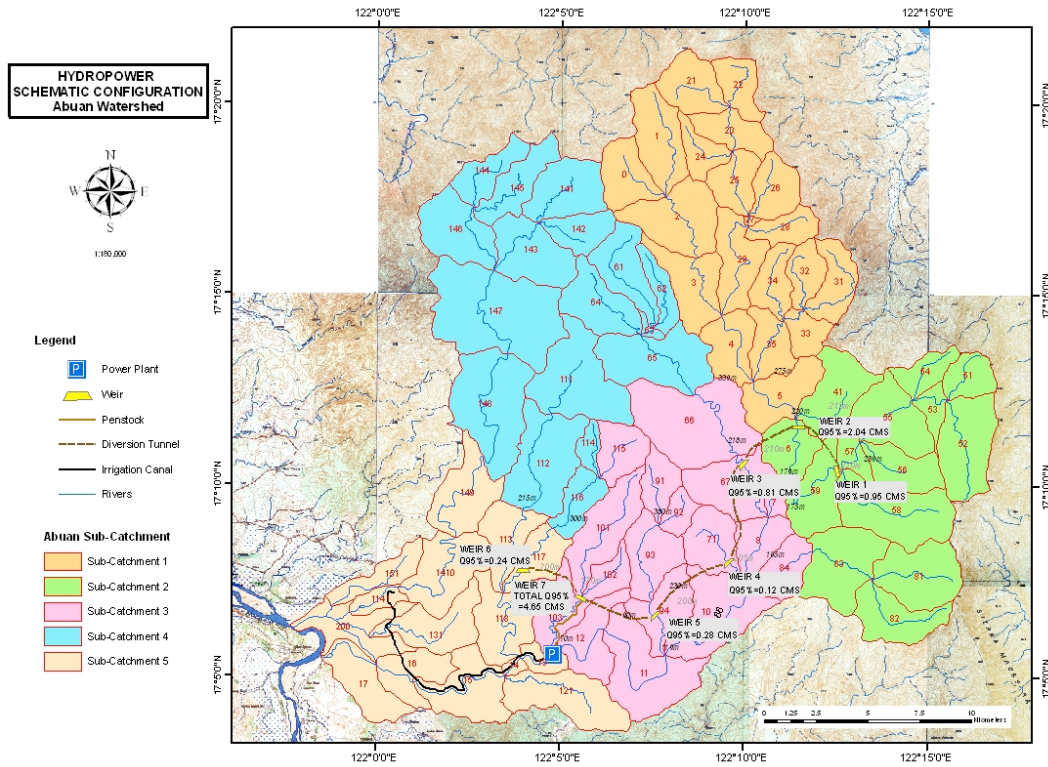


Figure 5-6. Schematic Configuration of Conceptual Hydropower/Irrigation Development

3.1.1 Run-off river Hydropower

The hydropower potential and irrigation potential of the basin was evaluated as a combined development. The scheme consists of 7 diversion dams (weirs) and a tunnel waterway to take water to a power station at lower elevation. The scheme is conceived in river stretches with steep gradients ($> 1/60$ slopes) or in places where the equivalent head is made available.

The outflow from the tailrace of the power plant will be discharged to the main canal to allow the slightly warmer water to cool down to ambient temperature as it flows through a canal parallel to the river and is distributed to the individual farm lots in the irrigable service area. Not all the water is needed for irrigation

throughout the year. Part of the water volume may go to a water treatment plant to supply the domestic water system for Ilagan town, with distance of 18 kms. With the combined development and conjunctive use of surface water for multiple use, the infrastructures needed and the initial capital investment are significantly reduced.

In estimating the economic benefits from mini-hydropower generation, we assembled the hydrologic data on the streams and determined the amount of water available and its distribution throughout the year and from year to year. For this purpose, the catchment area, approximate available head, and annual rainfall is used.

Rojas (2009) suggests usingf 95% dependable flow of $4.65 \text{ m}^3/\text{second}$ as exploitable discharge. With assumed hydraulic head of 80 m, the scheme can power a 3.3 MW hydro power plant. We assume a load factor of 0.8 and a selling price of USD 0.10 cents per KWH generated.

The estimated annual sales (in USD) from hydropower generation is computed as follows:

Gross Sales = Plant capacity x 1000 KW/MW x Load Factor x No. of days operations x 24 hours/day x USD 0.10/KWH

Gross Sales = $3.3 \text{ MW} \times 1000 \text{ KW/MW} \times 0.8 \times 360 \times 24 \times 0.10/\text{KWH}$

Gross Sales = USD 2,280,960 / year

Capital Costs/MW installed capacity = USD 2 Million

Hurdle Rate = 12% p.a.

3.1.2 Irrigation

Assuming 1 hectare of rice paddy will require 1 meter of water per cropping season, this means $10,000 \text{ m}^3/\text{hectare}$ of irrigation requirement. From the flow duration curve, the 80% dependable flow is equivalent to $7.0 \text{ m}^3/\text{second}$ which

amounts to 6.35 MCM in 105 days. Dividing this by the irrigation requirement of 10,000 m³/hectare, an equivalent area of 6,300 hectares can be irrigated in one (1) cropping season.

There is no formal irrigation system to service the flood plains of the Abuan watershed. Farmers who were interviewed are willing to plant rice if irrigation systems are in place. The irrigation scheme will convey water by gravity to channels and dikes and irrigate 1,025 ha of San Manuel clay loam in the lower terraces and the flood plain of Abuan watershed (Evangelista 2009). Irrigation will complement the rain-fed months and tapped for 105 days in summer. Excess water can be used to irrigate flood zones in adjacent watersheds.

Assumptions:

Service area = 1,025

Rice yield/ha/cropping = 4.2 Metric Tons (MT) (based on average yields of adjacent irrigated rice areas.

Projected rice production = 4,305 MT/ha-crop

Projected annual rice production = 4,305 x 2.5 = 10,763 MT/yr

Price of palay = USD 0.25/kg (@ P48: 1 USD)

Gross income per yer = 10,763 x 1000 x 0.25 = USD 2,690,750

Net income/ha-cropping = P25,900 (Evangelista 2009)

Annual net income = P25,900 x 2.5 = 64,750 or USD 1,249 per hectare

Capital Cost Irrigation Infrastructure/hectare: P280,000 (USD 5,833)

Capital outlay: USD 5,833/ha x 1,025 has = USD 5,978,825

Hurdle rate: 18% p. a.

3.1.3 Future Domestic Water Supply

This same water, used to power the hydropower plant, is returned to the river. From here, the water may be used conjunctively to supply irrigation water for dry months and domestic water all year round. Water for domestic use may flow to a water treatment plant and then piped 17 km downstream to domestic users in Ilagan town. At present, domestic and industrial water requirements of the town are supplied by groundwater.

As the town urbanizes, the increasing demand for groundwater will lead to heavy abstraction that may result in depletion of water tables, interference costs, saltwater intrusion and land subsidence. By channeling surface water to supply urban demand, competition with industrial users and depletion of water tables is avoided.

Assumptions:

Average per capita water consumption per year = $0.2 \text{ m}^3/\text{day} \times 365 \text{ days/year}$
= $182.5 \text{ m}^3/\text{year}$

Population of Ilagan town = 130,000 (NSO 2007)

Price of level III water system = USD 0.20 /m³

Gross Sales = $182.5 \times 0.20 \times 130,000$

Gross Sales = USD 4,745,000 / year

3.1.4 River-based Eco-Tourism

River-based tourism is growing in popularity in the region. A feasibility study by Carag (2009) on the tourism potential in Abuan river identified boating, kayaking, rappelling and white-water rafting as possible activities. Day and weekend package tours are being developed in Abuan River. These tours cater to weekend visitors from Manila. The packages are to be made part of the tourism program of the Ilagan Municipality, Isabela province and Region 2. Eco-tourism in Abuan can create employment opportunities for former logging-dependent households. Small entrepreneurs can benefit by leasing picnic huts

and boats, selling lunches and drinks, tour guiding services, souvenir sales among others. These investments spur the local economy through multiplier effects.

Assumption:

Visitor-trips per year: 1,000

Average spending or Travel Cost per visitor assuming 2D/2N: \$50

Tour cost/tourist: \$20/pax

Gross Sales/year: $1000 \times \$50 + 1000 \times \20

Gross Sales/year: \$70,000

3.1.5 Carbon Markets

With growing interest in carbon markets and emerging incentive schemes such as Reducing Emissions From Deforestation and Degradation (REDD), opportunities are emerging to generate payments for carbon sequestration to benefit Abuan communities.

Clean Development Mechanism

The Clean Development Mechanism allows Annex 1 countries to buy carbon credits from developing (non-Annex 1) countries in order for the former to meet regulatory caps to carbon emissions. The latter may sell carbon credits by sequestering carbon through tree plantations, energy efficiency measures, switching to biomass fuels, and the like. In the case of Abuan, open grasslands may be planted to agro-forestry to provide tree-based livelihoods and to sell carbon credits at the same time.

The following table shows the rate of carbon sequestered for agro-forestry plantations. Assuming 2,146 hectares of open grassland in Abuan is planted to agro-forestry. The carbon sequestered and equivalent sales from carbon credits is computed as follows:

Assumptions:

Open grassland converted to agro-forestry = 2,146 has

C sequestration rate of agro-forestry = 2.7 tons/ha-year (Lasco et al 2000)

Total C sequestration = 5,794 tons/year

Atomic weight of carbon = 12

Atomic weight of oxygen = 16

Atomic weight CO₂ molecule = (12 + (16 x 2))=44

Total weight of CO₂ = 5.79 x 10³ tons x 44 /12 = 21.25 x 10³ tons CO₂

Price of 1 ton CO₂ equivalent = US\$ 8/tCO₂-e

Gross sales /year = 21,250 x \$8 = \$ 170,000

Payments Through Avoided Deforestation (REDD)

This approach, also known as **REDD** (Reduced Emissions from Deforestation and Degradation), is being negotiated by tropical countries in the run-up to the Copenhagen Climate Change negotiations in December of 2009. This mode of financing aims to arrest the decline in forest cover and global loss of carbon sinks. It will generate financial resources by maintaining or improving existing carbon sinks in intact forests by protecting forest reserves. Payments are made based on reduced rates of deforestation.

The baseline deforestation rate in Abuan Watershed is derived from the volume of confiscated timber as reported by the Provincial Task Force on Forest Protection for 2008-2009 (Ly 2009). In fourteen months of the campaign (July 2008 to September 2009), the total volume of confiscated timber originating from Abuan watershed is reported at 1,449 m³. This translates to annual volumes of 1242 m³.

Deforestation rate/year = 1242 m³

Assumptions:

1 ton = 2.83 m³

Equivalent mass in tons = 438.87

% Carbon content of biomass (Lasco et al 2000) = 44.7

C content removed (tons/year) = 196

Price of 1 ton CO₂ equivalent = US\$ 8/tCO₂-e

Atomic weight CO₂ = (12 + (16 x 2))=44

Atomic weight of carbon = 12

Total weight of CO₂ removed a year = 196 * 44 /12 = 718 tons

Gross sales /year = 718 x \$8 = \$ 5,749

3.2 Identifying prospective buyers

The prospective buyers differ with respect to the ES. The buyers can range from hydropower companies, bulk water providers such as water districts, the National Irrigation Authority (as proxy for rice farmers), carbon brokers representing Annex 1 countries and visiting tourists (**Table 5-1**).

Summarizing the potential economic contributions from hydropower, irrigation, water supply, carbon credits and tourism, the economic values generated by conserving the Abuan forests may reach USD 9.34 Million a year.

Table 5-1. Environmental Services, Potential Buyers and Annual Economic Output in Abuan

Watershed Service	Potential Buyers	Annual Economic Output (in USD)
Hydropower (runoff river)	Independent Power Producers IPPs, Electric Cooperatives	2,280,960
Irrigation	VIBANARA farmers*	2,069,750

	Rice Irrigators associations	
River-based Adventure Tourism	Tourists, adventure groups	70,000
Water Supply	Barangay Water Association Ilagan Water District	4,745,000
Carbon sequestration (CDM)	Kyoto Protocol Annex 1 Countries Carbon brokers, banks	170,000
Avoided Deforestation	Same	5,749
TOTAL		9,341,459

- VIBANARA farmers may be both buyer and seller of ES

3.3 Identifying Sellers and Watershed Protection Services

“Sellers” of PES can be defined as actors that legally own the land or who exercises management control pertaining to land uses within the watershed. These can be state actors, non-state actors or a mix of both. The major “sellers” are the park authorities of the Northern Sierra Madre Natural Park and the CBFM organization who has jurisdiction to 69% and 16% of the watershed area respectively.

3.3.1 Northern Sierra Madre Natural Park Protected Area Authorities

The Northern Sierra Madre Natural Park covering 69% of the watershed area is located in the higher catchment and provides the largest proportionate share of benefits. The agency having jurisdiction over land use decisions in the park is the Dept of Environment and Natural Resources (DENR) through the Protected Areas Management Board (PAMB). Under the PAMB are the executive staff consisting of the park superintendent and the rangers. The park office, as with other parks in the country, is understaffed, lacks resources and equipment, and untrained to handle a complex job in park management.

Some parts of the park may be traditionally owned and controlled by hunting and gathering indigenous communities such as the *Agta* and *Dumagat* tribes by virtue of their ancestral claims. Reports show that 13 bands with 5-7 families per band belong to these groups. They subsists on *kaingin* or swidden farming,

hunting, fishing and gathering of non-timber forest products (rattan, honey, resin, etc).

3.3.2 CBFM Area

The state awarded a 25-year lease agreement to the Peoples Organization, called Vibanarra, under a Community Based Forest Management (CBFM) Agreement. Through this agreement, the organization has legal control to over 16% of the watershed.

Within the CBFM area, migrant and indigenous communities can be found in the lower sub-catchment of the watershed. This area, cleared through a previous logging concession, is now pre-dominantly planted to corn, upland rice, tree farms with expansive open grasslands, shrubs and residual forests. In the rainy months after a heavy downpour, the Abuan river turns brown, laden with silt from upstream deforested areas. Corn plantations and upland rice planted in hilly areas are reported to have high erosion rates (Evangelista 2009).

A large part of the haulers of illegal logs (called *bugadors*) consisting of about 150 families come from this community. Because of poverty and higher returns from logging, these *bugadors* rely on the illegal timber trade. At the height of the anti-logging campaign in 2008, some of these people were apprehended. Others have to seek other forms of livelihood. Given the right incentives, they play an important role in reversing forest denudation, land degradation and in providing buffering activities to the natural park. They are also key to any future PES scheme.

The incentive scheme may be channeled to the organization who allocates the benefits to its members. This reduces the transaction cost of relating to individual families participating in the PES scheme.

In the case of roaming tribal groups, their footprint or impact on forest resources is not as severe as the migrant farmers. Left on their own, these tribal groups

will continue to live sustainably off the park resources as they have since the time of their ancestors. Their subsistence activities and rights over ancestral territories are guaranteed under the Indigenous Peoples Rights Act of 1996.

3.3.3 Watershed Protection Services

Land use practices that disturb the soil results in high erosion. Road construction, agriculture cropping practices, deforestation may greatly accelerate erosion. Soil erosion results in deposition of silt in waterways, canals, weirs, pipes and other hydraulic structures. These deposits reduce the available volume that the structure is designed to convey. Every year, water utilities and hydropower plants spend considerable money to remove silt in logged canals and structures.

Swidden farms or *kaingin* especially in steep slopes are responsible for high erosion rates. The predicted annual erosion rates for *kaingin* farms in the Abuan watershed can range from 1524 to 3671 tons per hectare depending on slope categories. These erosion rates are classified as extremely high. If *kaingin* farms are converted to agro-forestry areas, the annual erosion rates will be reduced dramatically by 99% to 14.98 - 18.52 tons per hectare. *Kaingin* farmers are best candidates for any PES scheme in Abuan.

The organized farmers might offer to implement, for a fee, specific natural resource management practices or activities, such as maintaining forest cover; reforestation, possibly with a focus on native species; adopting 'sustainable' or 'best' land use management practices, such as sustainable farming or sustainable forestry. By adopting these practices, they are creating or maintain natural filters in the watershed to reduce soil erosion and water pollution. By maintaining vegetation, water flows are regulated through the year, controlling for floods and minimizing soil loss and sedimentation.

3.4.1 Assessing legal, policy context for PES

The policy environment enabling adoption of PES or PES-like schemes is embedded in sector policies linked to the use and management of natural resources. These policies are found in power generation, protected areas and irrigation.

The devolution of powers under the local Government Code presents opportunities to generate local financing from extraction or use of natural resources, e.g. mining, domestic water use, hydropower, forestry. The law provides for a 1% share of LGUs in the national wealth as stipulated in the Local government Code of 1991 (RA 7160).

A summary of these policies as they correspond to specific watershed service is presented in **Table 5-2**.

Table 5-2. Enabling Policy for PES, valuation methods used and responsible agency

Ecosystem Service	Policy	Valuation method	Implementing Agency
Hydropower	ENR 94-1 RA 7638 (DOE Act), RA 9136 (EPIRA)	1/2 of 1 centavo/kwh of gross sales	IPP, DOE, LGU, NAPOCOR
Hydropower	1% share of national wealth, Local Government Code	Voluntary 1% of gross sales	IPP LGU
Irrigation	Voluntary	% of summer yield	Irrigators Association, CBFMO
Eco-Tourism	LGU ordinance	WTP, Travel Cost	LGU, operators
Biodiversity, bio-prospecting	NIPAS Act (RA 7586)	WTP or Cost- Based	PAMB, DENR
Domestic Water	Wildlife Act (RA 9147)	Fee-based	PAMB, DENR
	PD 1067 Water Code of the Philippines	Cost-based	National Water Resources Board, Water District
	1% share of national wealth, Local	1% of gross sales	Water District, LGU

Carbon Payments	Government Code Kyoto Protocol	\$/ton-CO ₂ e sequestered	DNA, DENR
Forest services	REDD Executive Order 318 (2004)	carbon stocks in trees	

3.5 Prospective PES amounts per sector

This section explores the amounts that can be raised from PES schemes under existing laws and sectoral policies that can sustainably finance watershed protection.

Power Sector

The power sector is one of the potentially significant contributors to PES schemes. For all power projects, the Dept of Energy established the Reforestation, Water shed Management, Health and/or Environment Enhancement Fund (RWMHEEF) through Republic Act 7638 of 1992. The Implementing Rules and Regulations, as contained in ER-94-1, Sec 6(f), states that:

“One-half of one centavo (PhP 0.005) per kilowatt hour of the total electricity sales of the energy-generating facility shall be set aside by the power producer to be used for reforestation, watershed management, health and/or environment enhancement. The power producer and the energy resource developer, to the extent of their respective contribution to the fund, shall each submit work programs for reforestation, watershed management, health and/or environment enhancement which would have to be approved by the DOE in consultation and close coordination with the DENR, the DOH, the relevant water districts, local government units, regional development councils, non-government organizations, and other affected parties...”

This was amended by Department Circular No 2000-03-003, whereby the electrification fund will get 50% of one centavo and the remaining 50% will be shared equally between the Development and Liveihood Find and the RWMHEEF).

Republic Act 9136 also known as the Electric Power Industry Reform Act of 2001 (EPIRA) adopted these amendments to ER94-1.

Under the RWMHEEF Fund, there have been a total of 349 projects, with a total disbursement of PhP 413,935,169 for 38 power plants, over a period of 8.5 years. The majority of the projects are found in Luzon, mainly in Metro Manila, corresponding to the number of power plants located per regional center. (Rosales 2003)

The funds accruing from RWMHEEF are administered by the Department of Energy. For NAPOCOR assets, the fund is administered by NAPOCOR. The local government unit submits proposals to DOE/NAPOCOR for evaluation. The proposals may include construction of health centers, communal toilets, water supply system, erosion control, forest management, reforestation, rehabilitation, soil fertility conservation and enhancement, waste disposal and other related projects.

The amount accruing to RWMHEEF for hypothetical Abuan hydropower operation is estimated as follows:

$$\text{Annual Volume in KWH} = 3.3 \text{ MW} \times 1000 \text{ KW/MW} \times 0.8 \times 360 \times 24$$

$$= 22,809,600 \text{ KWH}$$

$$\text{RWMHEEF} = 22,809,600 \text{ KWH} \times .005/\text{KWH}$$

$$= 114,048 \text{ Pesos (USD 2,376)}$$

While these amounts may be small, the hydropower company may augment their investment in the watershed corresponding to the values they attach for watershed services. In addition to the RWMHEEF schemes, the power producer may provide for voluntary payments taken from their producer surplus.

For example, In a 1 MW run-off river hydroelectric project in San Fernando, Romblon, the power company is voluntarily setting aside P400,000 a year for reforestation, enforcement, livelihoods and scholarships to benefit indigenous upland communities (ROMELCO, pers comm.).

Assuming the economics and producer surplus with the Romblon hydropower project are the same, the envisioned 3.3 MW run-off river scheme in Abuan may annually generate an additional P1.2 M (or USD 25,000) for watershed activities.

LGU Share from National Wealth

The local government code provides a 1% share from gross sales in favor of the local government unit. With projected annual sales of USD 2,280,960, the 1% share of the LGU amounts to USD 22,809 per annum.

Irrigator Associations.

The National Irrigation Administration (NIA) is mandated to build irrigation infrastructures (weirs, canals, pumps, etc) to increase farm productivity in rice and corn lands. NIA also organizes farmers into irrigator groups in order to access loans for irrigation infrastructure.

In a survey of farmers in Romblon, the farmer groups have indicated willingness to pay 1 cavan of rice for each hectare for 1 cropping season. Assuming the same socio-economic profiles and willingness-to-pay is found in Abuan rice farmers, the future irrigation scheme may potentially generate \$12,812 a year, computed as follows:

Assumptions:

Price = \$0.25/kg

1 cavan = 50 kg

Potential irrigable area = 1,025 has

Voluntary payments by farmers = \$0.25/kg x 50 kg/cavan x 1 cavan/hectare x 1,025 has

= \$ 12,812 per year

Ecotourism payments.

Payments from visiting tourists can be in the form of entrance fees authorized through provincial or municipal legislation. Examples of LGU-legislated financing can be found in Tubbataha Reefs, Mabini-Tingloy (Anilao) Batangas, Puerto Galera, Olango Island and Hiluturan in Cebu and St Pauls Subterranean River in Puerto Princesa City.

Future operators in Abuan watershed can run packages for boating, kayaking, rapelling and white-water rafting activities. These operators can pay a fee similar to those charged by competing sites along Chico and Pinacanauan Rivers respectively in Cagayan Province, or by assessing 10% of their travel cost.

For Abuan, we assume an entrance fee of P100 per passenger/day to the river.

Assumptions:

Daily Entrance fee = P100

Visitor-trips per year: 1,000

Entrance fee: P100/visitor

Gross collections per year = P100/px x 1,000 pax/year = P100,000

Biodiversity

The NIPAS Law of 1992 is an act providing for the establishment and management of National Integrated Protected Areas system, defining its scope and coverage, and for other purposes. The law allows the park to collect entrance fees, donations, penalties and fines arising from park administration. The park collections are deposited in the national treasury where 75% are allotted to the park for direct use and 25% accrues to the IPAF sub-fund to subsidize other parks.

The Wildlife Act of 2001 is an act providing for the conservation and protection of wildlife resources and their habitats, appropriating funds therefore and for other purposes. The law upgrades the penalties and fees as a deterrent to commit wildlife violations. It also sets the protocol and fees for bio-prospecting by local and foreign institutions for commercial and non-commercial and academic purposes.

The PAMB may set visitor fees for entrance to the park. Since visitors do not cross into the park boundary, we omit the entrance fees in calculating the potential amounts to be raised from PES schemes.

Domestic Water

The LGU may collect 1% from the gross sales of the water district as its share of national wealth. For Abuan, these collections can earn the LGU up to USD 474,500 per year from domestic water use. These collections however do not guarantee earmarking for watershed activities.

Under the Philippine Water code, the NWRB through the Local Water District is responsible for setting water tariffs to be charged to consumers. Current water policies however do not reflect the true cost of water provision which includes the cost of maintaining watersheds. Apart from the 1% levy by LGUs, the water district may however voluntarily set aside funds for watershed protection.

Carbon

The credits from CDM and REDD and equivalent monetary values will go directly to the communities that host and manage the forest resources, including planting trees to sequester carbon. There is however a need for local consolidator, broker, and verifier to validate the carbon credits.

The carbon credits from CDM and REDD can generate up to USD 175,749 a year assuming all the open grasslands are reforested and illegal logging is curtailed.

Forest Services

Executive Order 318 (2004) on Promoting *Sustainable Forest Management*

“provides for proper valuation and pricing of forestry resources and collection of fees for use of environmental services of forests and watersheds. It also provides for a plough-back mechanism that ensures service providers are properly compensated.

Pooling all potential PES contributions from different sources, the proposed scheme may generate USD 715,329 per year (**Table 5-3**). With forest cover at 56,807 has, this is equivalent to USD 12.59 per hectare.

The ES indicators for the hydropower and irrigation schemes are the average base flows during dry months (March – June) measured in average MCM/day. For the water company, it is water quality measured in Total Suspended Solids and other parameters. For carbon brokers, the indicator is the forest cover in number of hectares. For tourism, it may be a combination of the above indicators.

Table 5-3. Identifying ES Buyers, indicators and estimated amounts for PES

ES Buyer	PES amounts In USD	Amounts (in USD/year)	ES indicators
Hydropower Power Company	RWMHEEF	2,376	Stable water flows year-round, base flows during dry months
	Voluntary	25,000	same
	1% share from gross sales	22,809	same
Irrigators association	Voluntary 1 cavan/HH-yr	12,812	Dry season flows, MCM
Tourists	WTP	2,083	Scenery, Clean & flowing water, H2O quality
Water District	1% Share from gross sales	474,500	Abundant, clean & Potable water, H2O quality
Carbon brokers	CDM	170,000	Re-Forestation cover (has)
	REDD	5,749	Old growth Forest cover

	(has)
Total	715,329

If we remove payments from carbon credits, the annual payments for PES is reduced to USD 539,580 or the equivalent of USD 9.50/hectare. This is comparable to the low end of the range of PES payments in the Costa Rica example made by a hydropower producer (see **Figure 5-2**). But this ratio is higher than what the other protected areas are earning and will improve management effectiveness if spent wisely.

3.6 Surveying available PES support services and organizations

PES programs can be in the form of self-organized deals between few sellers and buyers or legislated schemes and structured arrangements involving large numbers of buyers and sellers. The latter will require brokers to set up payment mechanisms, aggregate sellers and/or buyers, conduct studies, and defray the transaction costs essential for its establishment and monitoring. NGOs usually perform the brokering role while LGUs provide the enabling framework and initial funds. No hard and fast rule is prescribed in setting up voluntary and involuntary schemes, but a mix of both may be more applicable.

3.6.1 Institutional Arrangement

There is no standard blueprint in designing institutions to implement PES schemes. It is important to highlight that PES need to be adapted on a case-by-case basis and used as appropriate, keeping in mind that PES are means of securing ecosystem services that are important to socio-economic development.

In the case of Abuan, the potential role of the CBFM community is to provide buffering or “social fencing” to the park. This should be the goal of any PES scheme. These farmers are located in areas that provide access to the park, and are therefore in the best position to spot and report illegal activities, monitor and dissuade poachers, outsiders and migrants from entering the park.

Thus it is important for these farmers to benefit from incentive systems including cash and non-cash rewards. Non-cash incentives can include land tenure, credit, infrastructure or post-harvest facilities, and other support that are made conditional to farmers' sustainably managing their land. PES schemes can be earmarked to subsidize sustainable agriculture such as agro-forestry schemes, tree farms, inter-cropping systems, organic farming and other practices. Farmers can organize themselves into community watchdog groups and be employed to monitor and patrol the forests for any illegal activities.

The more sectoral benefits are realized, the greater the amount of funds that can be generated from PES. Watershed activities entail costs and PES schemes are gaining popularity because of latent demand for services from a range of buyers, whether hydropower, eco-tourism, irrigation or water utilities. If opportunity costs from logging are high, or if there is a big number of sellers, the contributions from buyers' can be pooled to pay for watershed activities that would otherwise be difficult for a single buyer. In most cases where PES schemes operate, the funds are kept in a trust account and a trustee organization or NGO is tasked to manage the account.

The functions of the trustee organization include organizing the watershed communities, building their capacities, reviewing proposals, work plans and budgets, disbursing funds, monitoring and reporting progress, evaluating outputs, and repeating the process after each project cycle.

The trustee will also report progress to its benefactors using indicators that are important to them. These indicators should signify health of the watershed and are linked to the level of water flows during summer, amplitude of flows throughout the year, water quality, forest cover, poverty, among others.

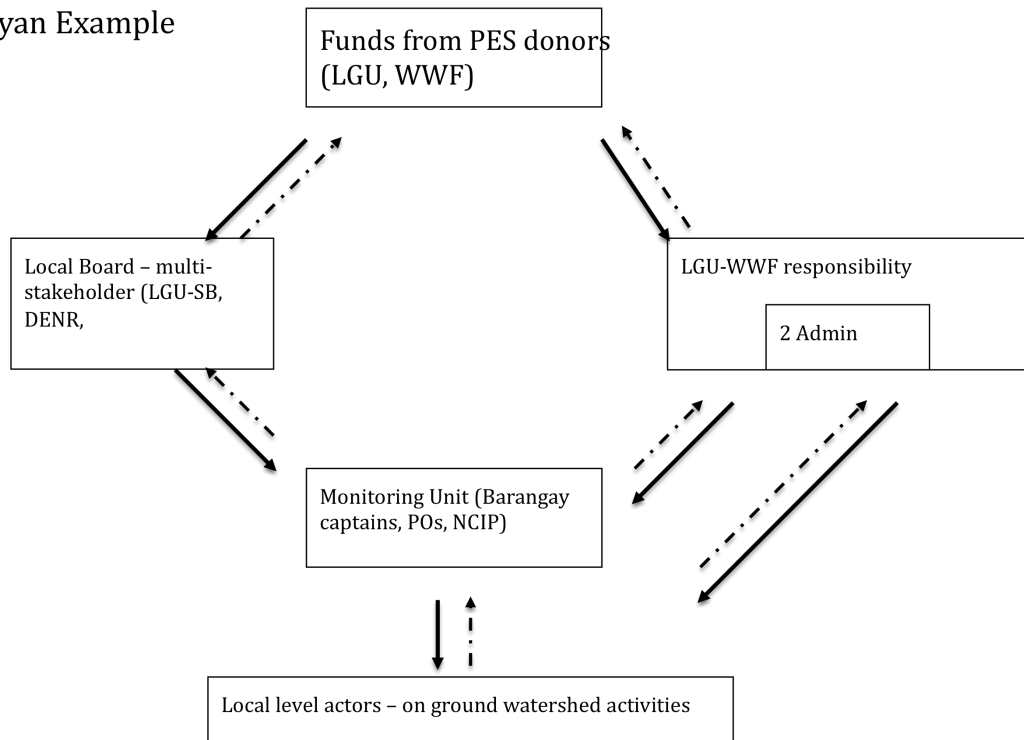
One of the important indicators to monitor in any PES scheme is the opportunity cost, especially those borne by farmers in giving up land uses that are more profitable, but may be ecologically destructive. These land uses can include small-scale mining, swidden farming, or establishing exotic tree farms. Because opportunity costs vary and fluctuates over time, it would be important for payments from PES schemes to be flexible in order to match or at least cover the

opportunity costs. Auctions, bidding and other schemes are some of the means to derive the opportunity costs of sellers.

Figure 5-7 depicts a PES governance structure operating in Sibuyan Island, Romblon Province. The watershed management project cycle coincides with the intra-LGU planning, budgeting and monitoring cycle. This scheme, which started in early 2006, is into its second cycle of implementation by the LGU of San Fernando, Romblon. The funds come from contributions of the Municipal Local Government, and WWF. The sellers are the upland communities consisting of *Sibuyan Mangyan Tagabukid* indigenous group. The upland communities receive payments to perform patrols, surveillance, plant native trees and agro-forestry species.

The funds for these activities are held in trust using a separate bank account. The donors' representatives are co-signatories to deposits and withdrawals. Funds are disbursed after satisfactory review of progress reports and verification by a monitoring committee which is composed of the barangay captains, DENR and the NCIP.

PES Governance Structure –
Sibuyan Example



Compact arrows: resource and information transfer
Dashed arrows – information transfer only

Figure 5-7. PES Governance Structure, Sibuyan Island, Romblon Province 2009.

Conclusions:

The values being derived from the Abuan is currently based on timber extraction. The recent campaign against illegal logging in Abuan in 2008-2009 yielded half a million board feet of timber valued at P 8 Million pesos. The baseline scenario shows that we will lose the forest and the watershed services to destructive activities. Assuming the returns from logging is P8 Million a year (or USD 166,667) based on confiscation records, this amount is small compared to the USD 9.3 Million economic values that can be derived from economic sectors that depend on maintaining forest services. This does not include the potential damage avoided from deforestation such as flooding and land slides. Without the carbon payments, the potential return per hectare of forest preserved is USD 9.50/hectare. This is well within the low end of payments being made to protect the forests in Costa Rica.

While Abuan shows high potential, the challenge is to convert these economic values into financial returns. The paper recommends that the LGU of Ilagan present the business case to the Regional Development Council chaired by the National Economic Development Authority of Region 2 (NEDA-2). NEDA-2 will then prepare an investment kit, conduct investors' roundtable, and market the site to invite investors in hydropower development, irrigation and domestic water supply. The Department of Tourism Region 2 (DOT-2) should adopt the recommendation of the Carag (2009) study, build capacities of operators and set tourism standards to launch eco-tourism in Abuan. Each sector will eventually undertake detailed feasibility studies and operational plans to make these schemes work. The PES schemes and governance structures can be established later once operations start in Abuan.

Unless the watershed services of Abuan basin are utilized for the benefit of its residents, the Ilagan town and society at large, the pull of deforestation will always remain. The Abuan watershed has much offer and the benefits can be significant as argued in this paper. It is either we use it, or we lose it.

References:

- Coase R. 1960. The Problem of Social Cost. *Journal of Law and Economics*. II (1959), 26-27.
- Evangelista P. 2009. Soil and Land Use Study of the Abuan Watershed. Technical report submitted to WWF-Philippines. Manila.
- Gunn R & Kinzer GD. 1949. The Terminal Velocity of Fall for Water Droplets in Stagnant Air. *J. Meteorol.* Vol. 6 pp.243-248.
- Landell-Mills N & Porrás I, 2002. Silver Bullet or Fool's Gold? A global review of markets for forest environmental services and their impact on the poor. UK. International Institute for Environment.
- Lasco R D & F B Pulhin. 2000. Forest Land Use Change in the Philippines and Climate Change Mitigation. *Mitigation and Adaptation to Global Change Journal* 5:81-97.
- Linsley R K, Kohler M & J Paulhus. 1982. Hydrology for Engineers. McGraw-Hill Inc. P. 322.
- Ly D D. 2009. List of Forest Products Apprehended by Provincial Task Force on Forest Protection (5 July 2008 to September 2009). Office of Governor, Province of Isabela.
- Padilla J E, Tongson E E, and R D Lasco (eds). 2005. Sustainable Financing for Conservation and Development: Proceedings from the National Conference – Workshop on Payments for Environmental Services: Direct Incentives for Biodiversity Conservation and Poverty Alleviation. Manila March 1-2, 2005, WWF, ICRAF, REECS, UP-CIDS, UPLB-ENFOR, CARE. 279 pp.
- Pagiola S. 2007. Using markets to preserve forests and the services they provide. IUFRO Symposium. Integrative Science for Integrative Management. www.worldbank.org/environmentaleconomics
- Pagiola S, Landell-Mills N & J Bishop. 2002. Making Market-based mechanisms work for forest and people. In S. Pagiola, & N Landell- Mills (eds.). *Selling Forest Environmental Services: Market-based mechanisms for conservation and development*. Pp 261-290. London UK. Earthscan.
- Rojas D Jr. 2009. Hydrology and Flood Studies in the Abuan Watershed. A technical report submitted to WWF-Philippines. Manila.
- Rollan R. 2009. Hydro-Geology Study of the Abuan Watershed. A technical report submitted to WWF-Philippines. Manila.
- Rosales, Rina Maria P. 2003. Developing Pro-poor markets for environmental services in the Philippines. International Institute for Environment and Development, London.
<http://www.iied.org/pubs/display.php?o=9248IIED&n=8&l=8&s=MES>

UNEP, Katoomba Group, Forest Trends. 2008. Payments for Ecosystem Services: Getting Started, A Primer. Accessible at: www.unep.org.

Wunder S. 2005. Payments for environmental services: Some nuts and bolts. Center for International Forestry Research. *Occasional Paper 42*, Bogor.