

Piloting
Of
Payment for Ecosystem Services (PES) at Ghodaghodi Lake Area
(GLA)



Submitted to

Ministry of Forests and Soil Conservation
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Prepared by

Lumbini Environmental Services Pvt. Ltd.

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Acronyms

BIC	Bagdauli Irrigation Committee
BPP	Biodiversity Profile Project
CBO	Community Based Organization
CF	Community Forest
CFUG	Community Forest User Group
CFUC	Community Forest User Committee
CSUWN	Conservation and Sustainable Use of Wetlands in Nepal
CVM	Contingent Valuation Method
DAO	District Agricultural Office
DDC	District Development Committee
DFO	District Forest Office
DIO	District Irrigation Office
DNPWC	Department of National Parks and Wildlife Conservation
DPSIR	Driver-Pressure-State-Impact-Response
ESs	Environmental Services
EMSF	Environment Management Special Fund
FAC	Field Advisory Committee
FECF	Forest Ecosystem Compensation Fund
FGD	Focus Group Discussion
FMC	Field Management Committee
FMU	Field Management Unit
FPG	Forest Protection Group
FUG	Forest User Group
GEF	Global Environment Facility
GL	Ghodaghodi Lake
GLA	Ghodaghodi Lake Area
GLC	Ghodaghodi Lake Complex
GSM	Ghodaghodi Sarokar Munch
HH	Household
ISRC	International Standard Recording Code
IUCN	International Union for Conservation of Nature
MFSC	Ministry of Forests and Soil Conservation
NBRB	Nepal Biodiversity Resource Book
NGO	Non - Governmental Organization
PES	Payment for Environmental Services
RIO	Regional Irrigation Office

SAFE	South Asian Forum for Environment
TAL	Terai Arc Landscape
UNDP	United Nation Development Programme
UNEP	United Nation Environment Programme
VDC	Village Development Committee
WDC	Wetland Dependent Committee
WTA	Willingness To Accept
WTP	Willingness To Pay
WTLCP	Western Terai Landscape Complex Project

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Table of Contents

1. Introduction.....	1
1.1 Background	1
1.2 PES Practices in National and International Level.....	2
1.3 Ghodaghodi Lake Area (GLA).....	5
1.3.1 Bio-physical attributes.....	7
1.3.2 Socio-economic attributes	8
1.4 Objectives of Study.....	10
1.5 Existing management practices within GLA	10
3. Methodology.....	12
3.1 Data Sources.....	12
3.2 Development of PES Mechanism.....	15
4. Results	16
4.1 Environmental Services in GLA	16
4.3 Stakeholders: Service providers, Beneficiaries & Intermediaries	19
4.3 Guidelines of PES Implementation	23
4.3.1 Identifying Beneficiaries and Generating Demand.....	23
4.3.2 Payments.....	24
4.3.3 Negotiation.....	24
4.3.4 General guidelines for piloting & implementation of PES.....	25

4.4 Mechanism Development of PES Scheme.....	27
4.5 PES as an Effective Mechanism in GLA	32
4.6 DPSIR Model With and Without PES	34
5. Conclusions.....	36
References	39
Annex	41

1. Introduction

1.1 Background

Nature provides an array of essential benefits for mankind. It gives us clean air and water, productive soil to produce food, carbon sequestration and predictable weather and many other services required for human well being. These free services/benefits derived from the nature and ecosystem to the human society is known as ecosystem services. Basically ecosystem services are considered as ecosystem functions which provide benefits for human beings (de Groot 2006; Costanza et al. 1997). Today however, many ecosystem and the nature derived services are under increasing pressure, natural and anthropogenic. Indeed, the most comprehensive study to date, the Millennium Ecosystem Assessment, which engaged over 1300 scientists, remarked that more than 60% of the world's ecosystems are being degraded in ways faster than they can recover. Therefore, there has become a growing focus for conservation movement, in the past decades or two. In search of an approach that contributes for both sustainable use of stocks and flows, and restoration of ecosystem services, devised the quantifiable economic value of these services. Thus, Payment for Ecosystem Services (PES) has emerged in businesses, public-sector agencies and non-profit organizations as an active interest in addressing the environmental issues by bringing natural capital into the market place. This approach fulfills the gap in financing formal and informal markets to entice investments in restoration and maintenance of ecosystems by providing the right incentives for encouraging the sustainable use of ecosystem services and encouraging beneficiaries to contribute their fair share to restoring and maintaining the stocks and flows of ecosystem services (UNEP, 2008). Such approach is known as Payment for Ecosystem Services (PES).

According to Wunder (2005), "A payment for environmental services scheme" is:

1. a *voluntary* transaction in which
2. a *well-defined* environmental service (ES), or a form of land use likely to secure that service
3. is bought by at least one ES *buyer*
4. from a minimum of one ES *provider*
5. if and only if the provider continues to supply that service (*conditionality*)."

PES is the practice of offering incentives to service providers in exchange for managing their land to provide some sort of ecosystem services. The core idea of PES is that ES beneficiaries make direct, contractual and conditional payments to local landholders and users in return for adopting practices that secure ecosystem conservation and restoration. The PES tools include direct public payments, direct private payments, tax incentives, cap and trade markets, voluntary markets, and certification programs.

1.2 PES Practices in National and International Level

After the realization of need of conservation to gain sustainability in the provision of services derived from the nature, the conservation approaches have moved from a sole focus on protected areas, to integrated conservation and development projects, to landscape management approaches, and now, the consideration of conservation contracts. At the same time, there has been the enforcement of environmental regulations towards more multi-stakeholder forms of governance which incorporates non-governmental and international organizations there by bringing a variety of market-based and negotiation approaches. Under this dynamic context, PES has come fore as a greater interest for sustaining the provision of ecosystem services in the context of Human Environmental System. Therefore, the PES mechanism initiated as an important and effective tool to address the environmental issues in many parts of the world. Most of them are recent or running for a few years, and several PES schemes remain experimental in scope or are still in pilot phase. Some of the examples around the globe are briefly described below.

- Kenya: PES scheme in Lake Naivasha Basin (Ramsar site) - Kenya, is similar to the pilot project of PES in GLA, related to natural resource management & provision of water services. This project was initiated as pilot study and was successfully commenced in 2008. Pilot site selection, community sensitization, livelihood assessment, cost-benefit analysis and monitoring were the major part of the project implementation. Within PES mechanism, the upper Turasha-Kinja and Wanjohi Water Resource Users Associations were compensated with initial financial incentive of USD 10000 followed by second payment of USD 10000 by the Lake Naivasha Water Resource Users Association as service beneficiary. The first incentive rewarded 470 farmers and second reward

benefitted 504 farmers. This project benefitted the watershed inhabitants by various ways like improved water quality, livelihood improvement, reduction of soil erosion, water conservation, increased forest cover, etc. (UNEP, 2011).

- China: The 'Paddy to Dryland' program initiated in 2005 is a part of direct public payment where a Beijing municipality pays directly to the farmers in the upper watersheds of reservoirs. These payments provide financial incentives to convert water-intensive rice paddies to corn and other low water intensive crops. Payments were originally set at approximately US\$ 980/ha and have been increased to approximately US\$ 1,200/ha in 2008. To date, more than 5,600 ha of paddy fields have been enrolled in the program.
- Nepal: PES is a new concept in the context of Nepal, however there are number of case studies conducted on PES in different places. PES mechanism in Kulekhani watershed is one of the examples, within which about 20% of the royalty received by the Makwanpur DDC from the Kulekhani I & II hydropower plants is allocated for the Environmental Management Special Fund (EMSF), formed by Makwanpur DDC and the Local Government Body in 2006. This fund is being used for the conservation and development programs in the upland region of Kulekhani watershed (Huang and Upadhaya, 2007). Even the transaction between upstream communities and hydropower project are still functioning, the PES scheme does not seem effective. This is because; the upstream communities are unaware about what purpose they are being paid and where to make the proper investment.

Piloting of PES in 6 community forests (CF) of Chitwan and Lalitpur districts; Mohana and Machhali watershed at Kailali and Kanchanpur districts; benefit sharing mechanism in Rupa wetland; PES implementation in Shivapuri National Park, etc. are some of the initiative works on PES in Nepal. The pilot study of PES in CFs (Lalitpur & Chitwan) covers water services, carbon sequestration, soil erosion control, biodiversity protection and recreation. Regarding the provision of water services, willingness to pay by the local users to the CF namely, Amrit dharapani is NRs.68/ha/yr; NRs.31/ha/yr and NRs.107.6/ha/yr for Godavari Kunda and Gupteswor respectively. The quantification of the water supply services was undertaken with the use of Contingent Valuation Method

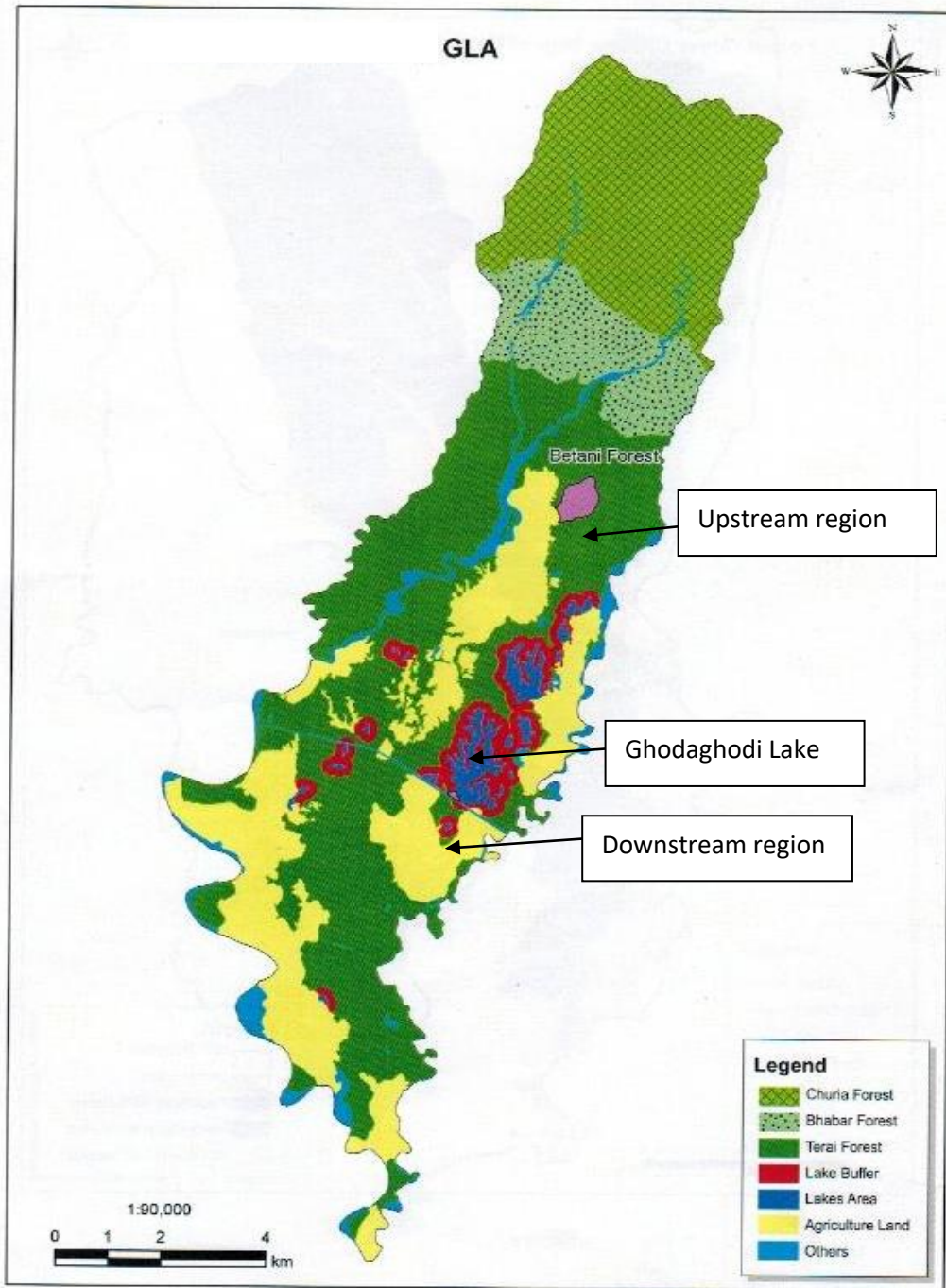
(CVM) to identify the actual water supply value at the local level. Similarly, the environment payment system in Rupa lake area initiated in 2002, under which the downstream Rupa Lake Rehabilitation and Fisheries Cooperative (RLRFC) pays 10% of its income from fishery management group to the upstream communities. The payment mode is in the form of community contribution, capacity building, and collaborative activities including cash payment. The expansion in the number of members of this cooperative from 360 to 600, especially from the watershed area proves the success of this mechanism in Rupa lake area. Under PES scheme, RLRFC has carried out different activities in the upstream region such as education scholarship to 52 students; conservation grants to 19 schools and 17 community forest user groups (CFUG); conservation oriented income generating activities to more than 5000 households, etc. Moreover, a vital watershed in the Shivapuri National Park is protected through the implementation of PES as it sustain the livelihood in Kathmandu, contributing one fifth of total piped water supply of the valley.

In this context, CSUWN is also planning to initiate the PES scheme in GLA through the linkages between upstream and downstream communities to conserve Ghodaghodi Lake and provision of water services to downstream farmers in long run. Review of PES implementation in Nepal attributes both success and failure. Therefore, for the effective implementation of PES in GLA, it is necessary to undertake lessons from both success & failure stories such as proper site selection, identification of local stakeholders, community sensitization, plan for proper investment of revenue and clear monitoring system.

1.3 Ghodaghodi Lake Area (GLA)

Ghodaghodi Lake Area (GLA) is the largest natural fresh water oxbow lake in Terai region of Far-western Nepal and covers an area of 2762 ha. It is large and shallow lake having the shape of finger-like projections (Map 1), with associated marshes and meadows surrounded by tropical deciduous forest on the lower slopes of Siwalik range. There are 20 natural, permanent or seasonal lakes and ponds ranging from 0.5 - 76.9 ha. Betini forest is the only permanent water source for these lakes & ponds. Most of these lakes remain marshy during dry season except Nakhrod and Ghodaghodi. Ghodaghodi, with an area of 76.9 ha is the largest lake of GLA followed by Nakhrod lake (46.9 ha). The total area of all lakes in GLA is about 164.9 ha. GLA is situated between 28°35'58.65" N - 28°49'11.87" N and 80°53'23.82" E - 81°0'33.02" E at an altitude ranging from 142 to 1474m. GLA spreads over Darakh, Sandepani and Ramshikharjhala VDCs of Kailali district. It is bounded by Kandara river in the west and Doda river in the east, flowing from the Churiya hills in the upstream and reaches the Terai in the downstream. The south-western part of GLA shares its boundary with the Basanta Corridor of Terai Arc Landscape (TAL). GLA has been listed as a Ramsar Site under the Ramsar Convention on Wetlands of International Importance on 13th August, 2003 due to its significance as a habitat for several endangered species of flora and fauna, especially the waterfowl. The Government of Nepal has identified GLA as a critical wetland in terms of its ecological importance (Diwakar et al, 2009).

Map 1: Ghodaghodi Lake Area (GLA)



1.3.1 Bio-physical attributes

GLA lies to the south of Churiya or Siwalik mountain range in the western part of the Nepal Himalaya. Around 72% of the GLA rests on the gentle slope indicating slow natural soil erosion process (*GLA Management Plan, 2011*). The forests of the watershed help to control soil erosion. However, the ongoing sedimentation in the river belt has created the irrigation problem and upliftment of lake. GLA includes various land uses: forest, cultivated, pond and lakes/water bodies, grassland, sandy area and swamp.

Almost 72% of the total area of GLA is covered by forest (*GLA Management Plan, 2011*). GLA is characterized by tropical vegetation dominated by Sal (*Shorea robusta*) forest. The prominent associated species include Black plum (*Syzygium cumini*), Myrobalan (*Terminalia alata*), Silk Cotton (*Bombax ceiba*) and Haldu (*Adina cordifolia*). The wetland vegetation consists of Sedge (*Cyperus* spp.), Common Reed (*Phragmites karka*) and Morning Glory (*Ipomea carnea* ssp. *fistulosa*). About 28 species of aquatic vegetation were recorded in GLA (*GLA Management Plan, 2011*). Threatened plant species include the endangered Orchid (*Aerides odorata*), religiously important and threatened Lotus (*Nelumbo nucifera*), and rare wild rice (*Hygrohiza aristata*). A total of over 450 species of plants have been recorded from GLA. Reed swamp formation and extensive marsh meadow conditions in the Ghodaghodi lake indicates the eutrophic status and high sedimentation rate, implying rapid succession towards meadow/forest condition and reduction in the life span of lake ecosystem. GLA is also rich in aquatic fauna. Among 185 species of fishes found in the whole country, 27 species were recorded from GLA such as *Oxygaster bacaila*, *Puntius* spp., *Chanda* spp., *Chana* spp., *Xentodon cancila* and *Mystus* spp., etc. (*BPP, 1995*). Around 140 partly migrating bird species inhabit the area representing over 16% of the national avifauna. Kafle (2005) recorded 60 waterbirds in Ghodaghodi lake alone. GLA is rich in bio-diversity, but the significant loss of the forest between 1977-2008 (Khanal, 2009), have initiated the vulnerability of the GLA towards environmental degradation. Low awareness level on the value of wetland and short-term profit motives in local people have undermined the long-term sustainable use of wetland and the natural resources of the GLA.

For the effective management of the forest in GLA, to date there are altogether 31 Forests User Groups (FUGs) registered in Darakh (13), Sandepani (1) and Ramshikharjhala (17) with an area ranging from 5.5 ha - 104 ha and total HHs of 3266 as members in FUGs. Forest protection and

management are the main functions performed by these user groups, even they are less aware of other functions of forest management such as bio-diversity conservation, community development, livelihood improvement, etc. They are simply protecting forest by mobilizing their own resources without external support.

1.3.2 Socio-economic attributes

About 57000 people reside in the GLA among which more than 50% are illegal settlers migrated from adjoining hilly areas (*GLA Management Plan, 2011*) and these populations are largely dependent on the natural resources for their livelihood. The national census result of 2001 revealed 43687 populations in three VDCs of GLA which was projected to increase to 57064 in the year 2008 as shown in table 1.

Table 1: Demographic status

VDC	2001				2008			
	HH	Population			HH	Population		
		Female	Male	Total		Female	Male	Total
Darakh	1694	5923	6248	12171	2287	7737	8161	15898
Sandepani	2592	8814	9142	17956	3499	11513	11941	23454
Ramshikharjhala	1824	6676	6884	13560	2463	8720	8992	17712
Total	6110	21413	22274	43687	8249	27970	29094	57064

(Source: ISRC, 2008)

The major ethnic groups residing in the GLA include Tharu, Dalit, Janajati, Brahmin, Chhetri and others, among which Tharu are the local indigenous residents of GLA. Hill Brahmin/Chhetri (37.2%) is the dominant ethnic group followed by Tharu (34.8%), Hill Dalits (11.4%) and others (*GLA Management Plan, 2011*).

Table 2: Caste/Ethnicity distribution in GLA by VDC

Ethnic Group	% Population			GLA
	Sandepani VDC	Darakh VDC	Ramshikharjhala VDC	
WDC	32.6	39.1	33.9	34.8
Hill Dalit	13.7	8.3	11.1	11.4
Hill Janajati	2.7	1.4	4.3	2.8
Hill Brahmin/Chhetri	37.5	26.9	46.2	37.2
Terai Brahmin/Chhetri	0.0	0.1	0.0	0.0
Other Terai Caste	0.0	12.7	0.3	3.6
Muslim	0.1	0.4	0.0	0.2
Not stated	13.4	11.1	4.2	10

(Source: FMU, GLA/CSUWN, 2009)

The people's occupation is predominantly farming and fishing. Land and livestock's are important economic assets and source of income of local people. Majority of them are involved in agriculture (43%) followed by students (23.2%) and abroad workers (11.2%) while rests are involved in wage (6.5%), service (4.7%) and business (3.7%) (FMU, GLA/CSUWN, 2009).

Ghodaghodi temple & lake have high religious value to local people. This lake has enormous influence on the culture and the way of life of the local indigenous Tharu ethnic group. This group comprises about one-third of the total population of GLA and are most dependent inhabitants on the lake resources. The lakes are being used for various purposes such as fishing, wallowing of livestock's, irrigation, recreation, etc. The major water uses includes irrigation, livestock wallows and drinking.

The forest is used for grazing, fuel wood and to harvest Sal wood for timber. The pressure of illegal immigrants from adjoining hilly areas have resulted intensive use of the lakes for fishing and agricultural purposes. The several threats of Ghodaghodi Lake Area are identified to be:

- High dependency on forest and wetland resources
- Overgrazing
- Loss of protected species by poaching

- Eutrophication
- Development or expansion of settlements
- Sedimentation/siltation and erosion
- Drainage/reclamation for agriculture
- Vegetation succession

1.4 Objectives of Study

The main objective of this study is to develop a mechanism for piloting of PES in GLA for the long term sustenance of environmental flows with the sustainable management of wetland resources. The specific objectives include:

- Assessing and analyzing the different environmental services and flows offered by GLA and its surroundings;
- Based on the assessment and its potential prepare necessary guidelines for PES implementation including its preparatory steps, negotiation process, working modality and approach with designated / identified roles of local stakeholders;
- Discuss and deliberate towards the institutionalization of PES mechanism at management level including a clear monitoring system.

1.5 Existing management practices within GLA

There are different local level organizations working for the protection and management of GLA as well as for the improvement of livelihoods among the GLA communities. A local level NGO namely Ghodaghodi Sarokar Munch (GSM) in partnership with TAL is implementing various programs in GLA such as bio-diversity conservation, promotion of alternative energy, livelihood improvement, forest restoration, etc. Similarly, Community Forests, Forest User Groups (FUGs) and Forest Protection Groups (FPGs), are implementing the protection and management practices within GLA despite of less awareness in terms of the conservation goals and objectives. CFUGCs are collecting sum of money ranging from NRs.10-15 per month from all the user groups for effective management of forests and watersheds.

The local irrigation committee "Bagdauli Irrigation Committee (BIC)" is providing the irrigation facilities within GLA. The working area of this committee covers the provision of water for irrigation and maintenance of the irrigation canals but it does not assure the long-term availability of water. However, this committee has made small contribution to soil and watershed conservation through provision of seedlings for plantation in the barren land in the upstream region of GLA.

3. Methodology

3.1 Data Sources

The study is based on both secondary and primary sources of information. The information related to demographic features, agricultural practices, environmental issues, organizational set up within GLA, etc. were collected from secondary sources. The secondary data sources include:

- ✓ VDC / DDC profile
- ✓ Ghodaghodi Lake Area Catchment Level Management Plan (B.S. 2069-2073)
- ✓ Baseline Survey Report of Ghodaghodi Lake Complex (2009)
- ✓ Published reports of relevant organizations

Similarly, different Acts and Policies related to wetland, forest, biodiversity, water resources and other relevant environmental components were reviewed. Similarly, the international conventions to which Nepal is signatory, were also overlooked. Some relevant Acts, Policies and Conventions reviewed during the study include:

- ✓ National Conservation Act 1988
- ✓ Water Resource Act 1992
- ✓ Forest Act 1993
- ✓ Environment Protection Act 1996
- ✓ Nepal Biodiversity Strategy 2002
- ✓ Local Self Governance Act 1999
- ✓ Soil & Watershed Conservation Act 1982
- ✓ National Wetland Policy 2003
- ✓ Agriculture Development Policy 1995
- ✓ Convention on Biological Diversity 1992
- ✓ Ramsar Convention 1971

Moreover, the relevant literatures of PES mechanism of lakes and watersheds applied in different parts of the world were reviewed to gain deeper understanding for preparation of PES guidelines in the context of GLA.

Different methods were undertaken to collect required information about the real ground picture of GLA. Following steps were simultaneously undertaken during one week field visit (August 27- September 2, 2012) for primary data collection.

Questionnaire/Interview:

Questionnaire survey and interview with the local people were carried out to collect the data on existing socio-economic, cultural and environmental conditions of the project area. The model of questionnaire was designed as per the requirement of the study which mainly focused on the following aspects.

- ✓ Water supply and demand
- ✓ Environmental services
- ✓ Perception of potential buyers and sellers towards PES
- ✓ WTP/WTA
- ✓ Socio-economic condition
- ✓ Farming practices
- ✓ Land and resource use ownership rights

The questionnaire survey covered 10% households from each service beneficiary and provider communities. These households were sampled randomly representing all villages of upstream and downstream regions. In addition, these sample households were considered based on the household details mentioned in VDC profiles, Bagdauli Irrigation Committee and Forest User Groups. Similarly, 15 local people were interviewed on key issues of GLA.

Focus Group Discussion / Workshop:

Workshop was organized at Sadabahar Community Forest's building, Sukhad on 29th August 2012, to ensure the local people participation on the piloting of PES mechanism in GLA. The major target groups were water user groups, FUG, GSM, BIC, CFUGC, DFO, DAO, DIO, CSUWN, VDC, local political leaders, local reporters, local farmers, NGOs & INGOs. The total of 24 representatives from these organizations attended the workshop. In addition, 2 focus group discussions representing farmers, and FUGs & CFUGs were carried out in upstream villages. Similarly, 2 focus group discussions in downstream villages representing farmers and Bagdauli

Irrigation Committee were also undertaken. The following issues were raised in FGD and workshop.

- ✓ Drivers of GLA degradation
- ✓ Local knowledge on environment and management practices
- ✓ Local people perception on PES
- ✓ WTP/WTA
- ✓ Land use and land cover changes
- ✓ Water supply and demand
- ✓ Laws & policies
- ✓ Value of water services

Interaction/meeting:

An interaction meeting with Sitakund Forest User Group was held on 28th August 2012. Altogether 8 local users participated in the meeting. Similarly, interaction with Bagdauli Irrigation Committee was held on 30th August 2012, in presence of 9 executive committee members. Likewise, different meetings with government agencies of Kailali district such as Regional Irrigation Office, Groundwater Resources Development, and District Agricultural Office were carried out intensively. The major topic of interactions was focused on the roles of subsidiary organizations in PES scheme and the market value of water services.

Field observation:

Field observation is necessary to know the actual geology and hydrology, biodiversity, landscape capacities, environmental vulnerabilities and ESs of GLA. The study of different physical parameters such as sedimentation, water depth, turbidity and trophic level were undertaken during field visit. The discharges of water at different sites in the upstream and the downstream regions of Ghodaghodi lake were also measured (27-29, August 2012). As the Ghodaghodi lake does not consist the marked inlet for water sources, different reference points in the upstream region were taken as the source of water that feeds Ghodaghodi lake. Betini forest being the major source of water, the outlet discharge from the river flowing through this forest was taken as first reference point. In addition, discharge of water in the irrigation canal at different sites, outlet from Ramjanaki forest, outlet discharge in the irrigation canal from Nakhrod lake were

measured in the upstream region of Ghodaghodi lake. Similarly, the discharge of water in the outlet of Ghodaghodi lake was measured in the irrigation canal that feeds water to Kauwa and Ghodaghodi village of Darakh-5 in the downstream region. The water level and flow in the irrigation canal in these villages were also measured. The saturation state of the soil and the flow of water to the agricultural fields were also observed at different sites of villages (Nakhrodi, Kauwa and Ghodaghodi). Moreover, different photographs were taken to capture baseline conditions of forests, agricultural land, and water sources and its level.

3.2 Development of PES Mechanism

A detail map of GLA was used to delineate the communities in the upstream and downstream regions of Ghodaghodi lake such that the potential service beneficiaries group and the service providers group were easily demarcated. This demarcation was also supplemented by field observation and views from different local based committees such as FUGs, CFUGCs and Irrigation Committee. Such a demarcation does not only reflect the real service providers and beneficiaries in the development of PES mechanism until and unless service providers and beneficiaries do not realize the level of services that falls on behalf of their activities and behaviors. Therefore, all of the interactions were initially focused on raising awareness in the local stakeholders.

The organizations working in the GLA were identified through the literature review, consultation with CSUWN and local people. Similarly, the organizations concerned with the water services and its uses (forest/lake/agriculture) were also identified through literature review, interview and FGD. Workshop at Sukhad, Key Informant Interview and interaction with district level organizations were carried out to define the roles and responsibilities of possible intermediary bodies in PES mechanism. Moreover, the possible roles and responsibilities of intermediaries defined in the national and international practices related to water services were also analyzed through literature review.

4. Results

4.1 Environmental Services in GLA

Huge wetland resources have supported basic needs of the wetland inhabiting local communities for the sustenance of their livelihood. Local people typically accept the lakes as a source of wetland products and irrigation water. They are benefitted from both goods and services from the lakes in GLA. They collect edible plants and plant products like Singada (*Trapa bispinosa*), Lotus (*Nelumbo nucifera*) leaves, flowers & seeds, Narkat (*Phragmites karka*) from the wetlands. Other products collected from the wetland include medicinal plants, molluscs, birds, drift wood, etc. The local community is using the lakes for fish farming besides Ghodaghodi and Nakhrod lakes. About 27% HHs are involved in fishing (FMU, GLA/CSUWN, 2009). Other services derived from the wetland include: irrigation, drinking water for human and livestock's, boating, religious, cultural, tourism, recreation, spiritual and aesthetic values (HH survey, 2012).

The local communities are directly dependent on the forest products offered by GLA. Community Forests and the National Forests are the two main sources of forest products. The local people collect timber, firewood, fodder, litter, grasses, thatch, reeds, wild edible foods, medicinal plants from these forests. The forest species which are collected for the sale include Amala, Amriso, Babiyo, Bamboo, Dodari, Harro, Jamun, Jibre sag, Kalo asuro, Kalo chiuri, Khajuri, Mahuwa, Malu, Mango, Mayako Biu, Narkat, Nigalo, Nigro, Panan, Rohini, Sadan, Sikari belu, Singane, etc. In addition, the CFs and the National Forests deliver different types of services which are as follows.

Table 3: Environmental services delivered from forests in GLA

Provisioning services	Regulating services	Supporting services	Cultural services
fresh water, fuel wood and timber, medicinal herbs, foods & livestock's	carbon sequestration, air & water regulation, flood & soil erosion control	biodiversity, biotic water flows, nutrient cycling & heterogeneity	religious, cultural, tourism, recreation, spiritual & aesthetic values

(Household Survey, 2012)

The multiple environmental services offered by GLA in reference to field observation and local people interactions are listed below.

1. Irrigation
2. Fish farming / fishing
3. Medicinal herbs (Kalkatte)
4. Clean and healthy environment
5. Timber / fodder / grasses
6. Firewood
7. Edible plants and plant products (singada, lotus leaves and flowers)
8. Drinking water
9. Fresh air
10. Aesthetic value
11. Tourism
12. Ground water
13. Raw materials (Pater, Khar) for household products (baskets, carpets)
14. Cultural and religious values
15. Research
16. Thatch
17. Recreation (boating, swimming, picnic)
18. Livestock wallowing

Among multiple services delivered from GLA including water bodies and forest land use, water service is an important in the local context because more than 80% of HHs are directly or indirectly dependent on wetland and agricultural activities. Therefore, in the shake of local farmers it is very urgent to address conservation and management of Ghodaghodi lake for the long term provision of water services to run their subsistence livelihood. The provision of water service in the GLA is improving in some extent due to the efforts of CSUWN but also the required quantity of water for agricultural practices in the downstream is not sufficient in the present context. The irrigation canal from Nakhrod and Ghodaghodi lake are providing water to the agricultural land. However, the outflow of water from Ghodaghodi Lake is allowed only when water level is more than 100 cm. Based on the experts opinion there should be at least 70

cm of water level throughout the year to maintain the integrity of the lake. The existing maximum water level in lake is 155 cm and minimum level is 15 cm. So, in order to fulfill the required quantity of water there should be linkage between upstream/service provider and downstream/service beneficiary communities along with conservation and management of Ghodaghodi lake with effective management of water sources specially Betini forest which is 16 km far from GL. To overcome with such management targets along with addressing the demand of irrigation facilities for 630 ha land in downstream, the only option seems to implement PES mechanism immediately with intensive homework.

Considering water services in the context of GL, forest ecosystems always come first because looking to ground based reality Betini forest represent the main source of water services within GLA. The list of services provided by Betini forest ecosystems are as follows:

- Water flow regulation: maintenance of dry season flows and flood control;
- Water quality maintenance: sediment load control, nutrient load control
- Erosion and sedimentation control;
- Water table regulation; and
- Maintenance of aquatic habitats (e.g., maintaining water temperature, shading rivers/streams, ensuring adequate woody debris in water).

The existing problems of GLA reflect soil erosion and sedimentation. In addition, natural springs have started to dry up and the Betini forest area is still experiencing anthropogenic disturbances such as timber felling, trampling, grazing, etc. Based on the field survey, villagers of both upstream and downstream also realized that sources of water are drying up due to the degradation of Betini forest. Overall, the GL condition is still in degrading stage even though there has been some improvement from the efforts of Field Management team of CSUWN in which the PES could be one of the great options to secure the long life of GL.

As it is mentioned already there are 20 different lakes within the GLA network, among them the piloting of PES in GL will be reference to other lakes in future.

4.3 Stakeholders: Service providers, Beneficiaries & Intermediaries

Service providers

Betini forest being the major source of water in GLA, it plays vital role in the provision of water services to the downstream communities. The local people have realized that the condition of Betini forest is degrading due to insufficient conservation and management efforts. Based on the household survey, more than 95% of local people are aware that the life of water services is dependent on the condition of Betini forest. Considering the degraded condition of this forest and its services, the local people has organized a committee "Betini Forest User Group" to maintain the forest condition and to ensure the provision of its services for the long run. So, the effort of this committee is truly appreciable from local as well as national context since GLA is the wetland of international importance. In addition to Betini forest, the other forests (Sitakund, Ramjanaki, Hariyali and Ghodaghodi) and Janahhit CF that lies in upstream region also contribute for the provision of water services to the downstream. Beside Betini, Sitakund forest which lies at the adjoining of Betini forest also act as a major water sources. Therefore, like Janahhit, other forests are also necessary to handover as CF for conservation of water sources to implement PES mechanism effectively. The water service in GL is directly dependent on the activities of the user groups of these forests. The forest user group of Sitakund and Betini are carrying out different protection and conservation programs such as plantation, adoption of stock feeding practice for livestock's, fencing the boundary of forests, etc. Since, Sitakund and Betini forests are the major water sources in GLA, they are considered as primary service provider while rest of the forest user groups (Ramjanaki, Hariyali, Ghodaghodi and Janahhit) are placed as secondary service provider based on their respective contribution in water services. The total area of these forests and the number of HHs of respective FUGs are illustrated in the table below.

Table 4: FUGs as primary and secondary service provider

Name	VDC/Ward	Area (ha)	Total HH
Sitakund FUG	Ramshikharjhala-4	190	380
Ramjanaki FUG	Ramshikharjhala-4	57	90
Janahit CFUG	Sandepani-9	103.43	182
Hariyali FUG	Ramshikharjhala-7	19.65	86
Ghodaghodi FUG	Darakh-5	27	37

(Source: FMU-GLC, Kailali)

Ward no. 3 and 4 of Ramshikharjhala VDC, with around 650 HHs could be placed as the primary service providers because these inhabitants are highly dependent on Sitakund and Betini forest, since long time for the sustenance of their livelihood. Therefore, the conditions of these forests are based on their activities and behaviors. Among them, the local inhabitants who have the legal ownership rights on their land as well as use of forest resources could be placed as a real service provider in the case of application of PES scheme in GL.

Based on the field survey and local people interaction, the major problem of GL was identified to be deforestation, sedimentation, population growth, encroachment, spreading of invasive species, insufficient cleaning campaign, etc. They also considered that if this condition continues, the GL could dry up within 20 years. Therefore, there is urgency for the preservation of GL. According to the HHs survey and FGD in upstream communities providing with the multiple choices, they are willing to agree following activities as a responsibilities to remain as service provider in the PES mechanism.

Activities	Respondents (%)
Agroforestry	75
Limit use of timber, fodder and grasses	75
Control grazing	100
Cultivation or plantation in barren land	100
Change in agricultural practices	50
Use restriction in sensitive areas	25

(HH survey, 2012)

In addition, it seems that more than 78% respondents are positive to develop PES mechanism to secure environmental services that are generated from forest and water bodies. In order to be a service provider with promising above activities as responsibilities, 100% of the respondents are willing to accept direct public payment through a local based committee of downstream communities whereas none of them are willing to accept direct individual payment. More than 80% are interested on investing that amount in community development, especially for the management of local forests while rest of them wanted to receive cash as per individual service provider. In addition, the service providers are interested to make an agreement with the service beneficiaries to receive payment on the behalf of following activities.

Activities	Respondents (%)
Plantation area	55
Restriction area	30
Water level	10
Agricultural productivity	5

(HH Survey, 2012)

Service beneficiaries

The local people in the downstream region of GL are mainly the farmers, among which more than 50% are totally dependent on agriculture for their livelihood and economy (HH survey, 2012). Based on the HH survey, the average area of agricultural land per HH ranges from 0.3-1.3 ha. As agriculture is the major income generating source of the downstream communities, water facility becomes the most requirements for the agricultural production. The "Bagdauli Irrigation Committee (BIC)" established in 2061, is providing the irrigation facility to nearly 1000 HHs, members of the committee, among which most of the members are from Darakh VDC ward number 5. These members possess around 630 ha of agricultural land in downstream region of GL out of which 400 ha are getting the facility from irrigation canal. According to the local people, the irrigation facility has improved due to the effort of this committee in comparison to past years. But the provision of irrigation facility is still not enough for all members because the water level in the canal is high (4 ft) only for 3 months during monsoon whereas it possesses minimum flow (1.5-2 ft) in rest of the months in Ghodaghodi gaun (HH Survey, 2012). Based on the local farmers and interaction with concerned organizations, the current production rate of rice is about 20 quintal per bigha per season. According to them production level has decreased due to insufficiency of water. During dry period, the downstream farmers irrigate their land through ground water with the use of pump, which costs very high.

As the farmers are the major users of water services from GL, they could be placed as service beneficiaries in the case of application of PES scheme in GL. These farmers are also aware that the quantity of water in the downstream region is highly dependent on the conditions of forests and the activities of local people in the upstream region. They also considered that there is an urgent need of conservation and management of Betini forest and other water sources for the sustainability of GL and long term availability of water services in the downstream region.

Downstream communities are aware that in absence of immediate conservation and management efforts, the GL could dry up within 10 years, if current water use for irrigation from Nakhrod and Ghodaghodi lake continues. Therefore, more than 85% respondents from downstream are agreed to be a part of PES mechanism in developing linkage between upstream and downstream communities to secure provision of water services for long run. According to the HHs survey and FGD, around 80% respondents accepted the cash payment to the upstream communities for the defined responsibilities considering the forest conservation and provision of water services. Out of this, 30% are interested to pay as per individual user while rests (70%) as collective means through local based committee. The 20% of the beneficiaries are interested to support in community development works in the upstream communities to remain within the PES mechanism. Considering the current situation of GL and the upstream forests degradation, the service beneficiaries are interested to make an agreement with the service providers to pay on the following basis.

Activities	Respondents (%)
Agricultural production	25
Amount of water use	10
Area of agricultural land	65

(Source: HH Survey, 2012)

Intermediaries

The three projects namely, CSUWN, TAL and WTLCP are being implemented in the district which mainly focuses on the landscape level bio-diversity conservation and livelihood improvement. However, implementation sites of these projects are different. There are several organizations working within GLA with different objectives. However, the DFO holds the overall administrative and management responsibilities of GLA. Considering the implementation of PES mechanism in GL, the district level organizations (DDC, DAO, DFO & Groundwater Resources Development-Kailali), Department of Irrigation-Mahendranagar and local based organizations/committees (GSM, BIC & VDC) could act intermediaries roles. Among them, VDC, DFO & DAO seems very positive in the initiation of PES mechanism in GL. TAL in partnership with local organization namely, Ghodaghodi Sarokar Munch (GSM) are

implementing various local based programs including bio-diversity conservation, promotion of alternative energy, livelihood improvement, forest restoration, etc. So, GSM could play vital role to supplement the PES mechanism in GL. Similarly, Bagdauli Irrigation Committee (BIC), working for the provision of irrigation facility in downstream region of GLA, has interconnection with the objectives of PES mechanism i.e., provision of water services, as it is necessary for this committee to assure such facility for the long term. Therefore, BIC could be reasonably placed as intermediary body in the case of PES scheme implementation.

Based on FGD, the roles and responsibilities of intermediaries within PES should be:

- Awareness on ESs and PES;
- Efficient transaction between upstream and downstream communities;
- Accessibility in PES implementation;
- Legal agreement between upstream & downstream communities;
- Monitoring of the forest conditions, activities of upstream and downstream regions;
- Assessment of water services;
- Financial & technical support;
- Enhancement of tourism facility in GL.

4.3 Guidelines of PES Implementation

4.3.1 Identifying Beneficiaries and Generating Demand

The application of PES schemes is only possible if there is a demand for an environmental service. Therefore, the first task in establishing PES schemes consist the identification of beneficiaries of environmental services and which ones are willing to pay for the provision of services. This requires a clear definition of environmental services and a careful assessment of existing demand for those services. It is easier to convince beneficiaries to participate in a PES scheme when the costs and benefits of environmental services are visible and quantifiable. Generally speaking, beneficiaries will be more inclined to pay for very specific services, as opposed to general conservation services. In identifying beneficiaries, it is also important to identify potential free riders that could benefit from the provision of services without contributing in the PES system. This may affect contributors' support for the PES scheme and/or lead to their withdrawal from the scheme. In the case of water services in GL it is visible and

relatively easy to quantify, and the demand is easy to identify. Therefore, there is no need of huge efforts to identify beneficiaries and generating demand.

Demand for environmental services can exist and yet no transactions take place due to a series of factors, including the following:

- Insufficient scientific evidences;
- Existence of cheaper substitutes;
- Insufficient regulatory frameworks;
- Co-ordination problems;
- Inadequate participation;
- Cultural resistance; and insufficient finances.

In all these situations, there can be beneficiaries of environmental services, but the benefits they receive may not translate into an explicit demand. In these situations, specific interventions by intermediaries may be needed to transform this implicit demand into an explicit willingness to pay for environmental services. These interventions may include stakeholder consultations, information sessions, institution creation, financial support or technical training. Looking to the situation of GL, no doubt there is a need of specific interventions from intermediary bodies to create market of water services. Nevertheless based on interactions with possible intermediary bodies and workshop findings, they are very positive to facilitate and support to bring both service provider and beneficiary communities into an agreement for the long term security of water services.

4.3.2 Payments

Payments in water service PES scheme in the context of GL need to be based on the forest area under protection and on specific activities carried out by service providers. The payments should be considered in reference to outcome from the PES scheme by establishing baselines and closely monitoring the effects of land use changes on the provision of water services.

4.3.3 Negotiation

There should be intensive negotiation among service provider and beneficiary communities to head on PES mechanism in presence of intermediary bodies. These bodies need to facilitate negotiation between service provider and beneficiary communities and even provision of some

financial and technical supports if it is necessary and possible from their side, to set up PES mechanism. The following things need to overcome from the negotiation part.

- Downstream buyers need to be convinced by clear benefits;
- Nature of the mechanism
- The nature of payments and duration of payments
- Role of stakeholders
- Willingness to pay by downstream and willingness to accept by upstream communities
- Responsibilities of upstream communities
- Provision of payments

4.3.4 General guidelines for piloting & implementation of PES

The following things should be considered in the preparation of guidelines while piloting of PES in GLA

- How do laws, policies and institutions affect PES schemes?
 - Formulation and changes of policies, legal and regulatory to establish a PES scheme
 - Can payments be made for activities that are obligatory under law?
 - Institution role: such as land-use and service monitoring, facilitating negotiation, and financial intermediation
- How much research is needed prior to and during PES implementation?
 - What the opportunities are for bundling these services or where PES might be a cost effective and efficient conservation approach?
 - Minimization of transaction costs
 - Information needed to initiate a PES scheme
 - Identification of highly, intermediate and low attachment of supplier and consumer of specific services
 - Clarification of the services uses that potential buyers are interested in receiving
 - Identification of the specific service(s) upon which each service user depends
 - Development of a baseline against which to broadly assess service delivery
 - Mapping supply and demand of specific service considering both spatial and temporal aspects

- Scrutinize probable livelihood scenarios with and without PES implementation
- Establishing a basis for setting a price for the provision of the service
- Identification of governance constraints and opportunities in the political environment
- When should services be “bundled” to increase payments?
- Scaling up
- Ranking levels (higher or lower) of bundling between services
- Trade-offs between multiple services
- When is it possible to sell more than one service?
- To whom can multiple services be sold?
- How can service users be stimulated to pay?
- How important are end-user attitudes towards payments?
- How important are PES initiatives for poverty reduction?
- Trade-offs between maximizing specific services and poverty alleviation
- Risk and benefits of PES schemes on the poor people
- Poor people’s participation
- Social equity
- How can PES schemes be designed to balance efficiency with fairness?
- Payments define and priced on contracts
- Monitoring of use service (character of the changes aspects, defined location of changes, tools of verification, frequency and sampling framework)
- Allocation of risks between parties
- Dimensions for PES scheme (Temporal, functional, spatial and administrative e.g. Units, Financing, Services, End use, Direction)

Moreover, following characteristics should be contemplated in site before PES implementation.

- The target services should be visible and beneficiaries have to be well organized
- Service provider community should be well structured, possess clear and secure property rights, strong legal frameworks, and relatively have access to resources
- PES systems should assure that the value of water services have to be high for beneficiaries and the costs of providing services need to be low
- Clear and consensual scientific evidence linking land uses to the provision of services

- Clearly define environmental services to be provided
- Nature of contracts and payments should be flexible, on-going and open-ended
- Transaction costs should be less than potential benefits
- Favorable environment for closely monitor of compliance, land use changes, and the provision of services
- Flexible enough to allow adjustments to improve their effectiveness and efficiency and to adapt to changing condition

Field study suggested that PES mechanism could be applicable and viable in the context of GLA because most of the above required characteristics possess in the site. Also, there is no other such an option which could bring bright light among service provider and beneficiary communities by creating win-win situation to both sides. In order to make an effective implementation of PES mechanism nevertheless there is need of awareness campaign regarding the whole mechanism and its possible positive outcomes in the society.

4.4 Mechanism Development of PES Scheme

The mechanism of PES on behalf of water services are usually developed between upstream and downstream communities. The collection of user fees from beneficiary communities is usually financed to improve management of the water sources area (forests) belongs to upstream. It is therefore essential to develop mechanism to link conservation practices with the generation of water quality and quantity services in order to make sure that the PES system is providing the services for which beneficiaries are paying.

The following things should be considered to make an effective implementation of PES in the context of GL.

- Stakeholders (service providers, service beneficiaries and intermediaries) should be aware about ESs, PES and program objectives;
- Local farmers of Dharak-5 inhabiting on downstream region of Ghodaghodi lake should be placed as service beneficiaries;

- Betini forest and Sitakund Forest User Group should be placed as primary service providers and other FUGs (Ramjanaki, Janahit, Ghodaghodi & Hariyali) as secondary service providers;
- Those households who possess legal ownership of land / property rights and forest resource use inhabiting around Betini and Sitakund forest could only be placed as primary service providers, similarly the landownership rights HHs belong to the FUGs (Ramjanaki, Janahit, Hariyali, Ghodaghodi) can be placed as secondary service providers. At present, only Betini and Sitakund Forest User Groups could receive payment from beneficiary groups whereas other forest user groups could receive payment in future based on the progress in provision of water quantity through their respective forest. These secondary service providers could be eligible to receive payment if the scenario from their respective forest could mark an increment of 5% water level than existing condition based on Rs.10/ha/year for five years;
- The responsibilities of service providers should be clear such as preservation of forest, plantation, control of grazing and limit use of forest products, maintenance of dry season flows, and control of flood, sediment and erosion;
- The negotiation between service provider and beneficiary communities should be carried out in presence of experts and intermediaries to clarify the mode of agreement;
- In case of monetary payment for primary service provider, the user fees for service beneficiaries could be assigned Rs.20/ha/year for first five years and if it works effectively then the user fees need to be increased up to Rs.30/ha/year for next 5 years;
- The service beneficiaries should have to receive at least more than 5% water for irrigation purpose than existing level in first two years. Likewise, there should be increase in water quantity by 1% every year for the next 3 years. Moreover, in order to pay Rs.30/ha/year for next 5 years, there should be overall increment by at least 10% in the provision of water quantity. In addition, the level of agricultural production could also be considered as a soft rule such that an increment in agricultural production should be at least 2% than existing production level;
- The service providers should expense payments received from beneficiary communities in different activities such as 3ha plantation in open area nearby Bagdauli irrigation canal

adjoining to the Ramjanaki forest within two years, fencing of forest (Betini & Sitakunda) area within 3 years, promotion of alternative energy (biogas) in upstream communities within 5 years and provision of security guard (1) for daily patrolling to control illegal activities in the forests;

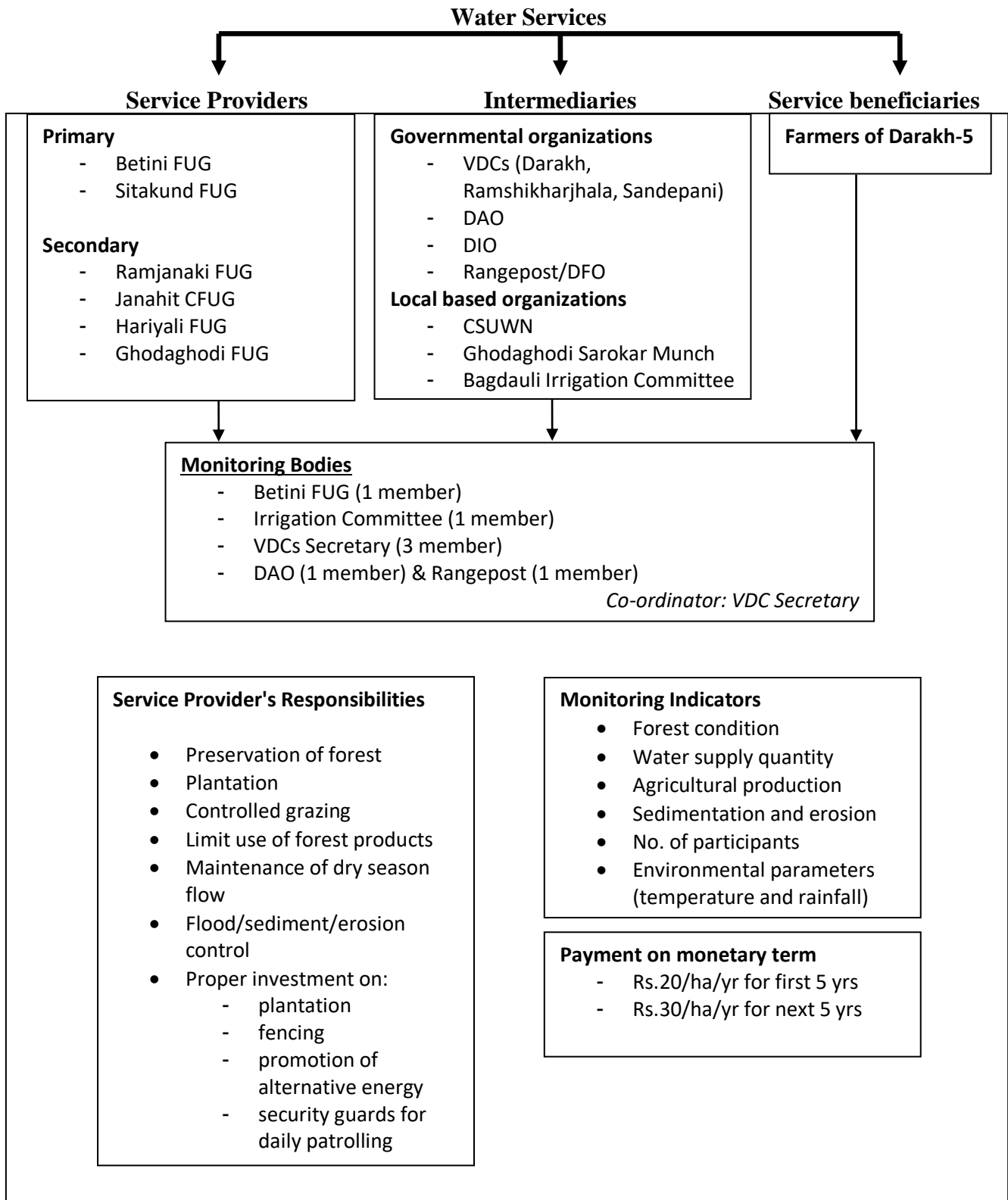
- The allocation of payment for service beneficiary groups need to cover only those local people who do have agricultural land;
- The payment mode should be collective through formation of user committee in beneficiary communities, if the existing irrigation user committee agree to lead then it could be more effective;
- The monitoring bodies need to evaluate the outcome of PES scheme in reference to baseline condition of water quantity and quality, and agricultural production;
- The monitoring bodies need to consider environmental parameters (temperature and rainfall) that impact water services and agricultural production;
- The monitoring bodies should include secretary of three VDCs (Darakh, Sandepani & Ramshikharjhala), a member of each service provider & beneficiary groups and one member from each of the following organizations/committees: Range Post-Sukhad, Bagdauli Irrigation Committee and District Agricultural Office-Kailali under the coordination of one secretary from any VDCs;
- The transactions cost such as preparation of PES mechanism need to be endured by CSUWN. Likewise, monitoring cost need to be covered from user fees received from beneficiaries group, if CSUWN project still remain during the period some part could be conceded by CSUWN;
- The monitoring should be carried out twice a year (Chaitra-Baisakh and Poush-Magh) whereas each monitoring task should be completed within 2 days;
- The duration of contract between service providers and beneficiaries could be made at the first time for five years and if it works well it could be extended based on the understanding of both groups;
- Monitoring need to focus on three levels: implementation/compliance, impact on the generation of services and impacts on local users;

- The most important task is to create positive attitude in executive irrigation committee members towards PES mechanism.

The following indicators could be considered to identify the effectiveness of PES mechanism.

- The number of participants (both service beneficiaries and providers);
- The agriculture land area that is included under the PES scheme;
- The extent to which a PES scheme is generating land use changes;
- The net additional revenues generated through PES scheme;
- The distributional impacts of PES schemes, especially on poor and traditional communities;
- The financial sustainability of the system in the long run;
- The extent to which the system is generating environmental services;
- The cost-effectiveness of PES schemes compared to alternatives.

Fig. 1: Flow chart of Stakeholders involved in PES



4.5 PES as an Effective Mechanism in GLA

GLA is facing scarcity of irrigation water, particularly in summer, when springs, streams and rivers have reduced flow or dry up. Based on the ground reality, water services are the most valuable environmental services derived from forest and water bodies to run livelihood of the agriculture dependent households. The activities of upstream land users result the deterioration of surrounding forest conditions are one of the major causes for decreasing the water supply quantity in downstream region. Therefore, there is a need of management of the water sources that could result in a 'win-win' situation for both upstream service providers and downstream service beneficiaries. Such kind of management is only possible through PES mechanism with productive outcome in convenient way. The representations of following aspects in GLA reflect that PES could be effective mechanism to sustain the flows of services in long term.

- There are ongoing practices such as payment of Rs.30 per user per annum for irrigation committee and Rs.10-15 per user per month in CFUGCs. That means certain type of payment from local initiatives are already taking place to secure local resources;
- The existing organizations can facilitate above practices;
- There is a possibility of cooperation with line departments and other key organisations in the area;
- Suppliers and receivers are organised;
- Certain type of community works have already gained success in the villages with the efforts of both communities (service providers and beneficiaries);
- Presence of traditional social linkages and mechanisms for maintaining water related services;
- Clear identification of water service suppliers and receivers;
- Receivers are facing major problem due to poor quality of service which have a strong economic impact on the receivers;
- The solution to the problem lies in the upstream area. That is, the management activities of the suppliers directly affect the provision of water service of receivers;
- There is willingness and enthusiasm among both upstream and downstream communities to participate in a transaction with favourable norms;

- There is a willingness to pay by the water service receivers to improve the service;
- There is no conflict between the upstream and downstream stakeholders that could affect the process;
- The downstream farmers irrigate their land through ground water with the use of pump during the scarce period, which costs very high. That means as an alternative option, "PES" mechanism could be economically feasible and socially acceptable.

In addition to the above listed possibilities of PES scheme in GLA, implementation of this mechanism also could address the other problems occurring within GLA. Plantation program in the denuded land in upstream region will increase the forest cover, maintain the watershed area, enhance the aesthetic beauty and at the same time reduces soil erosion, thereby reducing sedimentation rate in Ghodaghodi lake. Moreover, this program could open avenues for greater cohesion, sense of ownership or place attachment of local people which will reduce the encroachment problem and other illegal activities within GLA, which will also be countenanced by daily patrolling of forests and wetlands. Similarly, prohibition to haphazard utilization of wetlands, use-restrictions in sensitive zones, followed by cleaning campaign of water bodies will improve the water quality and reduce the eutrophication rate of GL. Increment of water quantity in GL in future and the regulation of outflow in sustainable way from the lake will prevent the transformation of lake area into terrestrial system. Further, GLA being a part of Basanta Protection Forest, the conservation effort through application of PES mechanism will supplement at meeting the objectives of this protection forest through maintenance of biological corridor. Therefore, implementation of PES scheme will be effective to address the social and environmental issues within GLA in some extent.

4.6 DPSIR Model With and Without PES

Fig 2. D-P-S-I-R framework without PES mechanism

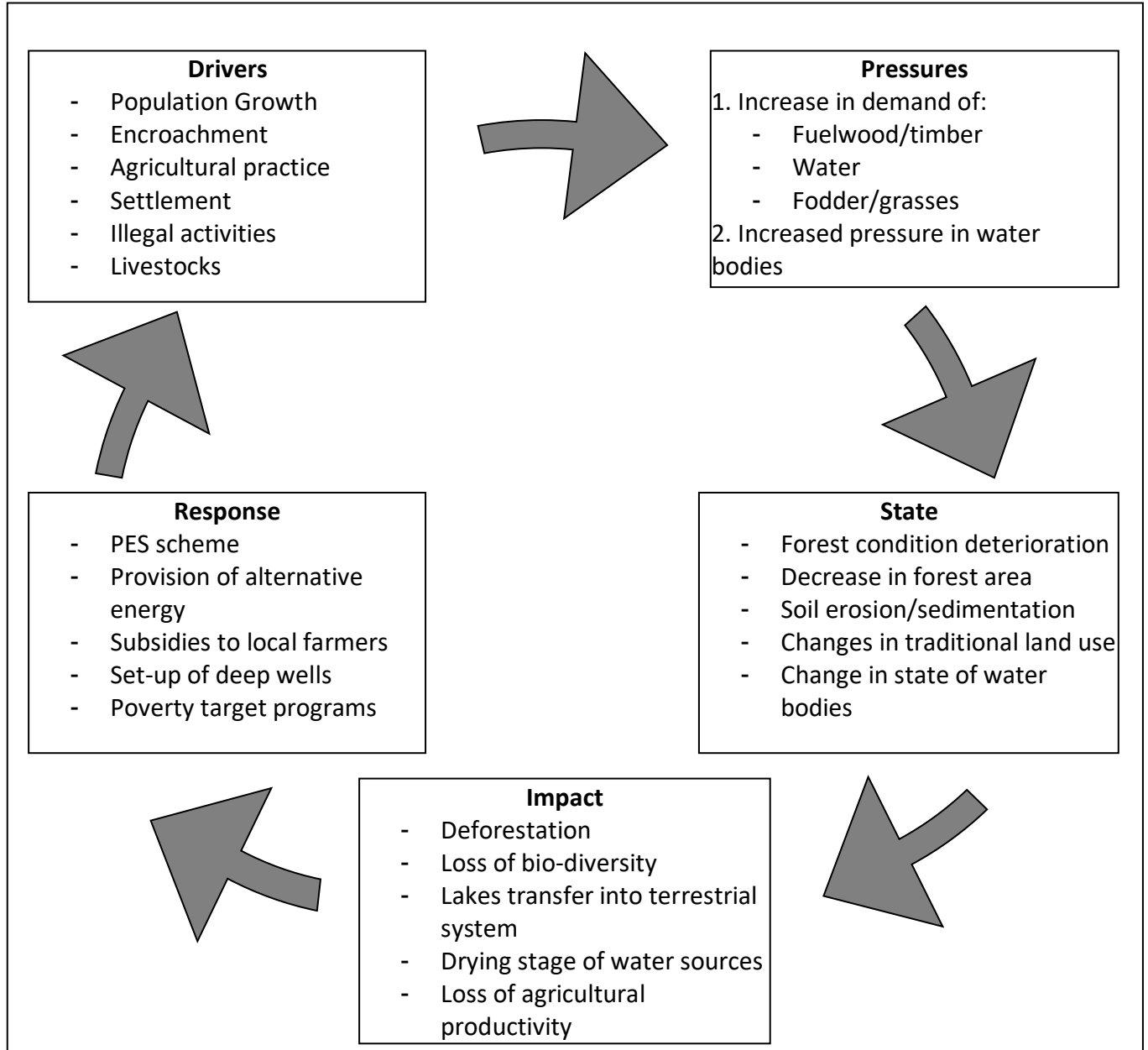
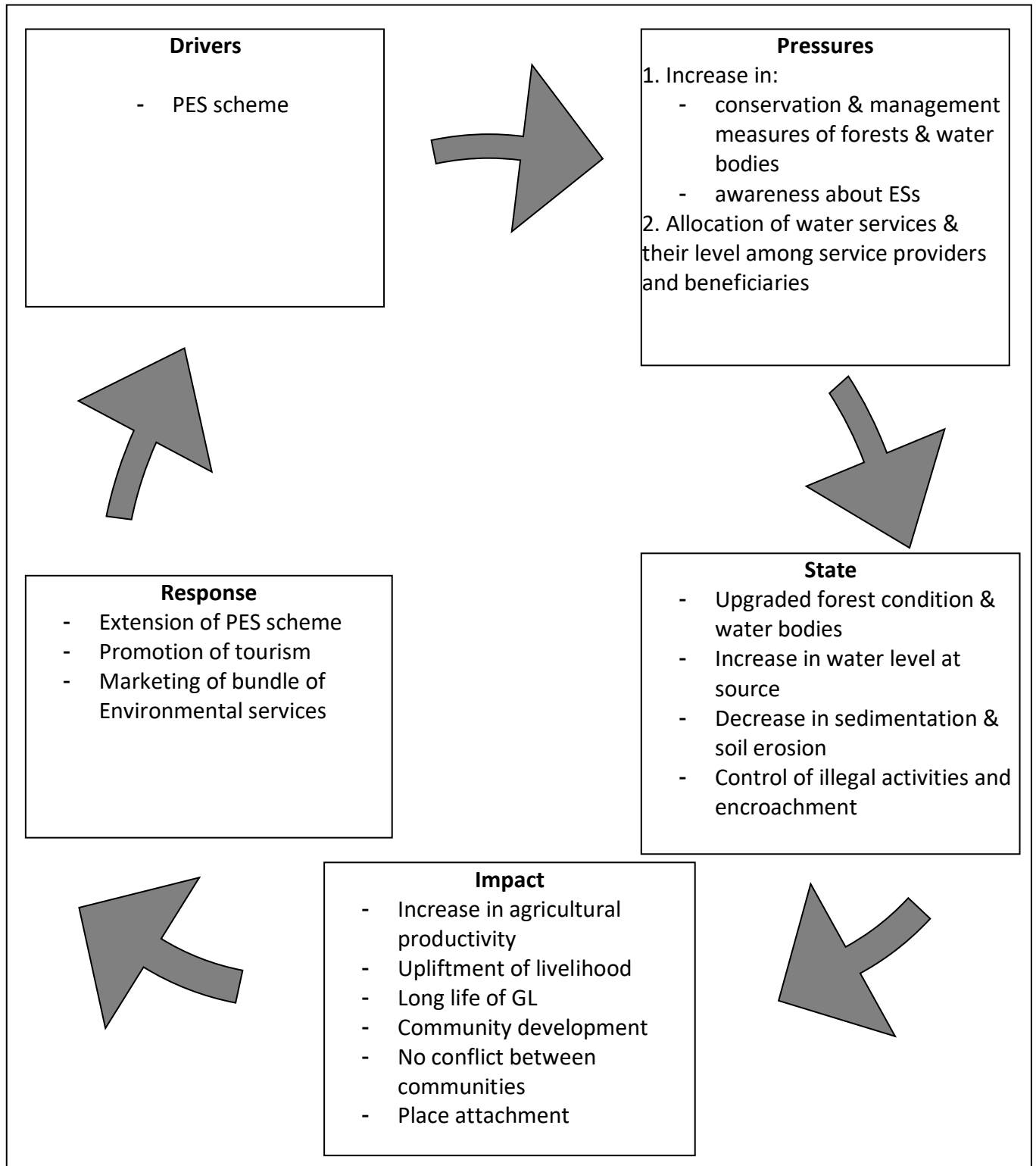


Fig 3. D-P-S-I-R framework with PES mechanism



5. Conclusions

The local people inhabiting within GLA are benefiting numerous environmental services from forest, water bodies and other land use. Among these services, water services remain vital one in reference to their current livelihood because most of the households are dependent on agricultural sector. The main sources for existing water bodies (lakes) are Betini forest and other adjoining forests that lie within the upstream region of GLA. The condition of water bodies and provision of water services is dependent on the activities and behaviors of the upstream communities. The existing supply of water quantity from these sources for irrigation facilities is not enough for 630 ha agricultural land that lies in the downstream region of GL because the condition of upstream forests are deteriorating. Based on the field study, PES option could be one of the effective mechanisms to fill up the gap of required quantity of water in downstream and for the improvement of those forests and lakes with the environment friendly efforts of upstream communities by creating linkages between service providers and beneficiaries. The National Wetland Policy 2003, Article-14, Sub-article: 14.5, 14.8 & 14.17, also indicates the preservation of the wetland and its biodiversity through protection of upstream watershed area in the initiation of local communities.

PES schemes have the potential to become very valuable transfer mechanisms to internalize positive environmental externalities, and to generate new revenues for sustainable management of upstream forests and water bodies in the context of GL. This potential will be gradually fulfilled as markets for water services mature over time and as PES schemes become more financially sustainable. In addition, positive outcome on both communities from this scheme will be ample for other similar regions of Nepal. If concrete efforts are made to run this mechanism very effectively and fairly, this could also be catalyst to address the poverty in poor and indigenous communities of the region.

Bundles of environmental services (tourism, carbon sequestration and biodiversity) could be brought into market in future through the effective conservation and preservation of upstream forests and water bodies with the application of PES mechanism. These services can be sold in merged bundles or in shopping basket bundles by upstream communities to buyers. In this scenario, the potential buyers could be hotels and lodges, carbon trading bodies and different

agencies working in the biodiversity and tourism fields. Likewise, the potential service sellers could also be other CFUGs within GLA.

Considering on-going natural resources conservation practices such as yearly payment to remain as user in community forest and irrigation committee reflects that there is no doubt PES mechanism could be socially accepted and sustained. But also, there is a need of awareness campaign about PES and environmental services before implementing PES mechanism in the site. In addition, the intermediary bodies should have to play vital role in facilitating negotiation between service providers and beneficiaries. Likewise, there may be need of financial and technical supports from those bodies in the pre-phase of PES implementation. In addition, in search of broad and diversified financial basis for ecosystem protection, restoration and sustainable use will result overall security of GLA.

Like other successful piloting of PES in different parts of the world, there is a clear identification of service provider and beneficiary communities. The service is distinct and there is willingness and enthusiasm among both upstream and downstream communities to participate in a transaction with favorable norms under PES mechanism. In addition, there exists a willingness to pay in service beneficiary groups to the service providers so as to improve the water services and assure its provision for the long run. Also, there is no conflict between the upstream and downstream communities that could affect the PES process. As the downstream farmers are forced to irrigate their land through ground water during the scarce period with the use of pump outlaying high cost, reflects that there are no other alternative options than "PES" mechanism that could be economically feasible and socially acceptable in the context of GLA.

Considering the total amount of fund collected from 630 ha agricultural land in downstream region, in accordance to NRs.20/ha/yr, will account for NRs.12600 per year. This amount of money will not be sufficient to upgrade the condition of upstream water sources. In such condition, the institutional support from the organizations working within GLA could be managed, for example, provision of seedlings for plantation by DFO, facilitation of alternative energy technologies by GSM and TAL, etc. Similarly, remaining within PES scheme the local stakeholders will realize their contribution towards the natural resource conservation which will

generate place attachment, ownership feeling and positive attitude towards natural resource utilization. Consequently, the conservation practices in GLA will be enhanced. Regarding the less revenue, if the mechanism gains success along with the service delivery, it will definitely increase in accordance to the mechanism developed or implied. Moreover, the additional fund could be generated by marketing bundle of services such as carbon trading, income from tourism industries, etc. Therefore, implementation of this mechanism will prove to be sensible in near future as it could address most of the ongoing social and environmental problems within GLA.

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Annex

Measurement of water discharge at different sites in upstream and downstream regions of GLA

S.N.	Site	Water discharge (ft ³ /sec)	Water quality
Downstream region			
1	Irrigation Canal in Ghodaghodi gaun (southwest of highway), Darakh-5	25.34	muddy
2	Irrigation canal in Kauwa gaun at the culvert	1.84	muddy
3	Outlet canal at Nakhrod lake	8	clear
4	Ghodaghodi gaun (Shanti tole, northeast of highway), Darakh-5	12.5 (main canal)	muddy
	Diversion to Kauwa gaun	11.4	muddy
	Diversion to Ghodaghodi gaun	6.25	muddy
5	Rice field in ghodaghodi gaun from canal (northeast of highway), Darakh-5	0.0245	clear
6	Dam of GL near the highway (when dam is closed)	0.1015	clear
7	Outlet from Nakhrod near the eastern dam of GL	7.111	muddy
Upstream region			
1	Bhulbhule Khola	0.2334	clear; mesotrophic
2	Betini Khola	6.5539	clear; mesotrophic
3	Irrigation canal from Betini Khola	5.314	clear
	Diversion to Nakhrod	1.837	clear
	Diversion to Gaidakheda	3.05	clear
4	Bagdauli irrigation canal (dam nearby Ramjanaki forest)	9	muddy
	Contribution from Ramjanaki forest	0.00105	clear

Sample of household questionnaire survey
(Upstream Region)

घोडाघोडी ताल क्षेत्रमा सःशुल्क वातावरणीय सेवा प्रणालीको लागि स्थानिय वासिन्दासँग घरधूरी सर्वेक्षण प्रश्नावली

१. अन्तरवार्ता दिनेको परिचय

नाम	रुकुमण्डा (बाबाभद्र)	लिङ्ग	पुरुष
गा.वि.स.	सामाजिक शिक्षा	बाड नं	४ (०१)
उमेर	२९	शिक्षा	४ कक्षा
पेशा	कृषि	मासिक आम्वनी	६६५५
परिवार संख्या	६	बसोबास गरेको साल	२०४० वा २ गते
कृषि योग्य जमिन	१५ कठ्ठा		

२. यस घोडाघोडी तालबाट कस्तो किसिमको सुविधाहरूबाट लाभान्वित हुनुहुन्छ? कृपया खुलाउनु होस्।

यस घोडाघोडी तालबाट हामीहरूले नयाँ नयाँ सामुदायिक सुविधाहरूबाट नयाँ कुरा पाउँछौं। हामी सामुदायिक खनबाट बाहिरै फेरि पानी प्रशस्त पाउँछौं। आलेलात्र पाउँछौं। हामी तालबाट उत्पादन गरेको कान्छाको पानी लिइन्छौं। उनीहरू प्राप्त

३. यस घोडाघोडी ताल क्षेत्रको मुख्य समस्याहरू के के हुन्? उल्लेख गर्नुहोस्।

- क) यस घोडाघोडी ताल क्षेत्रमा मुख्य समस्या भनेको खन बिनाश भएर
- ख) घोडाघोडी ताल यतिमा भित्र झारपात सरसफाई कमी गरिए
- ग) घोडाघोडी तालको वरपर खेडेरीमा आउलागी; डेढेला लगेर
- घ) घोडाघोडी तालको माछा कट्टा गरेर सिकारी गर्ने गर्छन्
- ङ)

४. घोडाघोडी ताल क्षेत्रमा निर्भर कृषि जमिनको विवरण

घोडाघोडी ताल क्षेत्रमा निर्भर कृषि जमिनको कुल क्षेत्रफल	मुख्य वाली	प्रति हे. उत्पादन		आवश्यक पानीको मात्रा (प्रति हे.)	बजार मुल्य (प्रति के.जी.)
		५ वर्ष अघि	वर्तमान		
१४०५	धान गहुँ	१६ गुण्डा	१६९	२५५६६ कोरिडो-१५	

५. विगत ५ वर्षको तुलनामा सिचाई सुविधामा कस्तो परिवर्तन महसुस गर्नुहुन्छ?

५ वर्षको तुलनामा लगभग १० प्रतिशत बढेको महसुस हुँ

६. कृषि कार्यमा कस्तो किसिमको मल प्रयोग गर्नुहुन्छ?

क) रसायनिक

ख) जैविक ✓

यदि दुवै प्रयोग गर्नुहुन्छ भने प्रति वर्ष कति-कति मात्रामा प्रयोग गर्नु हुन्छ?

रसायनिक:

जैविक: १० गुण्डा

७. यस घोडाघोडी ताल क्षेत्रबाट आवश्यक पानीको मात्रा कति वर्ष सम्म परिपूर्ति गर्न सकिन्छ होला?

५ वर्ष सम्म ✓ ५ देखि १० वर्ष १० देखि २० २० वर्ष भन्दा बढि

८. कृषि कार्यमा कस्तो समस्याहरू देख्नु हुन्छ?

क) पानीको अभाव (✓)

ख) वालीमा रोग ()

ग) माटोको उर्वरा शक्तिमा ह्रास ()

घ) कृषि कामदारको कमि (देन)

ङ) मलको अभाव (देन)

माथिल्लो तटिय क्षेत्रको लागि प्रश्नावली

८. यस घोडाघोडी ताल क्षेत्रमा पानीको मात्रा बढाउनको निम्ति कस्तो कस्तो कृषकलापहरूको आवश्यकता पर्दछ?

- क) निजि जग्गामा वृक्षारोपण गरि कृषि वन प्रणालीको बढुवा ()
- ख) काठ, दाउरा तथा घाँसको सिमित उपयोग (✓)
- ग) जथाभावि चरिचरणमा रोकथाम (✓)
- घ) नाङ्गो जग्गामा कृषि अथवा वृक्षारोपण (✓)
- ङ) जैविक खेति ()
- च) कृषि प्रणालीमा परिवर्तन (✓)
- छ) निश्चित क्षेत्रमा कुनै पनि प्रकारका गतिविधिहरूमा प्रतिबन्ध ()

१०. यी माथि उल्लेखित कृषकलापहरू तल्लो तटिय समुदायहरूको सम्भौतामा अपनाउनु हुन्छ भने कस्तो किसिमको भुक्तानी माध्यम स्वीकार्य हुनेछ?

- क) रकम ()
- ख) सामुदायिक विकास (✓)
- ग) ब्यक्तिगत भुक्तानी ()
- घ) सामुहिक भुक्तानी (✓)

११. भुक्तानी सम्भौताको आधार कस्तो किसिमको स्वीकार्य हुनेछ?

- क) वृक्षारोपण क्षेत्र (✓)
- ख) प्रतिबन्धित क्षेत्र ()
- ग) नतिजा (output) ()
- घ) कृषि प्रणालीमा परिवर्तन (✓)

(Downstream Region)

घोडाघोडी ताल क्षेत्रमा सःशुल्क वातावरणीय सेवा प्रणालीको लागि स्थानिय वासिन्दासँग घरधूरी सर्वेक्षण प्रश्नावली

१. अन्तरवार्ता दिनेको परिचय

नाम	सैदालाल चौधरी	लिंग	पुरुष
गा.वि.स.	हरख	बाड नं	५
उमेर	३८	शिक्षा	
पेशा	रैती र शिल्प	मासिक आमदानी	रु. ७०००/-
परिवार संख्या	७	बसोबास गरेको साल	स्थानिय
कृषि योग्य जमिन	१६ कठठा		

२. यस घोडाघोडी तालबाट कस्तो किसिमको सुविधाहरूबाट लाभान्वित हुनुहुन्छ? कृपया खुलाउनु होस् ।

- सिंचाई
- माछा मार्ने
- जडिबुटी

३. यस घोडाघोडी ताल क्षेत्रको मुख्य समस्याहरू के के हुन्? उल्लेख गर्नुहोस्।

- क) वन विनाश
- ख) पानीको सतह घट्नु
- ग)
- घ)
- ङ)

४. घोडाघोडी ताल क्षेत्रमा निर्भर कृषि जमिनको विवरण

घोडाघोडी ताल क्षेत्रमा निर्भर कृषि जमिनको कुल क्षेत्रफल	मुख्य वाली	प्रति हे. उत्पादन		आवश्यक पानीको मात्रा (प्रति हे.)	बजार मुल्य (प्रति के.जी.)
		५ वर्ष अघि	वर्तमान		
१६ कठ्या (२ डाँडा बाँट्ने)	धान, मकै जई		1	२ डाँडा	धान - १५०० प्रति के.जी.

५. विगत ५ वर्षको तुलनामा सिचाई सुविधामा कस्तो परिवर्तन महसुस गर्नुहुन्छ?

६. कृषि कार्यमा कस्तो किसिमको मल प्रयोग गर्नुहुन्छ?

क) रसायनिक

ख) जैविक

यदि दुवै प्रयोग गर्नुहुन्छ भने प्रति वर्ष कति-कति मात्रामा प्रयोग गर्नु हुन्छ?

रसायनिक:

जैविक:

७. यस घोडाघोडी ताल क्षेत्रबाट आवश्यक पानीको मात्रा कति वर्ष सम्म परिपूर्ति गर्न सकिन्छ होला?

५ वर्ष सम्म

५ देखि १० वर्ष

१० देखि २०

२० वर्ष भन्दा बढि

८. कृषि कार्यमा कस्तो समस्याहरू देख्नु हुन्छ?

क) पानीको अभाव (✓)

ख) वालीमा रोग ()

ग) माटोको उर्वरा शक्तिमा ह्रास ()

घ) कृषि कामदारको कमि ()

ङ) मलको अभाव ()

तल्लो तटिय क्षेत्रको लागि प्रश्नावली

८. के तपाईं तल्लो तटिय क्षेत्रमा उपलब्ध हुने पानीको मात्रामा माथिल्लो तटिय समुदायको महत्वपूर्ण भूमिका रहेको महशुस गर्नुहुन्छ? जार्दि

यदि गर्नुहुन्छ भने माथिल्लो तटिय समुदायको वर्तमान गतिविधिलाई वातावरण मैत्रिमा परिवर्तन गरि आवश्यक पानीको मात्रा दिगो समयको लागि उपलब्ध गराउन कस्तो किसिमको भुक्तानी प्रक्रिया वा माध्यम स्विकार्य हुनेछ?

क) रकम	<input checked="" type="checkbox"/>
ख) सामुदायिक विकास	<input type="checkbox"/>
ग) ब्यक्तिगत भुक्तानी	<input checked="" type="checkbox"/>
घ) सामुहिक भुक्तानी	<input checked="" type="checkbox"/>

१०. यदि भुक्तानीको माध्यम रकम हुनेछ भने प्रति महिना कति रकम तिर्न तयार हुनुहुन्छ?
रु. २० प्रति ठाटिमा

११. भुक्तानी सम्झौताको आधार कस्तो किसिमको स्विकार्य हुनेछ?

क) नतीजा/उत्पादन (output)

ख) उपयोग (input)

ग) कृषि जमिनको क्षेत्रफल

Photographs of field visit



Household questionnaire survey



Measurement of water flow in Betini river



Measurement of water discharge at point source from Ramjanaki forest into irrigation canal



Workshop participants at Sadabahr CF building-Sukhad



Participants presenting group work in workshop



Interaction with Bagdauli Irrigation Committee members



Agriculture field in downstream region



Bagdauli irrigation canal



Betini forest