

Feasibility for Piloting Payment for Ecosystem Services (PES) Initiative at Ramaroshan Lake Complex, Achham

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Abstract—Ramaroshan Lake Complex is an area comprised of 12 lakes and 18 meadows interconnected with each other, forming the complex, which provides multiple ecosystem services at local, national, and international levels. The study assessed potential of the area for piloting the PES initiative through social survey measures such as semi-structured household surveys, focal Group Discussion, key informant interviews, stakeholder consultations, and field observations. Shrinking of lakes, eutrophication and lake pollution, landslide, and flood are ecological challenges, while limited finance and budgeting are financial challenges for the area. Despite a low level of knowledge on PES, the majority are willing to participate in PES if implemented in the area. Among respondents, 82% are willing to change their resource consumption behavior through either cash (13.5%), or by kind labor (35.5%), or by participation (35.5%), or (16.5%) by none. The majority prefer local government as the lead agency and public funding mechanism for pilot PES if implemented in the area. Water is the most prioritized ecosystem service, Tourism and religious significance were other most valued ecosystem services. Community/Household, Salimkot CF, Bhangabuwa CF are service providers and Farmers group, Visitors, Kailash Lagubittiye Bidhut Priyojana, Hoteliers, Water mills, and Entrepreneurs are service users, while DFO, RTDMCO, SWMO, UNICEF, INGOs projects can act as service intermediaries of the PES initiative in RLC. Ramaroshan Rural Municipality should lead the PES initiative in coordination with service beneficiaries and intermediaries. Setting up a functioning institutional mechanism and sustainable financing is considered a critical step for piloting PES in the area. The lake restoration program was considered the heart of the pilot PES program at the study area. PES initiative through lake restoration and tourism development has potential for sustainable conservation and livelihood upliftment of locals. Overall, PES in Ramaroshan Lake Complex

is ecologically urgent, socially accepted, and financially feasible for further study.

Keywords— Ecosystem services, payment for ecosystem services, livelihood improvement, financing mechanism.

I. INTRODUCTION

Wetlands are dynamic aquatic ecosystems characterized by areas of land saturated with water either permanently or seasonally, encompassing diverse types such as marshes, fens, peatlands, and shallow water bodies (Sonia et al., 2025). These environments, which can be natural or human-made, feature water that can be flowing or static, ranging from fresh to brackish or saline, including marine waters up to 6 meters deep at low tide (Sonia et al., 2025). Globally, wetlands are recognized for their ecological significance, with estimates indicating vast coverages, for instance, between 125 and 131 million hectares in Africa and 204 and 286 million hectares in Asia (Sonia et al., 2025). Often referred to as "the kidneys of the landscape" due to their role in hydrological and chemical cycles, and "biological supermarkets" for their rich biodiversity and support of various food webs, wetlands are considered among the most diverse and productive ecosystems worldwide (Sonia et al., 2025). They deliver a wide array of ecosystem services essential for life support systems, biodiversity conservation, and act as a buffer against climate change impacts and ecosystem degradation (Sonia et al., 2025; Verma & Negandhi, 2011). The primary determinant of wetland



environments is water, which profoundly influences their diverse flora and fauna (Sonia et al., 2025).

The critical role of wetlands in providing numerous ecosystem services underscores the importance of their sustainable management, especially in the face of escalating environmental concerns such as climate change and extreme weather events (Verma & Negandhi, 2011). Proper understanding and economic valuation of the extensive range of ecosystem services provided by wetlands are crucial for informed decision-making (Aryal et al., 2021; Mulatu et al., 2022; Belyaev et al., 2022; Verma & Negandhi, 2011). Such valuation aids in comparing the cost-effectiveness of investments, evaluating trade-offs among different ecosystem management options, and choosing between competing land uses (Verma & Negandhi, 2011). Moreover, it facilitates the creation of markets for ecosystem services, mobilizes financial resources, and enhances public awareness regarding the contributions of these services to societal well-being and economic development (Verma & Negandhi, 2011). The ultimate goal of valuing ecosystem services in wetland management is to ensure that wetland resources are allocated to uses that generate the highest net societal benefits, considering both economic benefits and associated costs (Verma & Negandhi, 2011). Economic valuation can provide a regional benefit assessment, as demonstrated by studies in the Volga-Akhtuba Floodplain, which aids in decision-making for sustainable natural resource management (Belyaev et al., 2022).

Payment for Ecosystem Services (PES) represents an increasingly utilized mechanism to foster both environmental sustainability and local livelihoods (Maithya et al., 2021). These schemes involve compensating land users for adopting practices that maintain or enhance ecosystem services, thereby benefiting downstream communities (Maithya et al., 2021). For instance, communities dependent on the Nyando wetland in Kenya derive significant provisioning, cultural, supporting, and regulating services, making them potential beneficiaries or participants in PES initiatives aimed at conservation and improved livelihoods (Maithya et al., 2021). This approach emphasizes the potential for designing effective PES mechanisms that actively involve local communities in decision-making and payment processes, ensuring equitable distribution of responsibilities and benefits (Maithya et al., 2021). As natural habitats diminish and ecosystem services become scarcer, their potential for market-based trade increases, highlighting the growing relevance of PES (Verma & Negandhi, 2011).

Implementing effective PES schemes requires robust institutional arrangements and appropriate financing mechanisms (Mulatu et al., 2022). The success of a PES program is intrinsically linked to the nature of its institutional structure, its capacity to strengthen institutional performance, and its influence on social values and conservation norms (Mulatu et al., 2022). Effective collaboration among various levels of government—central, provincial, and local—is essential, particularly in contexts where comprehensive legislative frameworks for managing ecosystem services are evolving, as observed in Nepal (Aryal et al., 2021). Public and

private institutions, including non-governmental organizations, play significant roles in the successful implementation of PES schemes by facilitating improved collaboration and ensuring that ecosystem services are clearly defined and managed (Mulatu et al., 2022). Stakeholder engagement is crucial for sustainable wetland management, necessitating the identification of the roles and interests of various actors involved (Mulatu et al., 2022).

Studies assessing ecosystem services, such as those conducted for the Ghodaghodi wetland in Nepal and the Machar Marshes and Sudd wetlands in South Sudan, often prioritize these services and analyze institutional arrangements to propose frameworks for PES implementation (Aryal et al., 2021; Mulatu et al., 2022). Such research typically involves interactions with local communities to evaluate the potential of an area for framing PES schemes and to identify suitable institutional setups and their roles in piloting these mechanisms (Aryal et al., 2021; Maithya et al., 2021; Yasin et al., 2024). A comprehensive analysis, often incorporating mixed research designs that integrate quantitative and qualitative analyses, helps in understanding the multifaceted situation and providing insights for the sustainable management of wetlands and the well-being of dependent communities (Yasin et al., 2024). This structured approach ensures that PES initiatives are tailored to the specific ecological and socio-economic characteristics of the wetlands and their beneficiaries (Aryal et al., 2021; Mulatu et al., 2022; Yasin et al., 2024).

Despite the growing body of literature on wetland ecosystem services and PES, there remains a notable research gap in the comprehensive evaluation of long-term social and ecological impacts of PES schemes, especially in developing regions (Aryal et al., 2021; Mulatu et al., 2022). While many studies identify the potential for PES and assess local perceptions, there is a scarcity of robust, longitudinal studies tracking the effectiveness of implemented PES programs in achieving both conservation goals and livelihood improvements over extended periods (Yasin et al., 2024). This includes a need for more detailed analysis on how different institutional arrangements affect the equitability and sustainability of PES benefits distribution among diverse community stakeholders (Mulatu et al., 2022). Furthermore, a process gap exists in translating economic valuation studies into actionable policy and integrated management strategies, particularly in regions where awareness of wetland importance and their economic value is low at sub-national and national levels (Aryal et al., 2021; Belyaev et al., 2022; Verma & Negandhi, 2011). The integration of indigenous knowledge and local perceptions into formal PES frameworks, despite being recognized as crucial, also presents a process gap where standardized methodologies for this integration are often lacking (Yasin et al., 2024).

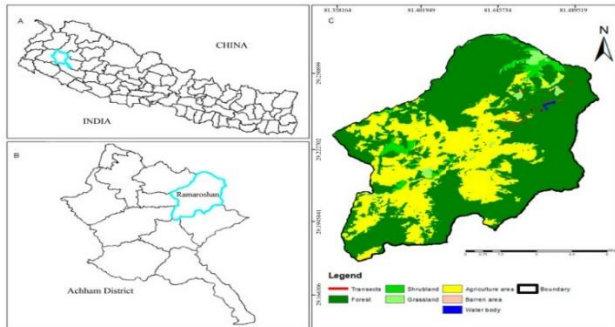
II. MATERIALS AND METHODS

1) Study Area

The Ramaroshan Lake Complex (RLC), locally known as *Barha Banda Athhara Khanda* (12 lakes and 18 meadows), is

an interconnected mid-hill wetland system in Achham District, Sudurpashchim Province, Nepal, extending from approximately 1,401 to 3,820 m above sea level. Covering about 3,051 ha, the landscape comprises forests, grasslands, lakes, and riverine habitats under pronounced climatic variability, with temperatures ranging from ~1–30 °C and annual precipitation of 1,486–1,739 mm (DoF, 2017; Tachamo-Shah et al., 2023). The complex delivers significant ecological, cultural, and tourism-related ecosystem services, including freshwater regulation and biodiversity conservation (Baral et al., 2022).

FIGURE 1: STUDY AREA SHOWING RAMAROSHAN RURAL MUNICIPALITY



2) Data Collection

This study aimed to support sustainable conservation of the lake complex through restoration activities using Payment for Ecosystem Services (PES). As it involved social research with human participants, informed consent was obtained from all respondents. Data were collected from both primary and secondary sources to ensure a comprehensive analysis. Data collection included household surveys, focus group discussions, key informant interviews, stakeholder consultations, and field observations. The household survey targeted 231 households in Ward No. 5, selected via simple random sampling. Sample size was calculated using the Arkin and Colton (1963) formula with 95% confidence level, 70% population proportion, and 5% margin of error. These methods captured socio-demographic details, ecosystem service benefits, threats, and local willingness to engage in PES. Focus group discussions were conducted with four groups, including two Community Forest User Groups (Salimkot and Bhangabuwa), one farmers’ group, and one entrepreneurs’ group, to explore constraints, opportunities, and perceptions regarding PES implementation. Ten key informant interviews were held with local experts, government officials, teachers, and visitors to identify critical ecosystem services and challenges for PES piloting. Eight stakeholder consultations involved relevant agencies, such as Ramaroshan Rural Municipality, Division Forest Office Achham, and UNICEF Achham Office, assessing institutional roles, PES knowledge, and potential contributions. Field observations were carried out throughout the process for ground truthing and situational analysis. Secondary data were gathered through literature reviews of published and unpublished materials, journal articles, e-books, online sources, government documents, and Community Forestry Operational Plans. This mixed-method approach ensured robust and reliable insights for PES

feasibility.

• Data Analysis

All quantitative data were analyzed using Microsoft Excel and SPSS. Descriptive statistics were used to concisely present data obtained by means of percentage, standard deviation, mean, and median for tabulating the socio-demographic profile and respondents’ willingness to participate in the pilot PES initiative in the study area. A participatory tool like pairwise ranking was used to rank and prioritize ecosystem services. Stakeholder analysis using the power and interest grid was used for framing potential institutional arrangements and the implementation framework. ArcGIS was used for land use and land cover change detection between 2013 to 2023 AD. A raster image was downloaded from Google Earth Explorer, and supervised classification using maximum likelihood was performed for land use and land cover change analysis. Qualitative data was thoroughly analyzed to provide information via text. Secondary sources of data provided a baseline for the study’s relevance and consistency. Field observation was carried out for overall situational analysis and ground truthing of the acquired satellite image.

3) Results

Table 1 presents respondents’ perceptions of ecosystem services. Participants were first asked about their understanding of ecosystem services and the benefits derived from them to sustain their livelihoods. A baseline understanding was established among respondents prior to the deployment of the questionnaire.

According to the study, 93% of respondents had not previously heard of the concept of Payment for Ecosystem Services (PES) in the study area. The remaining 7%, who were aware of PES, were asked to rate their knowledge level on a scale of 1 to 3 (with 1 being the lowest and 3 the highest). Of these, 93% reported having little knowledge of PES, 4.5% indicated slight knowledge, and 2.5% reported fair knowledge. Capacity building and raising awareness about PES are thus essential initial steps for piloting PES in the area.

Respondents were also asked whether they would be willing to change their ecosystem service consumption behavior—specifically, actions that adversely affect the provision of such services—through an incentive mechanism, and if so, how they would do so.

TABLE 1: RESPONDENTS’ PERCEPTION OF ECOSYSTEM SERVICES.

Local perception	Percentage(%)	Minimum	Maximum	Median	SD
Do you agree Ecosystem services in area are degrading than past?					
Strongly Disagree	4.2	3	5	4.00	.720
Disagree	4.1				
Neutral	12.1				
Agree	36.2				
Strongly Agree	43.4				
Do you agree conservation is possible without local development?					
Strongly Disagree	40.3	1	5	2.00	.822
Disagree	43.5				
Neutral	13.1				
Agree	2.1				
Strongly Agree	1.0				
Do you agree Ecosystem service should be a free service?					
Strongly Disagree	13.9	1	5	3.00	1.180
Disagree	25.7				
Neutral	20.4				
Agree	30				
Strongly Agree	9.9				

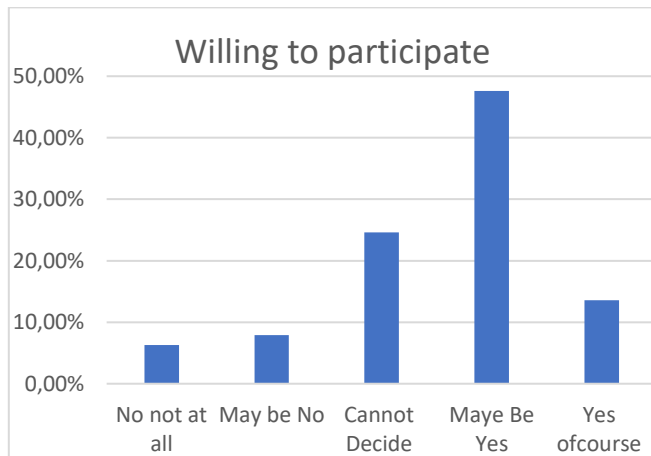
- Willingness to participate

Figure 2 indicates that a majority of respondents are willing to participate in a Payment for Ecosystem Services (PES) program if implemented in the study area, despite their limited prior knowledge of PES processes. Before assessing their willingness, respondents were familiarized with the concept of PES as a tool for both conservation and local development. They were then asked to rate their willingness to participate in a pilot PES program in the Ramaroshan Lake Complex Area on a scale of 1 to 5, where 1 = No, 2 = Maybe, 3 = Neutral, 4 = Maybe yes, and 5 = Yes.

The majority of respondents expressed a preference for public funding over private funding mechanisms for PES implementation. Among all respondents, 68% indicated a preference for the local government to be the lead institution for a PES program.

Respondents were also asked to identify the most important factors for the conservation of ecosystem services in the area. The study found that livelihood improvement (40.5%) and policy requirements (32%) were considered the most important factors. This was followed by sustainable financing and funding mechanisms (16.5%), functioning institutional mechanisms (8.5%), and collaboration among partners (2.5%).

FIGURE 2: WILLINGNESS TO PARTICIPATE IN PES



4) Ecosystem Services

The study area provides a wide range of ecosystem services. These include provisioning services such as freshwater, fuelwood, food, fodder, timber, non-timber forest products (NTFPs), and genetic resources from endangered species. Regulating services encompass climate regulation, water purification and recharge, flood control, air purification, disease regulation, and pollination. The scenic and heterogeneous landscape offers significant cultural services, including tourism, recreation, education, research, and religious value. Supporting services, fundamental to all others, involve nutrient cycling, soil formation, waste absorption, and habitat and biodiversity maintenance. However, these services are threatened by unsustainable practices like overgrazing, excessive resource extraction, illicit fishing, and unplanned infrastructure development. These pressures have led to lake shrinkage, siltation, pollution, the drying of water sources, landslides, and floods, which collectively undermine

sustainable ecosystem management (DoF, 2017).

- Ecosystem Service Prioritization

Through pairwise ranking, respondents prioritized ecosystem services critical to their livelihoods. Water was ranked highest (8 points), valued for drinking, irrigation, hydropower, and supporting tourism. Tourism (7 points) and the religious significance of the sacred lakes (6 points) placed second and third, respectively—a finding detailed in Table 3, which links these values to the area's role in ecotourism and spiritual practices. Subsequent rankings were: grasses/fodder (5 points), NTFPs (4 points), firewood (3 points), biodiversity (2 points), leaf litter (1 point), and timber (0 points). The notable valuation of biodiversity (2 points) is further explained by the presence of threatened wetland species in the complex.

TABLE 3: RANKING OF ECOSYSTEM SERVICES

Ecosystem services	Fresh Water	Tourism	Religious	Grasses	NTFPs	Firewood	Biodiversity	Leaf litter	Timber	Value	Rank
Fresh Water	Fresh Water	Fresh Water	Fresh Water	Fresh Water	Fresh Water	Fresh Water	Fresh Water	Fresh Water	Fresh Water	8	1
Tourism		Tourism	Tourism	Tourism	Tourism	Tourism	Tourism	Tourism	Tourism	7	2
Religious			Religious	Religious	Religious	Religious	Religious	Religious	Religious	6	3
Fodder				Fodder	Fodder	Fodder	Fodder	Fodder	Fodder	5	4
NTFPs					NTFPs	NTFPs	NTFPs	NTFPs	NTFPs	4	5
Firewood						Firewood	Firewood	Firewood	Firewood	3	6
Biodiversity							Biodiversity	Biodiversity	Biodiversity	2	7
Leaf Litter								Leaf Litter	Leaf Litter	2	8
Timber									Timber	0	9

5) Mapping Ecosystem Services

Figure 3 shows land use and land cover change between 2013 and 2023 of Ramaroshan Rural Municipality, ward no 5 prepared using USGS raster image from Arc GIS through Maximum Likelihood Supervised Classification.

As per Table 4, 14.05 ha area is covered with lake area, 2345.97 ha by forest, 464.07 ha by flood plains, 1770.92 ha by pasture land and 801.84 ha by built-up areas. 0.26 % of total area constitutes lake area, 43.46% constitutes forest, 8.59% of area is flood plains while 32.81 % and 14.85% is pasture land and built-up areas respectively in 2013 at Ramaroshan Lake Complex.

In 2023, the lake reduced to 12.96 ha covering 0.24% of the total area, forest cover increased to 2437.98 ha covering 45.17%, while flood plains constituted 650.21 ha, pasture land 1350 ha, and built-up 945.7 ha, each covering 12.04 %, 25.01%,17.52% of the total area, respectively. This shows that over a decade, lake and pasture areas have reduced while floodplains have expanded in the study area. However, there is a positive change in forest cover due to conservation efforts from the government and community via CF. Built-up area accounts for rural settlement and agricultural areas, which have increased land coverage in the study area.

- Institutional arrangement
- Service Providers/Sellers
- Dalyana and Dhanesalla are the nearest upstream

settlements to the Ramaroshan Lake Complex and represent potential buyers of ecosystem services. The lake's outflow drains first to Dalyana—home to Dalyana Tal lake—and then to Dhanesalla, which hosts a hydropower plant, before reaching downstream settlements such as Tallo Patal, Sallisen, Chauka, and Alledi.

FIGURE 3: LULC MAP OF WARD NO 5 OF RAMAROSHAN MUNICIPALITY.

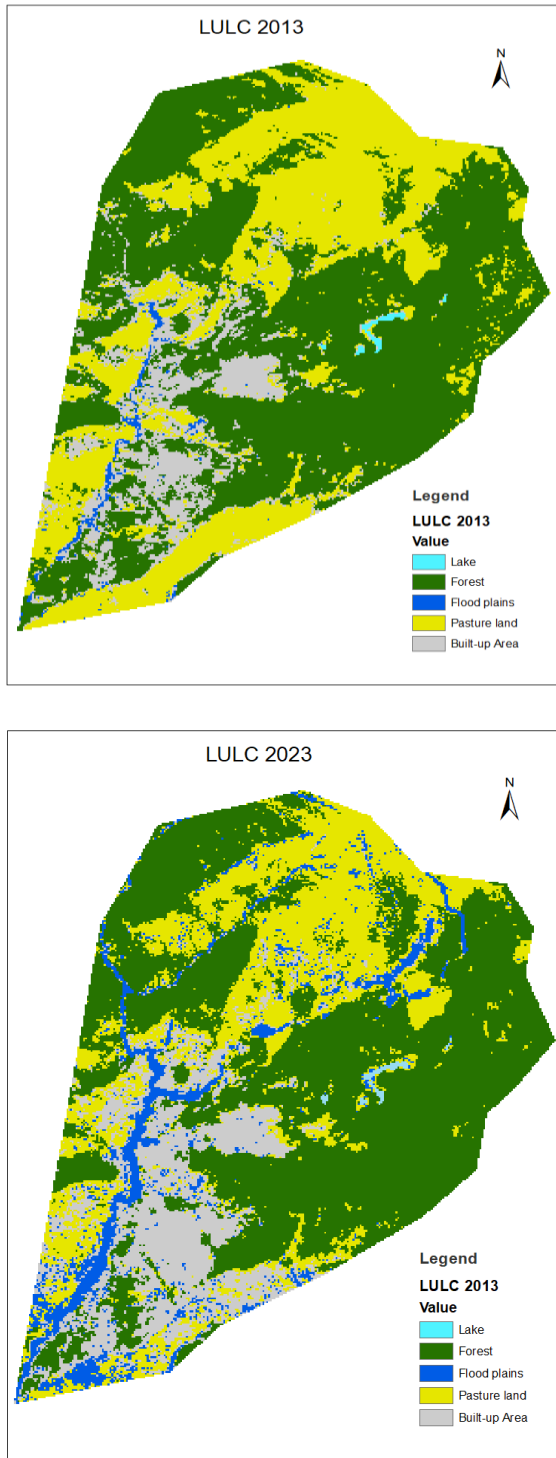


TABLE 4: AREA AND PERCENTAGE COVER BASED ON LULC MAP IN 2013 AND 2023 AT WARD NO 5.

LULC 2013 of RLC		
Ecosystem Services	Area(ha)	Percentage cover (%)
Lake	14.05	0.26
Forest	2345.97	43.46
Flood plains	464.07	8.59
Pasture land	1770.92	32.81
Built-up Area	801.84	14.85
LULC 2023 of RLC		
Lake	12.96	0.24
Forest	2437.98	45.17
Flood plains	650.21	12.04
Pasture land	1350	25.01
Built-up Area	945.7	17.52
Total	5396.85	100

The supply of these services could come from community-managed forests. The Bhangabuwa Community Forest (405 ha) in Dalyana, adjacent to Kinimini pasture, provides forest products and services to 211 local households. Further upstream, the Salimkot Community Forest (523 ha), bordering the proposed Ramaroshan Protected Forest Area, supports over 986 households in Ward No. 5.

These communities constitute potential sellers in a PES pilot scheme, with key roles including:

- Leading lake restoration and pollution control initiatives.
- Participating in financial management and decision-making.
- Consulting with intermediaries for monitoring and reward distribution.
- Identifying beneficiaries to promote wise resource use.
- Engaging in capacity-building programs.
- Conducting periodic project monitoring and evaluation.

• Service Users/Buyers

Downstream farmers, who depend on lake water for irrigation and crop production, represent a core group of potential PES buyers. The Ramaroshan Lake Complex, a designated tourism area, attracts approximately 8,000 annual visitors (a number that is increasing), positioning local, regional, and international tourists as major buyers with revenue potential from tourism fees. Furthermore, local hoteliers, the locally-operated Kailash Lagubittiye Hydropower Plant (providing electricity from the lake to over 800 households), and integrated agri-eco-tourism entrepreneurs constitute other vital buyer groups.

As buyers, these stakeholders can undertake several key functions: generating, collecting, and disbursing funds or taxes for the PES program; participating in its planning, implementation, and monitoring; engaging in capacity building; monitoring sellers' compliance with contractual

obligations to ensure enhanced service provision; and coordinating with both sellers and program intermediaries.

• Intermediaries

Intermediary organizations are critical for the facilitation, coordination, and management of a pilot PES program in the Ramaroshan area.

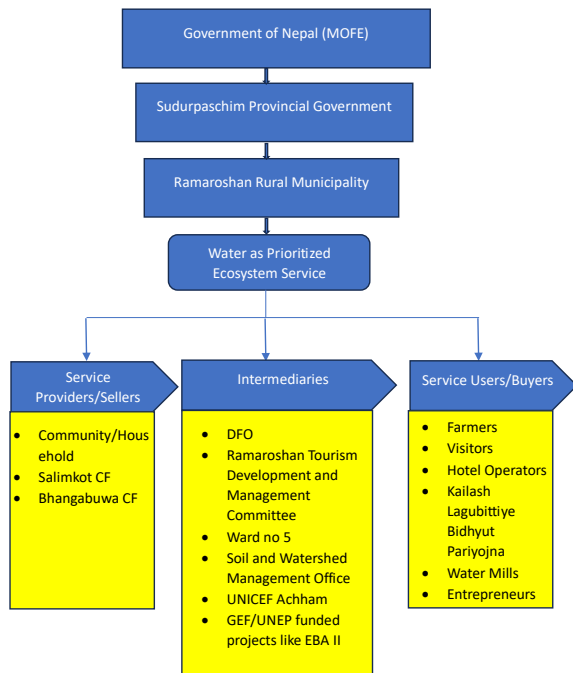
Key Identified Intermediaries:

- Division Forest Office, Achham: Legal owner/custodian of the Ramaroshan Lake Complex.
- Ramaroshan Tourism Development and Management Committee: Manages provincial tourism infrastructure and visitor flow.
- Soil and Watershed Management Office: Provides technical expertise for lake and watershed restoration.
- Ramaroshan Rural Municipality Ward No. 5: Local government unit for on-ground facilitation and coordination.
- UNICEF Achham Office: Brings climate resilience advocacy and practical project experience.
- GEF/UNEP EBA II Project: A strategic potential funding and technical partner (see Figure 4).

Core Intermediary Functions:

- Lead the legal and institutional setup of the PES program.
- Provide technical assistance in planning, prioritization, implementation, and monitoring.
- Facilitate contract negotiations, incentive structuring, and stakeholder dialogues.
- Secure and manage financial support for program sustainability.
- Conduct capacity-building activities for all PES stakeholders (buyers and sellers).

FIGURE 4: INSTITUTIONAL ARRANGEMENT BETWEEN SERVICE SELLER -BUYER AND INTERMEDIARIES.



• Implementation framework

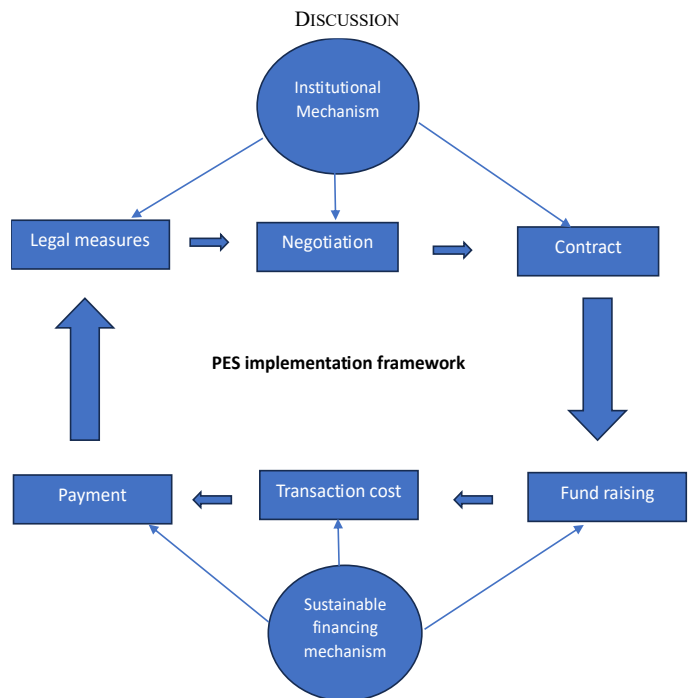
The focal institutions for piloting the PES scheme at the Ramaroshan Lake Complex will be the Ministry of Forest and Environment (federal level), the Sudurpashchim Ministry of Industry, Tourism, Forest and Environment (provincial level), and Ramaroshan Rural Municipality (local level). The Rural Municipality will take the lead in coordinating with beneficiaries and intermediaries on the ground.

Implementation will follow a structured, stepwise approach, as outlined in Figure 5:

- Legal and Institutional Setup: Establishing legal measures, including land rights and policy frameworks.
- Stakeholder Negotiation: Defining roles, responsibilities, and performance criteria.
- Contract Formalization: Signing Memoranda of Understanding (MoUs) detailing costs and incentives.
- Fund Mobilization: Raising incentives and securing donor support for restoration and conservation activities.
- Transaction Cost Management: Minimizing costs through equitable benefit-sharing and efficient monitoring.
- Performance-Based Payment: Executing payments contingent upon strong verification of service delivery.

The successful execution of this pilot hinges on several key components: clearly defined and quantifiable ecosystem services, robust institutional arrangements, a strict performance-based payment system, comprehensive capacity building, and the establishment of sustainable long-term financing.

FIGURE 5: IMPLEMENTATION FRAMEWORK FOR PES (MODIFIED FROM SOURCE: NARMA,2009 & WTLCP, 2012)



Nepal's Forest Act 2076 (Chapter 4) and Forest Regulation 2079 enable special/integrated plans for sustainable management of national forests, wetlands, watersheds, and

ecotourism areas, with DFO responsible for implementing PES through user groups or buyer-seller negotiations. National Wetland Policy 2069, Ramsar Strategy (2018-2024), Water Resources Strategy 2002, and Biodiversity Strategy 2014-2020 promote PES for wetland conservation, wise use, user/polluter principles, and revenue generation for livelihood improvement. Hydropower EIA Manual 2018, Community Forest Directive 2065, and Climate Change Policy 2067 support incentives, benefit-sharing, and PES for ecosystem services, rural electrification, and adaptive capacity. Other acts (Plant Protection, Aquatic Animal Protection, Soil & Watershed Conservation) reinforce sustainable watershed and biodiversity management.

Sellers of prioritized ecosystem services in Ramaroshan Lake Complex should undertake plantation, lake restoration, regulated fishing/grazing, and biodiversity conservation to enhance service provision for buyers, facilitated by flexible incentives and contracts via intermediaries, creating a "win-win" PES scheme (Fripp, 2014). PES typically involves government/NGO intermediaries to manage payments between sellers needing watershed protection and buyers seeking improved services (Mills and Porras, 2002) in RLC, DFO leads grazing/fishing regulation and technical support, while SWMO aids lake restoration and landslide control. Field observations revealed over 10 households near Dhanesalla displaced by floods/landslides, with severe property and crop losses, highlighting community recognition of urgent conservation needs amid drying sources, lake shrinkage, and pollution. Ramaroshan Rural Municipality can lead as intermediary in buyer-seller negotiations, pricing, contracts, and legal measures, coordinating with Ward No. 5, UNICEF Achham, and INGOs for PES design, voluntary agreements, payment administration, monitoring, and networking (Stearns et al., 2013).

- Conclusions

The majority of responders think that maintaining environmental services requires both local development and conservation. Notwithstanding their lack of understanding of PES, they are eager to alter the way they consume ecosystem services in exchange for some sort of reward, especially when it comes to lake restoration initiatives. The majority say they would take part in PES if it were to be implemented at Ramaroshan Lake Complex. To adopt PES for the sustainable management of the Ramaroshan Lake Complex, strong policy mechanisms, capacity building, awareness, and inclusive sustainable funding mechanisms are thought to be crucial. Freshwater, tourism, feed, firewood, NTFPs, leaf litter, timber, genetic resources, the area's religious and aesthetic value, and other numerous services all benefit the respondents. When it comes to drinking, irrigation, producing hydropower, tourism, and other uses, water is the most important resource.

Community/households, Salimkot CF, Bhangabuwa CF, Farmers group, Visitors, Hotels operators, Kailash Lagubittiye Bidhut Pariyojana, Water mills, and Entrepreneurs are service users; a potential pilot PES scheme in the study area is mediated by the Division Forest Office, Ramaroshan Tourism Development and Management Committee Office, SWMO,

UNICEF, and INGOs. The pilot PES's overall leader should be Ramaroshan Rural Municipality. While fundraising, maintaining low transaction costs, and payment based on performance are important aspects required for maintaining sustainable finance for PES implementation in the study area, legal measures, beneficiary negotiations, and flexible contract agreements are considered essential steps for maintaining a functioning institutional mechanism. Improving livelihoods is thought to be the most crucial component for the long-term preservation of ecological services. Because the respondents' level of knowledge is inadequate, increasing awareness and developing capacity are essential for implementing PES in the region. Socio-ecological concerns included budgeting, low-income generation, drying out water sources, shrinking lakes, and contamination of lakes.

The PES mechanisms, which focus on tourism development and lake restoration, have the potential to improve lake services and raise locals' standard of living to support the sustainable management of the Ramaroshan Lake Complex. All things considered, PES in the Ramaroshan Lake Complex is financially feasible, socially acceptable, and ecologically urgent, and further study is recommended.

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