# PROCEEDINGS OF NATIONAL WETLAND WORKSHOP 2024

## "WETLANDS AND HUMAN WELLBEING"

**Government of Nepal**
**Ministry of Forests and Environment**
**Department of Forests and Soil Conservation**
Babarmahal, Kathmandu, Nepal

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# Foreword

I am delighted to present the proceedings of the National Wetland Workshop, held on February 2, 2024, in Kathmandu, marking the celebration of World Wetland Day. Organized by the Department of Forests and Soil Conservation, this workshop served as a collaborative platform for policymakers, experts, conservationists, and a wide range of stakeholders to exchange valuable insights and experiences.

Wetlands are vital ecosystems that support a diverse range of flora and fauna, provide essential ecological services, and contribute to the livelihoods of many communities. They play a crucial role in water purification, flood control, carbon sequestration, and as habitats for numerous species. Nepal is blessed with a rich diversity of wetlands, including 10 Ramsar-listed sites, which are recognized for their international significance. These invaluable ecosystems play a multifaceted role in our country's natural resource management.

The National Wetland Workshop aimed to promote the exchange of knowledge and experiences among multiple stakeholders, fostering effective collaboration for the management and conservation of wetlands. This event served as an important platform for discussing best practices, identifying knowledge gaps, and exploring solutions to current challenges in wetland conservation.

The insights and recommendations produced during this workshop will undoubtedly contribute to the ongoing efforts to conserve and manage Nepal's wetlands. It is my sincere hope that this proceeding will serve as a useful resource for policymakers, researchers, and practitioners committed to the sustainable management of wetlands in Nepal and beyond.

I would like to extend my heartfelt thanks to all the participants for their active involvement and contributions, which have made this workshop a success. Special thanks to IUCN Nepal for their generous financial support in publishing this proceedings. I also express my gratitude to the organizing team and supporting partners for their dedication and hard work in making this event possible.

**Shiva Kumar Wagle**
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# Acknowledgement

It is a great honor to present the proceedings of the National Wetland Workshop, held on February 2, 2024, organized by the Department of Forests and Soil Conservation. This workshop brought together experts, professionals and practitioners, all dedicated to the conservation and management of wetlands. This proceeding aim to capture and summarize the insightful discussions and presentations shared during the event.

Wetlands, often referred to as the "kidneys of the landscape," play a pivotal role in maintaining ecological balance, regulating water flow, supporting livelihoods, and enhancing resilience against natural disasters. The discussions during the workshop highlighted the urgent need to conserve and restore these vital ecosystems, especially in the face of escalating climate change impacts and anthropogenic pressures. It was an opportunity to reflect on our shared responsibility to ensure the sustainable management of wetlands in Nepal, aligning with global commitments under the Ramsar Convention. The exchange of knowledge and experiences during this workshop has provided valuable insights that will help shape future strategies and policies for wetland management.

This proceeding captures the rich discussions, innovative approaches, and practical recommendations that emerged from the workshop. I am confident that the outcomes presented here will serve as a foundation for enhancing wetland conservation efforts in Nepal. By integrating the knowledge shared, we can move toward more effective ecosystem management, ensuring the health and vitality of our wetlands for generations to come.

I extend my sincere gratitude to all the participants, resource persons, and organizing teams who contributed to the success of this workshop.

**Ganesh Paudel**
Deputy Director General
Department of Forests and Soil Conservation
Babarmahal, Kathmandu, Nepal

# List of Abbreviations and Acronyms

| | |
|---|---|
| AAPA | Aquatic Animal Protection Act |
| ADB | Asian Development Bank |
| BCN | Bird Conservation Nepal |
| BRCRN | Building a Resilient Churia Region in Nepal |
| CAPA | Community Adaptation Plans for Action |
| CBD | Convention on Biological Diversity |
| CBOs | Community Based Organizations |
| CDM | Clean Development Management |
| CEO | Chief Executive Officer |
| CEPA | Communication, Education, Participation, and Awareness |
| CFUGs | Community Forest User Groups |
| CITES | Convention on International Trade in Endangered Species of Wild Fauna and Flora |
| CODEFUND | Conservation Development Foundation |
| COPs | Conference of the Parties |
| CPs | Contracting Parties |
| DCRL | Developing Climate Resilient Livelihoods |
| DDG | Deputy Director General |
| DFO | Division Forest Office |
| DG | Director General |
| DNPWC | Department of National Parks and Wildlife Conservation |
| DoE | Departmnet of Environment |
| DoFD | Directorate of Fisheries Development |
| DoFSC | Department of Forests and Soil Conservation |
| DPR | Department of Plant Resources |
| EIA | Environmental Impact Assessment |
| FAO | Food and Agriculture Organization |
| FRTC | Forest Research and Training Centre |
| FWMRC | Federal Watershed Management Resource Center |
| GEF | Global Environment Facility |
| GHGs | Greenhouse Gases |
| GIS | Geographic Information System |
| GoN | Government of Nepal |
| HR | Human Resource |
| ICIMOD | International Centre for Integrated Mountain Development |
| INGO | International Non-Governmental Organization |
| IoF | Institute of Forestry |
| ITTO | International Tropical Timber Organization |
| IUCN | International Union for Conservation of Nature |
| IWMI | International Water Management Institute |
| IWRB | International Waterfowl Research Bureau |
| LCDA | Lake Conservation and Development Authority |
| LSGA | Local Self Governance Act |
| M&E | Monitoring and Evaluation |
| MEAs | Multilateral Environmental Agreements |
| MoFE | Ministry of Forests and Environment |
| MoITFE | Ministry of Industry, Tourism, Forest and Environment |

| | |
|---|---|
| NAPA | National Adaptation Programme for Action |
| LAPA | Local Adaptation Plans for Action |
| NBS | National Biodiversity Strategy |
| NBSAP | National Biodiversity Strategy and Action Plan |
| NCNSFSD | Nature Conservation National Strategic Framework for Sustainable Development |
| NCS | National Conservation Strategy |
| NDC | Nationally Determined Contribution |
| NDWQS | National Drinking Water Quality Standards |
| NEFEJ | Nepal Forum of Environmental Journalists |
| NGO | Non-Governmental Organization |
| NLBI | National Lake Bioindicators |
| NLCDC | National Lake Conservation and Development Committee |
| NPC | Nepal Planning Commission |
| NPWC | National Parks and Wildlife Conservation |
| NPWCA | National Parks and Wildlife Conservation Act |
| NRSAP | National Ramsar Strategy and Action Plan |
| NTNC | National Trust for Nature Conservation |
| NTV | Nepal Television |
| NWP | National Wetlands Policy |
| PAs | Protected Areas |
| PES | Payment for Ecosystem Services |
| RIS | Ramsar Information Sheets |
| RRC-EA | Ramsar Regional Center - East Asia |
| SAARC | South Asian Association for Regional Cooperation |
| SCWM | Soil Conservation and Watershed Management |
| SDGs | Sustainable Development Goals |
| SES | Social-Ecological Systems |
| SPNP | Shey Phoksundo National Park |
| STRP | Scientifice and Technical Review Panel |
| SWC | Soil and Watershed Conservation |
| TU | Tribhuvan University |
| UNDP | United Nations Development Programme |
| UNESCO | United Nations Educational, Scientific and Cultural Organization |
| UNFCCC | United Nations Framework Convention on Climate Change |
| USD | United States Dollar |
| WECS | Water and Energy Commision Secretariat |
| WET | Wetland Extent Trend |
| WHO | World Health Organization |
| WMO | Watershed Management Officer |
| WRA | Water Resources Act |
| WWF | World Wildlife Fund |
| ZSL | Zoological Society of London |

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# I. Background

The National Wetland Policy (NWP) 2012 of Nepal classifies wetlands as "Perennial water bodies that originate from underground sources of water or rains. It means swampy areas with flowing or stagnant fresh or salt water that are natural or manmade, permanent or temporary. Wetlands also mean marshy lands, riverine floodplains, lakes, ponds, water storage areas, and agricultural lands" (National Wetland Policy, 2003). The government of Nepal formulated a wetland policy in 2003 and it was revised in 2012. Wetlands are among the world's most productive ecosystems (Costanza et al., 1997; Mitsch et al., 2015). Wetlands cover about 750,000 hectares in Nepal, representing roughly 5% of the country's total surface area (NBSAP, 2014-2020).

Nepal, a signatory to the Ramsar Convention since 1988, demonstrated its commitment to wetland conservation on an international level. The country has designated ten wetlands as Ramsar sites of international importance: Koshi Tappu Wildlife Reserve, Beeshazaari and Associated Lakes, Jagadishpur Reservoir, Ghodaghodi Lake area, Mai Pokhari, Pokhara Lake Cluster, Gokyoand associated lakes, Gosaikunda and associated Lakes, Rara Lake, and Shey-phoksundo Lake. These wetlands are distributed across all seven provinces, ranging from the highland Himalayas to the lowland Terai. Among these wetlands, Six wetlands are located inside the Protected Areas (PAs), while four are outside the PAs. These Ramsar sites contribute 0.025 percent of the global Ramsar site surface area (Ramsar, 2017). Notably, Nepal, while lacking coastal and marine wetlands as classified by Ramsar, possesses 19 types of natural and 10 types of man-made inland wetlands (IUCN 2004; Siwakoti 2007), underscoring its rich inland wetland diversity.

The National Biodiversity Strategy and Action Plan 2014-2020 (NBSAP) recognizes wetlands as crucial for biodiversity. These ecosystems support a variety of flora and fauna. The National Ramsar Strategy and Action Plan (2018-2024) highlights wetlands' importance for species diversity, provisioning, cultural, regulating, and supporting services. Wetlands offer numerous ecological benefits, including water purification, landslide and flood control, carbon sequestration, and habitat for diverse species (Jisha & Puthur, 2021). They also bolster community resilience by providing livelihoods, food, and water. According to IUCN's 2004 report, 10% of ethnic communities traditionally depend on wetland resources for subsistence.

Despite their social, economic, religious, and touristic significance, wetlands have been neglected. They are among the most threatened natural ecosystems, necessitating high-priority conservation efforts. Wetlands face degradation from sedimentation, encroachment, land-use conversion, eutrophication, invasive species, chemical pollution, and climate change impacts.

Effective wetland conservation requires appropriate policies, institutions, and approaches. The Constitution of Nepal 2015 ensures the devolution of wetlands to the federal structure. National Wetland Policies, developed in line with the Ramsar Convention, play a central role in this effort. Although a wetland policy was formulated in 2012, it now requires revision to align with the three tiers of government. This policy aims to conserve, maintain, and develop the country's wetlands while supporting the economic, social, and cultural development of local communities through sustainable use.

The Ministry of Forests and Environment (MoFE) serves as the focal agency for wetland management in Nepal, with the Department of National Parks and Wildlife Conservation (DNPWC) acting as the Ramsar Administrative Authority. The National Wetland Coordination Committee (NWCC), under MoFE, includes representatives from key sectoral ministries that significantly impact wetlands. The Department of Forests and Soil Conservation (DoFSC) manages wetlands outside protected areas, but its

performance in policy revision and providing guidance to provincial governments has been suboptimal. The National Lake Conservation and Development Committee (NLCDC) under MoFE and the Lake Conservation and Development Authority (LCDA) in Gandaki Province are also involved in wetland management. Several strategies and policies, such as the National Ramsar Strategy and Action Plan (2018-2024), guide wetland management efforts across Nepal. Nepal employs diverse approaches for sustainable wetland management, such as Integrated Watershed Management, Integrated Water Resource Management, Cooperative Management of Lakes, and Payment for Ecosystem Services —to ensure the benefits provided by wetlands to both nature and local communities.

Following Nepal's adoption of a federal system, there is a lack of effective coordination among the three tiers of government, hindering the implementation of wetland conservation and management programs. This issue is compounded by insufficient awareness and engagement from stakeholders, including government agencies, NGOs, local communities, and civil society. Consequently, there is inadequate monitoring and evaluation (M&E), making it challenging to assess policy impacts, identify shortcomings, and implement corrective actions. The absence of a robust M&E framework and limited evidence-based decision-making, due to insufficient knowledge and scientific data, further obstructs necessary policy adjustments.

In response to these challenges, the Department of Forests and Soil Conservation (DoFSC), in collaboration with the Department of National Parks and Wildlife Conservation (DNPWC), organized the National Wetland Workshop. Held on February 2, 2024, in Budhanilakantha, Kathmandu, this workshop, in celebration of International Wetland Day, aimed to bring together policymakers, experts, and stakeholders to share ideas, knowledge, and experiences on wetland conservation and management. The event provided a platform to share knowledge and experiences on wetland conservation, review targets, and evaluate the progress of action plans and policies adopted by the Ministry of Forests and Environment (MoFE).

The National Wetland Workshop aimed to enhance wetland conservation and management through knowledge exchange and collaboration. Specifically, it aimed to share experiences, best practices, and innovative approaches related to wetland conservation policies and programs; identify research gaps and issues in wetland conservation; increase awareness of the importance and challenges of sustainable wetland management; and provide a platform for collaboration, partnerships, and networking among those involved in wetland management.

## II. Inaugural session

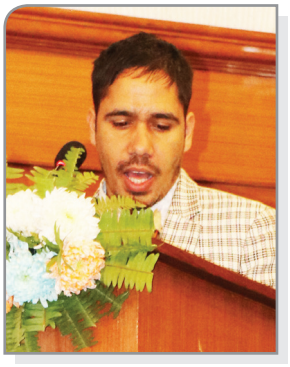
The National Wetland Workshop commenced with the National Anthem of Nepal. The workshop was inaugurated by the Honourable Minister Dr. Birendra Prasad Mahato and chaired by Mr. Shiva Kumar Wagle, DG of the DoFSC. Present among the distinguished guests were; Mr. Krishna Prasad Oli, Chairperson of NTNC, and other guests from various divisions under the MoFE as well as all the departments, centers, and representatives from the conservation partners and wetlands committees.

### Welcome Speech

**Mr. Ganesh Poudel, DDG, DoFSC,** welcomed all the participants and presented the overall framework of the workshop. He expressed his gratitude towards the chief guest Honorable Minster, Dr. Birendra Prasad Mahato; Chairperson of the NTNC, Mr. Krishna Prasad Oli; DG of DoFSC, Mr. Shiva Kumar Wagle, Head of all the departments, and centers and committees under the MoFE; Divisional Chiefs; Representatives from university; Media person; Representatives from the conservation partners, wetland committee and all other participants for their kind presence in the workshop.

He emphasized the importance of conservation and management of the wetland for a stable environment and biodiversity conservation. He also threw some lights on the degrading condition of the wetlands covering around 1.2 billion hectares of the world which is greater than the area of Canada. He quoted that according to the Global Wetland Outlook (2022), about 35% of the natural wetland areas have declined since the 1970s linking the declining trend of the wetland area in Nepal by 5.41% due to conversion into agricultural land (MoFSC, 2014).

He appreciated the effectiveness of the effort of DNPWC in conserving and managing wetlands inside the protected areas and DoFSC in conserving and managing the wetlands outside the protected areas.



Similarly, he express his gratitude towards other line agencies, provincial and local governments, international organizations, NGOs, CBOs, etc. for contributing in the field of wetland management. However, the necessity of an updated wetland policy after federalism programs and budget was well reflected in his speech. Moreover, he also said that the lack of scientific knowledge, inter-agency cooperation and coordination insufficiency contributing in ineffective ecosystem restoration and conservation of wetland biodiversity and its resources. At the end, he highlighted the objectives and the intentions of the workshop i.e. to bring diverse knowledge, experiences, best practices, lessons learned, and innovative ideas for wetland conservation and management in a holistic approach and to identify research gaps and general issues and assist in raising awareness for sustainable wetland conservation and management. He clearly spoke about the equal importance of developing a common understanding of wetland management in different management modalities among different stakeholders. Finally, he stated that the workshop will serve as a good platform to foster cooperation, coordination, and collaboration among all the stakeholders.

## Dr. Ghanashyam Gurung, Country Representative, WWF Nepal

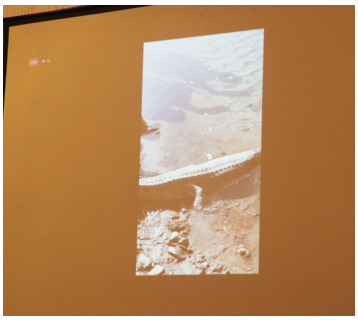
He started with the significance of water as an irreplaceable natural resource, emphasizing that it cannot be artificially created, only transformed through natural processes. He noted that the water we use today is the same that existed during the era of dinosaurs. Despite its crucial role in human life from birth to death, water remains one of the most polluted resources, extensively exploited and contaminated from the Himalayas to the Bay of Bengal. He urged government bodies to take action against the direct dumping of sewage and waste into rivers. While restrictions can be placed on activities within protected areas to conserve wildlife, he emphasized that polluted water continues to endanger the health of these ecosystems. He highlighted that the sustainability of all resources is tied to the quality of water. He also pointed out that the five "Jas" of watersheds—Jal (water), Jamin (land), Jungle (forest), Jadibuti (herbs), and Janawar (animals)—are interconnected and cannot be managed separately.

He requested the MoFE to review and speed up the process of enlisting other potential wetlands of Nepal in the Ramsar list. He also stressed that it is necessary to jointly manage and strengthen the existing institutions for wetland conservation. He pointed out that where there is water, there is potential for the tourism industry, but unfortunately the water bodies in Nepal are polluted. Hence, they should be properly managed so that we can take advantage of their aesthetic and recreational value as well. He emphasized the necessity of implementing the Integrated River Basin Management Strategy 2023 which has been recently approved by the MoFE with the coordination and collaboration of all the three tiers of the government as well as other development partners and civil society to manage wetland and its resources. He noted that development partners should play a role in allocating resources, providing technical support, and bringing all stakeholders together for discussion and consultation.

He concluded by stating that while development is necessary, it is crucial to consider the wise use of resources in development projects. He emphasized that investment in conservation should not be avoided, as depleted resources will eliminate future tourism opportunities. He also stressed the need for strict regulation of the direct discharge of industrial, household, and other waste into water bodies.

## Live video presentation of Gharial release program

10 gharials raised in the Gharial Breeding Centre, Kasara were released in the West Rapti River. Gharials (*Gavialis gangeticus*) are one of the protected reptiles in Nepal under Schedule I of NPWC Act 1973. They are enlisted as vulnerable in the CITES list and as a Critically Endangered species in the IUCN Red list. The population of gharials in Nepal's natural habitat currently stands at only 198 individuals. Therefore, to support their conservation, breeding programs are conducted in Chitwan National Park and Bardia National Park, with periodic releases of gharials into the wild to bolster their population.



The program was followed by launching three books that were published by the DNPWC in the current fiscal year: Blackbuck Conservation Action Plan (2023-2027); National Wildlife Health Action Plan (2023-2032) and Population assessment of SPNP's snow leopard and its prey.

The inauguration session was continued.

## Dr. Maheshwar Dhakal, Joint Secretary, MoFE

He started with his opinion on the decision to discontinue the NLCDC. According to him, it was the sole institution that works in the research and documentation as well as management of all the lakes in Nepal and hence should be continued. He said that Nepal being a landlocked country, has only two sources of water: snow melting from the Himalayas and precipitation. He emphasized that in a country with steep mountainous terrain if water is not managed sustainably, we might have to face a war, not just conflict due to water stress in Nepal.

He stressed on the importance of wetland by stating that more than 40% of wildlife are completely dependent on wetland resources. Additionally, all living species utilize wetlands for various ecosystem services, including provisioning, regulating, supporting, and cultural functions. In the case of Nepal, the role of wetlands in providing regulating services is highest in the world. He explained that the water cycle, which supplies water to wetlands, is essential for recharging the country's spring sources, making it crucial for sustaining water supplies. He warned that poor wetland management could lead to the depletion of these essential water sources, making life unsustainable. Additionally, he emphasized that wetlands serve a variety of purposes, including drinking water, household uses, irrigation, and clean energy through hydropower. He also pointed out the crucial role wetlands play in the tourism sector, with many regions experiencing a tourism boost due to their presence.

Therefore, he emphasized that all three tiers of the government, the private sector, the civil society, and the general people must work together to conserve the wetlands for sustainable resource use and climate change adaptation. He mentioned that existing provisions for wetland conservation are found in the NPWC Act 1973, Forest Act 2019, and NRSAP 2016-2024. However, he noted the need for a new strategy as the current one is nearing its conclusion. He also clarified that, given the abundance of existing policies, creating additional ones is unnecessary.

He highlighted that Phewa tal has been declared as a protected watershed and Kulekhani is set to follow. He stressed the need to declare additional watersheds as protected. He called on the Central government to facilitate the local government to raise awareness, capacity building and allocate resources for wetland conservation. He pointed out that many ponds constructed for soil and water conservation are cemented, which impedes water recharge. He advocated for replacing cement with earthen ponds, a nature-based solution that supports water recharge. He also emphasized the need for institutional strengthening, policy formation, coordination, and collaboration between three tiers of the government, public participation, youth mobilization, and research and study to conserve wetland resources.

He concluded by saying that though there is no sea in Nepal, but the country is very rich in water resources and wetland is an important infrastructure for building climate resilience and a medium for biodiversity conservation. He emphasized that wetland can be an entry point for the Green Growth Strategy adopted by the Government.

## Krishna Pd. Oli, Chairperson, NTNC

He started his speech by focusing on the importance of wetlands in human life. He said that human life is formed by five elements: earth, water, air, fire, and Space (Panchamahabhutas) and Hindus pray these elements before conducting any ritual rites. He noted that water is formed in the atmosphere and a study on atmospheric seawater states that 15% of the water falling on the earth's surface used to be directly converted to snow and glacial lakes. However, due to global warming, much of that water now falls as rain. He criticized developed nations for diverting funds, originally pledged to combat climate change, toward weapon development. As a result, he stressed that the likelihood of receiving international funding for conservation efforts is slim, urging the need for self-reliance in conserving and managing Nepal's resources.

He stressed on the significance of water as it is important since the formation of sperm to residing in the mother's womb and after birth for the rest of the life. He remarked that words cannot fully capture the significance of water and wetlands, referring to wetlands as the "kidneys of nature." Traditionally, people used to do all their daily activities like bathing, cleaning, washing and other household chores around the river and the river used to assimilate on its own but now the pollution has increased beyond the assimilation capacity of the river. He also highlighted the religious significance of water, using Shree Shwosthani puja and Chatta puja as examples of rituals that are impossible without it. Additionally, he underscored the importance of wetlands as rich sources of biodiversity.

He pointed out the importance of dam formation in the Bagmati River by stating its significance to flush away the wastes of the Bagmati River time and again and to supply water to the Kathmandu valley in case of need. He stressed that the future of wetland conservation:" Management of too much water and too little water."

He recalled research done by ICIMOD with the involvement of around 150 scientists which has estimated that a further rise in 1.5-degree Celsius global temperature will result in the decline of the 1/3rd of the Himalayan. He urged the government of Nepal to allocate major investment to reduce run off by conserving soil and water resources, warning that without such efforts, future water-dependent projects would be at risk. He also insisted that the future of available water in Nepal depends on the spring water than on river water from melting snow. Hence, he stressed that there is an urgency to conserve soil and water resources to increase percolation and thereby ensure spring water, a critical issue that has been largely overlooked, even by the government. Also, he highlighted the significance of Nepal's peatland in carbon sequestration.

He brought the attention of all the participants back to the importance of the dam project by saying that the future of major hydropower projects depends on the construction of dam. He referenced a global review of many dams and reservoirs, which demonstrates that 20% - 50% of total floods have been circumvented by dam construction. Hence, he expressed that the future of water management in Nepal lies in dam construction.

He said that though there are many wetlands in Nepal, their state is very critical. Many are facing the problem of eutrophication. Another major issue is alien invasive species. He mentioned that Phewa Lake in Pokhara faces the problem of massive increase in water hyacinth suggesting that this could be controlled by converting the plant to biogas.

According to him, the Government allocates a very insignificant amount for wetland conservation despite it being a very important

ecosystem required for many kinds of agricultural production. He emphasized that it is necessary to formulate laws and regulations to implement the Ramsar convention and strengthen the existing institutions for wetland conservation. He also highlighted pollution as a major environmental issue in Nepal, yet with very insignificant research on it. Citing a study by the Nepal Planning Commission (NPC) on the atmospheric carbon intensity in the Himalayas of Nepal conducted in eastern Nepal (Itahari, Sunsari, and Hile, Bhojpur) he mentioned that the pollution levels at 1 km altitude were recorded at 250-300 ppm, which is not excessively high. He added that Nepal's contribution to global greenhouse gas emissions is nearly negligible.

He appreciated that the practice of Integrated watershed management by the ministry is the key to manage any resources like forest, agriculture, wildlife, etc. He stated that there is no future without watershed management, however, stressed that it should be linked to PES. He argued that Nepal should be able to claim PES from the Government of India as all the available water in India has been contributed by the Himalayas of Nepal. 65%of the water of the river Ganges has originated from Nepal. He urged the GoN should diplomatically approach the GoI to encourage our farmers who are managing the watershed in Nepal, thereby contributing to river water in India.

He pointed out that the lack of coordination and collaboration in federal structure of the government should be addressed by the central government. He also urged the government to simplify the complex mechanisms for utilizing funds and loans within the national budget system, making them more flexible for conservation activities.

He warned that a lack of available water is inevitable in the future. As long as the sea exists, rising water temperatures will lead to more evaporation, with precipitation eventually bringing that water back to land. Therefore, he stressed the need to conserve water on land through integrated watershed management.

He concluded by stating that locals are self-aware of water conservation. He acknowledged our ancestors were far-sighted than us, having constructed ponds in Hills as well as in plains for water recharge to utilize during dry seasons. So, he emphasized that rather than teaching the locals, we should learn from their traditional practices. He stressed that wetland conservation and augmentation are possible only by integrating the traditional practices with scientific knowledge.

## Dr. Birendra Prasad Mahato, Minister, MoFE

He started with welcome remarks. He said that the conservation of wetland and its resources in future is not just a national issue but a global one. He criticized the traditional practice of dumping urban household waste directly into rivers, which leads to pollution and a decline in river quality due to unmanaged development. This, in turn, reduces water availability and increases water stress. He pointed out that wetland conservation is not possible by organizing a one-day workshop in a year and raising a revolutionary voice for a day but rather by focusing on meaningful policy input and its effective implementation.

He also said that the decision to discontinue NLCDC was made by those who used to advocate for its necessity in the past. He stressed that the inability to spend grant amounts for development work due to administrative, institutional, and policy constraints is a major issue in the context of Nepal. He also pointed out that conservation activities in the Chure region are centered on political interest rather than the actual needs of the vulnerable site. He suggested that it is necessary to work on a holistic and integrated approach for conservation that can be demonstrated for decades rather than conducting small activities in scattered areas.

He expressed that our laws and acts are 2 decades old, yet conservation activities are planned for the next two decades. He stressed the importance of aligning current activities with enabling policies and legislation. According to him, our major issue is policy-related; if we are unable to amend our laws based on the changing global scenario, we won't be able to meet the conservation needs.

He expressed his concern that the conclusion of the workshop will be documented properly and materialized into action, unlike many other research study and reports which are stored but not used. He also insisted that personal attitudes and thoughts need to be kept aside while implementing acts and policies as they are necessary during the formulation of laws but should not influence their execution.

He concluded by stating that Nepal has already met its target of total forest area (44.74%) and total protected area (23.23%), and the focus should now shift to their sustainable conservation. He emphasized that it is the ethical responsibility of all human beings to conserve nature and its resources. He urged the local community, enterprises, and businesses to realize their duty to conserve natural resources as they are gaining both direct and indirect benefits from nature. He reminded everyone that nature provides us with food, shelter, clothing, air, water, and everything we need and use in day-to-day life from nature, making us all accountable for its conservation.

## Mr. Shiva Kumar Wagle, DG, DoFSC

He began with welcome remarks, emphasizing the essential role of water in sustaining life. He pointed out that freshwater, specifically from wetlands, is the only source of drinking water, as seawater is not potable. Hence, the more we can hold the freshwater on land the more water is available to drink. He explained that runoff water will ultimately get mixed with the sea but if it is percolated in the land, we can extract it whenever necessary. Hence, the workshop, he noted will mainly focus on the ways for water retention on or in the land surface as long as possible, drawing on insights from various experts. He stressed that the major objective of the workshop is to assist in policy and plan input for the conservation of freshwater ecosystems. He expressed his gratitude towards all the honorary and dignitaries of the workshop for their kind suggestions and recommendations.

## III. Keynote Presentation

**Dr. Sindhu Prasad Dhungana, DG of DNPWC** started by welcoming all the dignitaries and the participants. He stated that there are two types of aquatic ecosystems: marine and wetland ecosystems. Wetlands are ecosystems, in which water is the primary factor controlling the environment and the associated plant and animal life. Although they cover only around 6 percent of the Earth's land surface, 40 percent of all plant and animal species live or breed in wetlands. He noted that over a billion people across the world depend on wetlands for their livelihoods which is about one in eight people on Earth.

He described the significance of wetlands as a biodiversity hotspot. Wetland acts as a natural filter that purifies water and controls floods. It is also essential in climate regulation by sequestering carbon and influencing local and global climate patterns. It provides provisioning, regulating, cultural, and supporting services. There are around 5358 lakes (2323 glacial lakes, more than 2700 ox-bow lakes, 480 tectonic lakes), 6000 rivers, 2300 ponds, and 10 reservoirs (manmade lakes) in Nepal. Around 5 % of land in Nepal is occupied by wetlands.

The Ramsar Convention is the main global commitment to conserve wetlands and its resources. It was held in Ramsar Iran on February 2, 1971. It is a globally recognized treaty emphasizing the importance of wetlands; and encourages wise use and conservation. Similarly, CBD 1992 which aims to conserve biological diversity, including wetland ecosystems; provides a framework for the sustainable management of wetlands and their resources. Nepal has signed many global environmental agreements such as CITES 1975, UNESCO 1975, ITTO 1986, UNFCCC 1992, SDGs (2015-2030), etc.

Wetland conservation contributes to achieve most of the SDGs. It is specifically linked to Goal 6 (Clean water and sanitation); Goal 13 (Climate Action); Goal 14 (Life below water) and Goal 15 (Life on land). These Goals are directly linked to wetland conservation; and interconnectivity with other SDGs is essential to achieve holistic sustainable development.

Nepal demonstrated its commitment to wetland conservation by signing the Ramsar Convention on December 17, 1987, and by designating Koshi Tappu wetland in the Ramsar list in 1987. Since then, the Government of Nepal has enlisted other nine wetlands in the Ramsar list in different years and has also identified other potential wetlands as well. The GoN has successfully enlisted Pokhara Lake clusters in the Ramsar list as the 10th wetland of Nepal in 2016. These wetlands broadly represent high-altitude, mid-hills, and lowland Terai wetlands.

The Constitution of Nepal (2015) has prioritized the conservation of natural resources. Policies of Nepal that have focused on wetland conservation are Wetland Policy 2012, National Forest Policy 2019, National Climate Change Policy 2019, and National Environment Policy 2019. Similarly, other legal provisions relating to wetland conservation are the Forest Act 2019, Environment Conservation Act 2019, Water Resource Act 1992, Electricity Act 1992, NPWC Act 1973, etc.

At the institutional level, the country has various institutional frameworks at local, provincial, and federal levels to conserve wetlands and its resources. The Constitution of Nepal has enlisted wetland conservation as the sole responsibility of the central government. Further, wetlands of international importance have to be managed by the central government as they are under the international treaty; whereas management responsibility of the remaining all other wetlands lies to all the

three tiers of government. The role of the local government is even more significant as they are residing in the vicinity of the wetlands.

There are various approaches for the conservation and wise use of wetlands in Nepal. An integrated watershed management approach is one of the best ways to conserve wetland ecosystems along with other resources like forest, land, wildlife, etc. in an integrated way to achieve the objectives of the SDGs. Similarly, the Integrated Water Resource Management Approach, Integrated Lake Basin Management Approach, and Cooperative Management of Lakes have also been adopted in Nepal by various institutions. The concept of Payment for Ecosystem Services is emerging but not practiced in the case of wetland conservation in Nepal.

There are many best practices of wetland management in Nepal which include Community-Led Conservation Initiatives, Sustainable Livelihood Programs, designating key wetlands as protected areas, Implementing holistic water resource management strategies, Construction of artificial wetlands, etc.

He outlined various challenges in wetland management. One of the major challenges is habitat degradation and land use land cover change. Additional challenges include encroachment of wetlands for agriculture and settlement; pollution and decrease in the water quality due to direct disposal of industrial and household wastes in the water bodies; unmanaged development; invasive species such as water hyacinth causing drying up of wetlands; climate change impacts; lack of public awareness and insufficient legal framework for direct management of all the wetlands of Nepal. Another main issue in managing wetlands is the lack of coordination and collaboration among institutions, as wetland management is a cross-cutting sector.

He emphasized the need to move towards holistic ecosystem management that considers the interconnectedness of wetlands with surrounding landscapes. He called for developing and implementing climate-responsive strategies that enhance wetland resilience. He advocated for the use of innovative technologies for effective monitoring and surveillance of wetland health and integrating data analytics and remote sensing to inform decision-making and conservation strategies. Community centric approach with a focus on empowerment, education, and sustainable livelihoods, was also highlighted, along with the need for enhancing collaborative governance structures that actively involve local communities in decision-making processes. He stressed the importance of prioritizing habitat restoration initiatives for biodiversity conservation. He also called for conducting targeted public awareness campaigns and advocacy to highlight the importance of wetlands as well as strengthening international collaboration and fostering coordination with neighboring countries for transboundary wetland conservation. Last but not least he emphasized the need to ensure sustainable funding mechanisms not just from international sources but also by encouraging the public and private sector in wetland conservation and management.

# Wetland Policies, Institutions and Practices in Nepal

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*Collaboration,*
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*Wetland.*

**ABSTRACT**

Wetlands provide vital ecosystem services such as water purification, flood control, and provide habitats for numerous species. These wetlands, however, face significant threats from climate change, pollution, invasive species, and unsustainable land use practices. To combat these challenges, Nepal has actively engaged in several Multilateral Environmental Agreements (MEAs), including the Ramsar Convention, the Convention on Biological Diversity (CBD), and the United Nations Framework Convention on Climate Change (UNFCCC). These international commitments are supported by comprehensive national policies like the National Wetland Policy and the National Ramsar Strategy and Action Plan, which provide a strategic framework for wetland conservation efforts.

Institutional frameworks are critical in driving these conservation initiatives, with the Ministry of Forests and Environment (MoFE), Department of National Parks and Wildlife Conservation (DNPWC), and the Department of Forests and Soil Conservation (DoFSC) playing pivotal roles across federal, provincial, and local levels. MoFE is the central authority to form policies and acts that are directly or indirectly related to wetland conservation and management in Nepal. DNPWC manages and protects the wetlands within the protected areas and Ramsar sites while the DoFSC has the authority to conserve all the wetlands outside protected areas including Ramsar sites. Besides that, this paper highlights the best practices in wetland management including community-led conservation initiatives, sustainable livelihood programs, protected area designations, integrated water resource management, and biodiversity monitoring and research, and also gives insights into the future directions for Nepal's wetland conservation efforts such as adopting holistic ecosystem management approaches, enhancing climate resilience, leveraging innovative technologies, and strengthening international collaboration. By focusing on these areas, Nepal aims to ensure the sustainable management and preservation of its vital wetland ecosystems, contributing to global biodiversity conservation goals and supporting local communities.

## Background

Wetlands are among the most essential ecosystems in the world. The global area of inland and coastal wetlands is estimated to be over 12.1 million km², making it larger than Canada of which, 93% are inland, while the remaining 7% are marine and coastal (Ramsar Convention on Wetlands, 2018). The largest portions of these wetlands are found in Asia (32%), North America (27%), and Latin America and the Caribbean (16%). In contrast, Europe (13%), Africa (10%), and Oceania (3%) have smaller wetland areas (Davidson et al., 2018). There are currently more than 2,300 Ramsar Sites, which cover nearly 2.5 million km² - an area

bigger than Greenland. These sites represent about 13-18% of the world's inland and coastal wetlands, showing the strong commitment of the Ramsar Convention's Contracting Parties (Davidson & Finlayson, 2018). Wetlands play a crucial role in climate regulation, biodiversity preservation, hydrological processes, and human health (Ramsar Convention Bureau, 2001). Wetlands impact both global and local/regional climates by releasing potential or near-potential evapotranspiration into the atmosphere and by absorbing carbon dioxide while emitting methane (Russi et al., 2013). Although freshwater wetlands constitute only 1% of the Earth's surface, they are home to over 40% of the world's species, highlighting their significance for biodiversity (Mitra et al., 2003). Hydrologically, wetlands are vital as they replenish groundwater, regulate water flow, and purify water, playing key roles in the water cycle (MEA, 2005). In terms of human health, wetlands provide traditional medicines relied upon by 80% of the global population for primary healthcare (Mitra et al., 2003).

In Nepal, wetlands cover approximately 5% of the country's total land area, encompassing a diverse range of habitats, including rivers, lakes, marshes, ponds, paddy fields, and reservoirs (MoFE, 2018). The country boasts around 6,000 rivers and streams, which are crucial for irrigation, hydropower, and biodiversity (MoFE, 2018). Nepal's lakes, such as Rara, Phewa, and Gokyo, are significant for tourism, fisheries, and local livelihoods. The marshes and swamps, primarily found in the Terai region, play essential roles in flood control, groundwater recharge, and supporting biodiversity. Additionally, agricultural wetlands, particularly paddy fields, are vital for rice cultivation, contributing significantly to the nation's food security (Dixon et al., 2016).

Nepal's commitment to wetland conservation is evident in its journey as a signatory to the Ramsar Convention since 1988. This international treaty aims to promote the conservation and wise use of wetlands through local, national, and international cooperation. Since joining the convention, Nepal has designated 10 Ramsar sites, reflecting its diverse ecological zones from the lowland Terai to the high Himalayas (MoFE, 2018). These Ramsar sites include the Koshi Tappu Wildlife Reserve, known for its floodplain ecosystem and diverse bird species; Beeshazar and Associated Lakes, crucial for biodiversity and groundwater recharge; Ghodaghodi Lake Area, a cluster of oxbow lakes supporting rich biodiversity; and Jagadishpur Reservoir, an artificial wetland important for irrigation and birdlife. Other notable sites are Rara Lake, the largest lake in Nepal; Gosaikunda and Associated Lakes, high-altitude lakes with cultural and ecological significance; Phoksundo Lake, known for its clear waters and unique biodiversity; Gokyo and Associated Lakes, glacial lakes vital for water resources and tourism; Mai Pokhari, a pilgrimage site with rich biodiversity; and the Lake Cluster of Pokhara Valley, which includes Phewa, Begnas, and Rupa lakes, crucial for biodiversity and local economy (Finlayson & Davidson, 2018). In addition to these Ramsar-listed wetlands, Nepal hosts several other important wetlands that play crucial ecological roles. For example, Taudaha Lake near Kathmandu is a small but significant wetland that supports various species of fish and migratory birds. Barun Valley, part of the Makalu Barun National Park, contains wetlands that are vital for high-altitude biodiversity. These wetlands, though not internationally recognized, are crucial for local ecosystems, providing habitat, supporting agriculture, and maintaining biodiversity. Conservation efforts for these wetlands are essential to ensure the sustainability of Nepal's diverse and rich natural heritage.

However, many of these wetlands are facing degradation due to pollution, encroachment, and unsustainable practices. The degradation of wetland ecosystems poses severe consequences on both a global and national scale. Globally, wetlands are under threat from urbanization, agriculture, pollution, climate change, and invasive species. The Wetland Extent Trend Index (WET Index) estimates that the average annual rate of natural wetland loss is -0.78% per year, which is more than three times the rate of

natural forest loss (-0.24% per year) between 1990 and 2015 (FAO, 2016). Meanwhile, human-made wetlands, primarily rice paddies and reservoirs, nearly doubled during this period, now constituting 12% of all wetlands. However, this increase has not offset the loss of natural wetlands (Ramsar Convention on Wetlands, 2018). The conversion of wetlands for agricultural and urban development is the leading cause of wetland loss, resulting in habitat destruction and reduced biodiversity (Dixon et al., 2016). Pollution from industrial, agricultural, and domestic sources severely impacts water quality and ecosystem health. Climate change exacerbates these threats by altering precipitation patterns, increasing temperatures, and causing sea-level rise, which further degrades wetland ecosystems (Junk et al., 2013). Approximately 35% of the wetlands were lost between 1970 and 2015 across the globe and the rate of loss has even accelerated annually since 2000 (Ramsar Convention on Wetlands, 2018). Furthermore, the wetlands in the Hindu Kush-Himalayan region are steadily declining and undergoing degradation with substantial impacts on ecosystem services, biodiversity, and the livelihoods of people. Nepal is not an exception; the National Biodiversity Strategy and Action Plan (2014-2020) reported that around 5.41% of the total wetland has been converted to cropland over the years (MoFE, 2014). In Nepal, wetland degradation has profound implications, leading to biodiversity loss, water scarcity, increased flooding, and economic impacts. Degraded wetlands fail to provide essential ecosystem services, such as water purification, flood control, and carbon sequestration, making communities more vulnerable to natural disasters and climate change impacts (MoFE, 2018). The economic costs associated with wetland loss include increased expenses for water treatment, flood damage repair, and loss of income from tourism and fisheries.

To combat these issues, Nepal has adopted a range of national and international policies, including adherence to the Ramsar Convention and implementing local conservation initiatives. Nepal has made significant efforts to conserve its wetlands through policies, community involvement as well as through international cooperation. As a signatory to the Ramsar Convention, Nepal is committed to the conservation and sustainable use of wetlands. Additionally, community-based management approaches have proven effective, with local communities actively involved in sustainable resource use and biodiversity conservation. However, there are various inadequacies in sustainable wetland management in Nepal that need to be addressed through proper policies, institutions, and programmatic interventions. The subsequent sections in this paper will discuss the global framework, national policy and institutional framework, success stories, issues and challenges, and the way forward regarding wetland conservation in Nepal

## Global Framework

Nepal's commitment to Multilateral Environmental Agreements (MEAs) is indeed commendable, particularly in the context of protecting its crucial wetlands. These MEAs provide essential frameworks that facilitate international cooperation, harmonize policies across borders, and effectively mobilize resources. By actively participating in these agreements, Nepal demonstrates its dedication not only to preserving its own wetlands but also to contributing to global initiatives aimed at sustaining ecological health and promoting sustainable development goals. This commitment underscores Nepal's understanding of the interconnected nature of environmental issues and its willingness to collaborate internationally to safeguard ecosystems' long-term health and resilience worldwide.

The Ramsar Convention, 1971 officially known as the Convention on Wetlands of International Importance, especially as Waterfowl Habitat, is an international treaty aimed at the conservation and sustainable use of wetlands recognizing their ecological importance and fostering international cooperation for conservation. Nepal became a contracting party to the Ramsar Convention in 1987 and has enlisted 10 of its wetlands

in the Ramsar lists and is conserving and managing them based on NRSAP. Similarly, CBD (Convention on Biological Diversity) is an another international treaty established in 1992 with the aim of conserving biodiversity, promoting its sustainable use, and ensuring fair and equitable sharing of benefits arising from genetic resources. Nepal ratified the CBD on February 19, 1993, and has developed its NBSAP, which outlines strategies and actions for biodiversity conservation and sustainable development. Nepal has established a network of protected areas, including national parks, wildlife reserves, and conservation areas, to conserve biodiversity and provide habitats for endangered species.

Besides these, Nepal has been party to other various MEAs, some of which are enlisted in Table 1. The table also explores MEAs focusing on wetlands, their roles, current status, major achievements, and Nepal's specific efforts within these frameworks.

**Table 1. Global Framework on Wetland Conservation**

| MEA | Year Established | Roles/Goals | Current Status & Major Achievements | Nepal's Efforts & Contributions |
|---|---|---|---|---|
| Ramsar Convention | 1971 | - Halt wetland loss and promote sustainable use | - 172 parties, 2,400+ Ramsar Sites, 250+ million hectares covered | - Signatory since 1988, 10 Ramsar Sites designated, guided by National Wetlands Policy and Strategy |
| Convention on Biological Diversity (CBD) | 1993 | - Conserve biological diversity, promote sustainable use, fair benefit sharing | - 196 parties, Aichi Biodiversity Targets achieved significant conservation actions | - Aligned policies with CBD, implemented projects for wetland biodiversity protection and restoration |
| Aichi Biodiversity Targets | 2011-2020 | - Set 20 goals to address biodiversity loss | - Expanded protected areas, integrated biodiversity into national/local planning | - Expanded protected areas including Ramsar Sites, integrated biodiversity into national policies |
| UN Framework Convention on Climate Change (UNFCCC) | 1992 | - Address climate change through emission reductions and resilience | - 197 parties, Kyoto Protocol and Paris Agreement, Clean Development Management (CDM) benefited wetland conservation | - (Nationally Determined Contribution) NDCs include commitments for wetland restoration and conservation |
| Sustainable Development Goals (SDGs) | 2015 | - Comprehensive sustainable development framework | - Global mobilization towards sustainable targets, integrated into national development plans | - Incorporated SDG targets into national policies, focusing on water management, climate action, biodiversity |
| Sendai Framework for Disaster Risk Reduction | 2015 | - Enhance disaster risk reduction through ecosystem management | - Promoted ecosystem-based disaster risk reduction, enhanced capacities for sustainable risk management | - Integrated into national strategies, using wetlands to mitigate flood risks and enhance resilience |
| UNESCO World Heritage Sites | 1972 | - Identify and protect sites of outstanding universal value, including wetlands | - 1,100+ sites globally recognized for ecological importance, enhanced protection and international support | - Chitwan and Sagarmatha National Parks recognized, benefiting from enhanced protection and support |

In this way, MEAs are indeed indispensable in the global effort to conserve wetlands, providing essential frameworks for international cooperation, resource mobilization, and policy harmonization across borders. These agreements have played a crucial role in achieving significant milestones such as expanding protected areas, integrating biodiversity targets into national policies, and promoting ecosystem-based approaches to disaster risk reduction. Such achievements underscore the pivotal role of MEAs in addressing complex environmental challenges on a global scale. Nepal's proactive engagement and unwavering commitment to MEAs serve as a commendable example, particularly in the conservation of its vital wetland ecosystems. By actively participating in these agreements, Nepal not only ensures the protection of its own wetlands but also contributes significantly to global conservation endeavors. This commitment reflects Nepal's recognition of the critical role that wetlands play in preserving biodiversity, supporting local livelihoods, and providing essential ecosystem services. Through sustained collaboration and the effective implementation of MEA frameworks, the international community can further enhance efforts toward the sustainable management and protection of wetlands worldwide. This collective action is crucial for maintaining the resilience and productivity of wetland ecosystems for future generations, thereby advancing global environmental sustainability and safeguarding biodiversity. Nepal's proactive stance in MEAs serves as an inspiring model of environmental stewardship, emphasizing the shared responsibility to conserve natural resources for the benefit of current and future generations globally.

## National Policy Framework

Nepal's proactive approach to implementing national-level policies and plans for wetland conservation and sustainable management reflects its commitment to environmental stewardship and biodiversity preservation. These initiatives are strategically designed to achieve a wide range of environmental goals while ensuring effective management of natural resources. NRSAP basically address the specific conservation needs of Nepal's diverse wetland ecosystems and include habitat restoration projects, efforts to control invasive species, and measures to improve water quality. SWC Act involves promoting sustainable practices in watershed management, and encouraging environmentally friendly techniques. NPWC Act includes safeguarding endangered species, preserving unique habitats, and ensuring the overall ecological health and functionality of wetland environments. Beside this, there are various national policy, acts, and regulations which (enlisted in Table 2) guide the conservation and management approach of wetlands in Nepal. By implementing these comprehensive policies and plans, Nepal not only protects its valuable wetland ecosystems but also promotes sustainable development practices that benefit both natural environments and local communities.

**Table 2: National Policy Framework**

| Policy/Act | Year | Roles/Goals | Major Achievements |
|---|---|---|---|
| National Wetland Policy | 2012 | - Conservation and sustainable management of wetlands | - Increased awareness and participation in wetland management |
| National Forest Policy | 2018 | - Aims for tourism development through wetland management<br>- Conservation of land and water through Integrated watershed management | - Promotion of community-based wetland management<br>- Implementation of soil conservation and watershed management |
| | | - Prevention and control of pollution and invasive species | - Development of comprehensive wetland inventories and improved management practices |

| Policy/Act | Year | Roles/Goals | Major Achievements |
|---|---|---|---|
| National Parks and Wildlife Conservation (NPWC) Act | 1973 | - Protection of national parks, wildlife reserves, and conservation areas | - Conservation of endangered species and their habitats |
| | | - Strengthened enforcement against poaching and illegal activities | |
| Soil and Watershed Conservation (SWC) Act | 1982 | - Conservation of soil and water resources | - Maintained ecological integrity of wetlands |
| | | - Prevention of siltation and erosion | - Supported watershed management practices ensuring sustainability |
| Local Government Operation Act | 2017 | - Decentralized management of natural resources | - Improved coordination between national and local levels |
| | | - Greater involvement of local communities | - More effective conservation and sustainable use of wetland resources |
| Forest Act | 2019 | - Sustainable forest management | - Effective conservation and sustainable use of wetland resources within forested regions |
| | | - Community forestry and biodiversity protection | |
| Environmental Protection Act | 2019 | - Safeguard the environment, including wetlands, from pollution and degradation | - Enhanced regulatory framework for environmental impact assessments (EIA) |
| | | | - Strengthened pollution control measures |
| National Ramsar Strategy and Action Plan (NRSAP) | 2020-2024 | - Conservation and sustainable management of Ramsar sites and other important wetlands | - Effective management of Ramsar sites |
| | | - Raising public awareness about wetland conservation | - Increased international cooperation and enhanced funding for wetland conservation projects |
| Nepal Biodiversity Strategy and Action Plan | 2014-2020 | - Conservation of biodiversity, including wetland ecosystems | - Promoted research and monitoring of wetland biodiversity |
| | | - Sustainable use of biological resources | - Contributed to the protection and sustainable management of wetland ecosystems |
| National Adaptation Plan | 2021-2050 | - building a climate-resilient society and reducing the risk of climate change on people and ecosystems<br>- One Community-managed Forest-One Wetland<br>- Wetlands Development and Conservation along the Chure | - Climate resilient strategies adopted in all sectors<br>-Promotion of community based wetland conservation and restoration program |
| Forest Regulation | 2022 | - Detailed guidelines for implementation of the Forest Act | - Enhanced sustainable management of forest and wetland resources |
| | | - Community participation | - More effective protection and sustainable use of these ecosystems |
| National River Basin Management Strategy | 2024 | - Ensure environmental services through sustainable management of watershed resources and wetlands | - Initiation for integrated land use planning<br>- Wetland inventory and management |

Overall, Nepal has made substantial progress through its comprehensive policies and plans aimed at wetland conservation and sustainable management. These efforts have yielded significant achievements that contribute to the overall preservation and enhancement of these crucial ecosystems. Nepal has strengthened its legal and regulatory frameworks concerning wetland conservation and has implemented enhanced conservation practices tailored to the specific needs of its wetland ecosystems such as habitat restoration projects, control of invasive species, improvement of water quality, and adoption of ecosystem-based management approaches. Conservation efforts in Nepal have directly contributed to the protection and enhancement of biodiversity within wetlands. There has been notable engagement and participation from local communities in wetland conservation initiatives. Nepal's commitment to environmental conservation and sustainable development is evident through these achievements.

## Institutional Framework

In Nepal, wetland conservation is a complex and multi-faceted effort involving coordination among numerous institutions across the federal, provincial, and local levels of government. The transition to a federal system with three tiers of government - federal (central), provincial, and local - has expanded the scope and scale of environmental governance, including wetland conservation. The federal system in Nepal has decentralized environmental governance, allowing for more localized and context-specific approaches to wetland conservation. While the transition has presented challenges in terms of coordination and capacity building, it has also created opportunities to strengthen environmental governance and enhance the resilience of Nepal's wetlands. Through sustained collaboration and commitment across all levels of government and with stakeholders, Nepal can achieve long-term conservation success and ensure the ecological integrity of its wetland ecosystems for future generations. A detailed overview of the key institutions involved in wetland conservation at each level in Nepal is given in Table 3.

**Table 3: Institutional Framework**

| Level | Organization Name | Function |
|---|---|---|
| Federal Governmental Bodies | Ministry of Forests and Environment (MoFE) | Formulates national policies and strategies for wetland conservation. Coordinates with international bodies like the Ramsar Convention. |
| | Department of National Parks and Wildlife Conservation (DNPWC) | Acts as Ramsar Administrative Authority in Nepal. Manages Ramsar Sites and protected areas, implements conservation programs. |
| | Department of Forests and Soil Conservation (DoFSC) | Focuses on watershed management, afforestation, and reforestation impacting wetland health. Manages wetlands outside Ramsar sites. Conducts wetland survey and inventory. |
| | Department of Environment (DoE) | Ensures compliance with environmental standards to protect wetlands from pollution. |
| | National Lake Conservation and Development Authority | Responsible for initiating, coordinating, and furthering in consultation with the State, federal and local governments concerned, and schemes for control, conservation, and utilization of wetlands and lakes throughout the country. |
| | Water and Energy Commission Secretariat (WECS) | Develops policies and plans for integrated water resource management integrating wetland conservation. |
| Local and Provincial Governmental Bodies | Provincial Ministry of Industry, Tourism, Forest and Environment | Develops provincial policies and plans for wetland conservation. Coordinates provincial-level initiatives. |
| | Provincial Forest Directorate | Manages provincial forest resources impacting wetland ecosystems. Implements conservation projects in provincial boundaries. |
| | Municipal Environment Divisions | Manages local environmental resources including wetlands. Conducts community-based conservation programs and awareness campaigns. |

| | | |
|---|---|---|
| Community based Organizations | Community Forest User Groups (CFUGs) | Manages community forests and associated wetlands, implements sustainable resource management practices. |
| | Buffer Zone User Groups and Management Committees | Manages protected areas and associated wetlands for sustainable conservation; monitors and reports illegal activities |
| | Local Conservation Committees | Focuses on protection and sustainable use of specific wetlands. Partners with NGOs for conservation projects and monitoring. |
| Conservation Partners | WWF Nepal | Provides technical expertise, funding, and support for wetland conservation projects. |
| | Bird Conservation Nepal (BCN) | Engages in conservation efforts and biodiversity monitoring in wetland areas. |
| | IUCN Nepal | Works on policy advocacy and conservation initiatives in wetland ecosystems. |
| | National Trust for Nature Conservation (NTNC)<br>Other Conservation Partners | Supports in conservation and management of ecosystem, including wetland; build local capacity for community mobilization; research, monitoring and documentation<br>Supports wetland conservation through research, capacity building, and community engagement. |
| Collaborative Institutions | Ramsar Network Nepal | Facilitates coordination among stakeholders for wetland conservation. Promotes knowledge sharing and capacity building. |
| | Academic and Research Institutions | Conducts research on wetland ecosystems, biodiversity, and conservation strategies. Provides data-driven insights for policy and management decisions. |
| | International Organizations and Donors | Organizations such as the United Nations Development Programme (UNDP), Global Environment Facility (GEF), and the Asian Development Bank (ADB) fund and support wetland conservation projects in Nepal. These projects often involve capacity building, community engagement, and the implementation of best practices for wetland management. |

In this way, Nepal's approach to wetland conservation involves a multi-tiered institutional framework that engages federal, provincial, and local levels of government. Each level has specific roles and responsibilities, and together they create a comprehensive system for managing and protecting wetland ecosystems. Despite this, there are inconsistencies in approaches and resource allocation for wetland conservation due to the lack of a national policy framework that clearly defines the roles of all the relevant stakeholders. There is also a lack of coordination among these institutions. Limited communication and information sharing between institutions have hindered collaborative decision-making and coherent efforts. Collaboration among these institutions, along with support from NGOs, academic bodies, and international organizations, is necessary to ensure that wetlands are conserved and sustainably managed for the benefit of biodiversity and local communities.

## Success Stories

Nepal has implemented several best practices in wetland management and conservation, focusing on community-led initiatives, sustainable livelihood programs, protected area designations, integrated water resource management, biodiversity monitoring and research, international collaboration and knowledge exchange, and awareness and education programs. These practices have significantly contributed to preserving the country's rich wetland ecosystems while enhancing the livelihoods of local communities. Here is an in-depth exploration of these best practices: Community-Led Conservation Initiatives:

Community involvement is at the heart of Nepal's wetland conservation efforts. The active participation of local communities in the management and protection of wetlands ensures sustainable conservation. For example, the Ghodaghodi Lake, a Ramsar

Site, benefits from the engagement of local communities organized into Community Forest User Groups (CFUGs). These groups monitor biodiversity, prevent illegal activities such as poaching, and implement sustainable practices like controlled fishing and harvesting of wetland resources. This grassroots involvement fosters a sense of ownership and responsibility, making conservation efforts more effective and sustainable. This approach not only protects biodiversity and ecosystem services but also empowers communities to benefit from and contribute to the sustainable management of their natural resources. Overall, the active participation of local communities through CFUGs at Ghodaghodi Lake demonstrates a successful model of community-based wetland conservation.

**Sustainable Livelihood Programs:**
Integrating wetland conservation with sustainable livelihood opportunities is a crucial strategy in Nepal, ensuring that local communities derive economic benefits while safeguarding natural resources. Ecotourism initiatives in areas like Beeshazar and Associated Lakes in Chitwan provide income through guided tours, bird watching, and homestay services. These activities not only generate revenue for the communities but also raise awareness about the importance of wetlands, thereby promoting conservation. Additionally, sustainable agriculture and fishery practices are promoted in wetland areas to reduce the environmental impact while supporting local economies. This integrated approach serves as a model for sustainable development, ensuring that wetlands remain resilient and productive for future generations while supporting local livelihoods in a changing climate and environmental landscape.

**Protected Area Designation:**
Designating wetlands as protected areas under national and international frameworks provides legal protection and helps manage these ecosystems more effectively. Nepal has several Ramsar Sites, which are recognized for their international importance. These designations ensure that conservation measures are enforced, and resources are allocated for the maintenance and restoration of these critical habitats. Protected areas also serve as refuges for numerous species, contributing to biodiversity conservation. This approach underscores Nepal's dedication to maintaining ecological integrity and promoting sustainable development in its wetland ecosystems.

**Integrated Water Resource Management:**
An integrated approach to manage water resources is essential for ensuring the health and sustainability of wetland ecosystems. The Rupa Lake Restoration and Fishery Cooperative in Pokhara exemplifies this practice by implementing watershed management techniques, such as reforestation to stabilize soil and improve infiltration, soil conservation to prevent erosion and runoff, and sustainable agricultural practices. These measures reduce sedimentation and pollution in the lake, improve water quality, and enhance the habitat for aquatic species. This holistic management approach ensures that the entire watershed is managed sustainably, benefiting both the wetlands and the communities that depend on them. By balancing conservation goals with economic benefits and community well-being, this model sets a precedent for achieving sustainable development outcomes worldwide.

**Biodiversity Monitoring and Research:**
Scientific research and regular monitoring are crucial for understanding the health of wetland ecosystems and guiding conservation efforts. Institutions like Tribhuvan University and the International Centre for Integrated Mountain Development (ICIMOD) conduct extensive research on wetland biodiversity, hydrology, and climate change impacts. Their findings provide critical insights into the state of wetland ecosystems, helping to inform policy decisions and conservation actions. Participatory monitoring, involving local communities, enhances data collection and empowers residents to take part in conservation actions. For instance, community members in Koshi Tappu Wildlife Reserve are trained to

monitor bird populations and water quality, providing valuable data for conservation planning. By leveraging scientific knowledge and community engagement, Nepal can effectively preserve its wetland biodiversity and ecosystem services for future generations.

**International Collaboration and Knowledge Exchange:**
Collaboration with international organizations and participation in global conservation initiatives enhance Nepal's wetland management practices. Partnerships with organizations like the Ramsar Convention, World Wildlife Fund (WWF), and Wetlands International facilitate knowledge exchange, capacity building, and funding for conservation projects. These collaborations bring in global expertise and innovative solutions that can be adapted to local contexts, improving the effectiveness of conservation efforts.

**Awareness and Education Programs:**
Raising awareness about the importance of wetlands and educating the public about conservation practices are key components of successful wetland management. Programs and campaigns conducted by NGOs, government agencies, and local communities aim to educate people about the ecological and economic benefits of wetlands. Environmental education is integrated into school curricula, and community outreach programs engage citizens in conservation activities. Awareness programs help build a culture of conservation and encourage sustainable practices.

## Issues and Challenges

Effective management of wetlands in Nepal is crucial for maintaining biodiversity, supporting livelihoods, and ensuring sustainable development and resilience against environmental risks. However, achieving these goals faces numerous challenges that need to be addressed comprehensively. These challenges encompass fragmented policies, institutional weaknesses, and varied practices that often struggle with implementation and coordination. Addressing the challenges facing wetland management in Nepal requires concerted efforts to strengthen policies, enhance institutional capacities, and promote inclusive and sustainable practices. By overcoming these hurdles, Nepal can better preserve its wetland biodiversity, support local livelihoods, and achieve sustainable development goals while mitigating environmental risks and ensuring resilience for future generations. Effective wetland management is not only crucial for Nepal's environmental health but also for its social and economic well-being, making it a priority for integrated and collaborative action moving forward.

Nepal adopted a federal system of government in 2015, and this shift requires the National Wetland Policy 2012 to be updated to align with the new governance structure, ensuring that it can serve as a guiding framework for provincial and local governments in managing wetlands effectively within their jurisdictions. There is a need to establish or designate institutions at provincial and local levels to effectively implement the wetland policy. An updated policy should integrate strategies to mitigate and adapt to climate change impacts, ensuring wetlands' resilience. It should incorporate mechanisms for financing wetland conservation and management efforts and should also emphasize the importance of local participation and collaboration among different stakeholders. Finally, the policy should focus on building the capacity of human resources at all levels (national, provincial, and local) to effectively deal with the complexities of wetland management.

The existing institutions like NLCDC (National Lake Conservation Development Committee) at the federal level and the Lake Development Authority in Gandaki Province serve crucial roles in wetland and lake management in Nepal. While centralizing expertise at the federal level (NLCDC) ensures national coherence, capacity building, and uniformity in policy implementation; provincial authorities like Gandaki's Lake Development Authority cater directly to local needs and context. Hence, evaluating

their necessity and potential replication or merging into other institutions should be duly considered to optimize resource utilization and improve effectiveness across all provinces, ultimately contributing to sustainable wetland and lake management nationwide.

The status and lack of a centralized and comprehensive national wetland database that catalogs all wetlands along with their ecological, hydrological, and socio-economic characteristics pose significant challenges to effective wetland management and conservation efforts. Information gaps exist regarding wetland types, distribution, threats, conservation status, and ecosystem services provided by various wetlands. Different agencies are maintaining separate databases and data from scientific research, monitoring programs, and local knowledge often remain disconnected.

The issues and challenges can be discussed under Policies issues, institutional issue and practice issues which are discussed in Table 4.

**Table 4: Issues and Challenges of Wetland Conservation in Nepal**

| Category | Issues and Challenges | Explanation |
|---|---|---|
| Wetland Policies Issues | Policy Amendment | National Wetland Policy 2012 is not in line with the federal structure of the nation. |
| | Policy Fragmentation | Lack of standards, guidelines and working procedures<br>Lack of integration between various environmental and sectoral policies |
| | Inadequate Implementation | Poor enforcement of existing wetland policies and regulations |
| | Limited Scope | Policies often fail to address all aspects of wetland conservation comprehensively |
| | Insufficient Updates | Outdated policies that do not reflect current ecological and socio-economic realities |
| Institutional Issues | Global cooperation and coordination | Lack of global financing, information sharing and technology transfer in the field of wetland conservation and management |
| | Coordination Gaps | Weak coordination among governmental agencies responsible for wetland management |
| | Resource Constraints | Limited financial and human resources dedicated to wetland conservation institutions |
| | Capacity Building | Insufficient training and capacity development for staff involved in wetland management |
| | Decentralization Challenges | Ineffective transfer of authority and resources to local governments |
| Issues in Practices | National Wetland Database | Lack a national level wetland database regarding condition, conservation status, distribution and types of wetland in Nepal |
| | Community Involvement | Inadequate engagement of local communities in wetland conservation efforts |
| | Sustainable Use | Overexploitation and unsustainable use of wetland resources by local populations |
| | Pollution Control | Poor management of pollution sources affecting wetland ecosystems |
| | Invasive Species Management | Lack of effective strategies to control and prevent the spread of invasive species in wetlands |

## Future Directions

As Nepal continues to advance its wetland conservation efforts, it is essential to look towards future directions that can enhance the effectiveness and sustainability of these initiatives in the face of evolving challenges such as climate change. The dynamic challenges posed by climate change, socio-economic developments, and technological advancements necessitate a forward-thinking approach. Strengthening policies, improving institutional frameworks, and adopting innovative practices will be critical to ensuring the long-term health of Nepal's wetlands. Collaborative efforts involving government agencies, local communities, international

partners, and research institutions will be essential to achieving long-term conservation goals and preserving the ecological integrity of Nepal's wetlands for future generations.

The following future directions outline key areas of focus for wetland policies, institutions, and practices in Nepal:

**Standards, Guidelines, and Working Procedures:**
Standards and guidelines provide a framework for prioritizing conservation actions, optimizing resource allocation, enhancing accountability among stakeholders, facilitating better coordination, and ensuring that conservation efforts are targeted and impactful. Defined working procedures enable adaptive management approaches, where strategies can be adjusted based on monitoring data and evolving environmental conditions.

**Holistic Ecosystem Management:**
Adopting a holistic approach to ecosystem management that integrates wetland conservation with the management of surrounding landscapes and watersheds is essential. This approach ensures that conservation efforts consider the interconnectedness of various ecosystems, leading to more sustainable and effective outcomes.

**Climate Resilient Strategies:**
Implementing strategies to enhance the resilience of wetlands to climate change is critical. This includes measures such as restoring degraded wetlands, constructing check dams, and promoting agroforestry to mitigate the impacts of extreme weather events and maintain the ecological balance.

**Innovative Technologies:**
Utilizing innovative technologies such as remote sensing, Geographic Information Systems (GIS), and mobile applications for monitoring and managing wetlands can greatly enhance conservation efforts. These technologies provide accurate and timely data, enabling better decision-making and management.

**National Wetland Database**
By establishing standardized data collection protocols that include ecological, hydrological, and socio-economic parameters; leveraging advanced technology for data analysis and mapping; building capacity; integrating database development into national environmental policies and strategies; and regularly updating and maintaining database, Nepal can create a robust foundation for effective wetland management and conservation.

**Community-Centric Approach:**
Continuing to prioritize community-centric approaches in wetland conservation ensures that local communities are engaged and benefit from conservation activities. Empowering communities through capacity building, financial incentives, and participatory management practices will enhance the sustainability of conservation efforts.

**Biodiversity Conservation:**
Focusing on biodiversity conservation within wetland management plans helps protect the diverse species that depend on these habitats. Conservation strategies should aim to preserve genetic diversity, protect endangered species, and maintain ecosystem services.

**Education and Advocacy:**
Strengthening education and advocacy efforts to raise awareness about the importance of wetlands and the need for their conservation is crucial. Engaging schools, universities, and the media in these efforts can help build a broad base of support for wetland conservation.

**International Collaboration and Sustainable Financing:**
Enhancing international collaboration and securing sustainable financing is vital for the long-term success of wetland conservation projects. Building partnerships with international organizations, donors, and financial institutions can provide the

necessary resources and support for large-scale conservation initiatives.

Therefore, by prioritizing effective management practices, addressing challenges, and engaging stakeholders collaboratively, Nepal can ensure the sustainable conservation of its wetland ecosystems. This not only supports local communities' livelihoods and well-being but also contributes to global biodiversity conservation efforts, demonstrating Nepal's commitment to environmental stewardship and sustainable development.

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# IV. Technical Session

## Introduction:

The National Wetland Workshop, held on February 2, 2024, in celebration of World Wetland Day, featured a thought-provoking Thematic Session comprising four oral presentations across three crucial thematic areas and there were four poster presentations as well. The thematic session was chaired by Dr. Maheswor Dhakal, Joint Secretary of Ministry of Forest and Soil Conservation. The thematic session aimed to deepen understanding and foster dialogue on Ramsar Implementation, Socioeconomic Dynamics of Wetlands, and Wetland Environment focusing on Biodiversity Conservation and Watershed Management. The rationales behind the selection of the three thematic areas are given below-

1. **Ramsar Implementation - Global and National Scenario:**
   This thematic area focused on the international Ramsar Convention on Wetlands, which aimed to promote the conservation and sustainable use of wetlands worldwide. Understanding the global and national scenario regarding Ramsar implementation helps stakeholders assess Nepal's progress, identify challenges, and learn from global best practices in wetland conservation.

2. **Socio-economic Dynamics of Wetlands:**
   Wetlands play critical roles in supporting local livelihoods, providing ecosystem services, and influencing socioeconomic dynamics. This thematic area explored the interactions between wetland ecosystems and human societies, including issues such as resource utilization, economic activities, community involvement, and the impacts of development projects on wetland-dependent communities.

3. **Wetland Environment (Biodiversity Conservation and Watershed Management):**
   Biodiversity conservation and watershed management are fundamental aspects of wetland conservation. This thematic area delved into the ecological importance of wetlands, including their role in supporting diverse plant and animal species, maintaining water quality, regulating hydrological cycles, and mitigating the impacts of natural disasters such as floods and droughts. It also addressed strategies for integrated watershed management to ensure the long-term health and resilience of wetland ecosystems.

Overall, the selection of these thematic areas reflects a comprehensive approach to wetland management, considering ecological, socioeconomic, and policy dimensions. By addressing these key areas, the workshop aimed to facilitate knowledge exchange, capacity building, and collaboration among stakeholders involved in wetland conservation efforts in Nepal.

## Presentation on Thematic Area

### Thematic Area 1: Ramsar Implementation - Global and National Scenario

***Presentation 1 – "An Overview of Ramsar Implementation in Nepal."***
***Presenter: Mr. Shailendra Kumar Pokharel***

The presentation by Mr. Shailendra Pokharel extensively addressed the implementation status of Ramsar provisions in Nepal, offering a thorough exploration of the Ramsar Convention's historical roots, which date back to the 1960s. This convention has evolved into the oldest intergovernmental environmental agreement globally. The presentation provided a comprehensive examination of both global and national wetlands scenarios, underscoring the vast ecological significance of wetlands on a global scale. Additionally, it highlighted the unique challenges Nepal has encountered during its 53-year Ramsar journey. The presentation thoroughly examined the components of the National Ramsar Strategy and Action Plan (2018-2024), outlining its 5 objectives, 17 strategies, and 47 key actions.

Mr. Pokharel provided a fine assessment of Nepal's implementation of Ramsar provisions, supported by detailed Assessment Matrices, offering a comprehensive insight into the country's progress. The focus on objectives related to Ramsar site management, wise wetlands use, stakeholder capacitation, national and international cooperation, and monitoring revealed a 7% overall achievement against the set targets, underscoring both successes and areas for improvement.

Nepal's involvement in global Ramsar networks, showcasing 10 Ramsar sites that makeup 0.69% of the country's land, was discussed alongside an examination of the challenges within institutions. The conclusion highlighted Nepal's noteworthy efforts in expanding its Ramsar network and lauded its institutional and policy responses. However, it also emphasized the need for intensified collaboration, coordination, consolidation, and addressing existing gaps, ranging from legislative measures and wetlands inventories to strategic planning. The presentation's call to action included specific recommendations for updating strategies, enhancing monitoring mechanisms, and strengthening international cooperation, while also emphasizing opportunities for collaboration with key organizations in the field of environmental conservation.

# An Overview of Ramsar Implementation in Nepal.

Shailendra Kumar Pokharel
*CODEFUND, Nepal*

***KEYWORDS***

*Climate Resilience,*
*Ramsar,*
*Wetland Ecosystem.*

**ABSTRACT**

This paper presents an overview of Nepal's efforts and challenges in implementing the Ramsar Convention and conserving its wetland ecosystems. Despite substantial progress, including the designation of ten Ramsar sites covering approximately 101,283 hectares and the development of national policies aligned with global conservation goals, significant challenges persist. These challenges include fragmented governance, inadequate resources, and limited coordination among various governmental and non-governmental stakeholders.

The governance analysis revealed that key agencies, such as the Department of National Parks and Wildlife Conservation and the Department of Forests and Soil Conservation, fall short of the required threshold for good wetlands governance, with average scores of 22 and 23, respectively, against the qualifying score of 30. Additionally, Nepal's Ramsar implementation has seen limited progress, achieving only about 9% of the targets for expanding the Ramsar network and 10% for the wise use of wetlands. Only 5% of the National Ramsar Strategy and Action Plan targets for resource mobilization have been met, and 77% of targets related to monitoring and evaluating the ecological integrity of Ramsar sites remain unfulfilled.

The paper underscores the importance of strengthening institutional frameworks, enhancing community engagement, securing financial resources, and integrating climate resilience into wetland management. Furthermore, it emphasizes the need for improved coordination and collaboration at local, national, and international levels to effectively address environmental challenges and promote sustainable wetland conservation. Overall, the paper calls for a concerted effort from all governance levels and active participation from communities and international partners to achieve the sustainable management and preservation of Nepal's vital wetland ecosystems.

## Background

This paper is the outcome of a national symposium organized by the Department of Forests and Soil Conservation (DoFSC) to commemorate World Wetlands Day 2024. Its primary goal is to shed light on the general landscape of the Ramsar Convention and the implementation of Ramsar provisions in Nepal. Through this paper, we aim to disseminate information about the significance of wetland conservation, the role of the Ramsar Convention in global efforts, and the specific actions taken by Nepal to uphold its commitments under the convention. By sharing insights from this symposium, we hope to raise awareness, foster

dialogue, and catalyze collective action towards the sustainable management and preservation of wetland ecosystems in Nepal and beyond.

**Ramsar Convention**

The Ramsar Convention, also known as the Convention on Wetlands of International Importance especially as Waterfowl Habitat, was established in 1971 in Ramsar, Iran, to promote the conservation and sustainable use of wetlands worldwide. Recognizing their critical ecological functions and their economic, cultural, and scientific significance, the convention seeks to prevent the loss of wetlands globally and ensure the preservation of those that remain through careful management and utilization.

Member countries, referred to as Contracting Parties (CPs), nominate wetlands within their territories to be included in the Ramsar List of Wetlands of International Importance based on their ecological, botanical, zoological, limnological, or hydrological significance. Currently, over 172 countries are parties to the Ramsar Convention, collectively designating more than 2,503 Ramsar sites, covering a total area of over 256.19 million hectares. This makes the Ramsar Convention one of the most significant international efforts for wetland conservation.

Globally, wetlands cover an estimated 1.5-1.6 billion hectares and contribute an economic value of over 47 trillion USD annually, representing approximately 43.5% of the economic value of all-natural biomes. This highlights the immense importance of wetlands in sustaining ecosystems and human well-being (Convention on Wetlands, 2021).

The establishment of the Ramsar Convention in 1971 marked a significant milestone in global environmental conservation efforts. However, its inception was not the result of a single year's effort but rather a series of discussions and initiatives throughout the 1960s. This journey began with projects like MAR/1962 and conferences in St Andrews, UK, in 1963, followed by the development of the Liquid Asset Concept in 1964 and proposals by the International Waterfowl Research Bureau (IWRB) in 1965 (Convention on Wetlands, 1993).

Subsequent meetings in various locations contributed to drafting articles, which were discussed, revised, and eventually finalized. The first Convention officially took place in Ramsar, Iran, on February 2, 1971, and was later enforced in 1975. This historical timeline underscores that the Ramsar Convention was the culmination of a collaborative and iterative process over several years, highlighting the international community's commitment to wetland conservation (Convention on Wetlands, 1993).

**Nepal and the Convention**

Nepal signed this Convention in 1971 as one of the CPs; however, the convention entered into force on April 17, 1988, and the country delegated to the Department of National Parks and Wildlife Conservation (DNPWC) as a Ramsar Administrative Authority. DNPWC administers Ramsar sites and wetlands at the legal setting of the National Parks and Wildlife Conservation Act-1973 (Amended, 1992 (NPWCA) [DNPWC 2016] inside the protected areas, whereas DoFSC) manages all wetlands inside the national forests under its own legal structures.

By the end of 2023, Nepal has accomplished 53 years of Ramsar journey. This journey also witnessed socio-political uncertainties from 1996 to 2006 followed by the adoption of Nepal's New Constitution-2015 that federally restructured Nepal, which also slewed the managerial roles of Ramsar Sites from DNPWC and DoFSC to, Division Forest Offices (DFOs) and subnational governments. Besides, the government has also given wetlands to other agencies National Lake Conservation Development Committee (NLCDC) in the center, and the Lake Conservation and Development Authority (LCDA) in Gandaki Province. Some subsidiary inter-and-non-governmental institutions have supportive roles to the government, especially in empowerment, participation, and awareness, and to some degree of structural improvement

of wetlands. Nevertheless, Nepal's such long journey of wetlands conservation and its effectiveness have not been examined until now (Pokharel, 2022).

## Nepal's Ramsar Scenario

### Global Obligations

Nepal actively engages in various global conventions related to wetlands, biodiversity, and the environment, such as Ramsar, the Convention on Biological Diversity (CBD), and the United Nations Framework of Climate Change Convention (UNFCCC). These commitments align with Aichi's 5 goals, the Sustainable Development Goals (SDGs) 17 goals, the Sendai Framework's 7 targets, and the Paris Agreement's 4 priorities, all crucial for wetland preservation. Annex 1 illustrates their interconnectedness with Ramsar provisions.

As a SAARC charter member, Nepal is committed to regional initiatives aimed at improving people's welfare, fostering economic growth, and addressing environmental concerns. SAARC's goal is to enhance lives, including the preservation and sustainable use of wetlands, ensuring dignity and realizing the potential for all *(source: https://www.saarc-sec.org/)*.

### Institutional Response: Polycentric Governance

Governance is a dynamic process involving a diverse range of public and private entities and their interconnected relationships, facilitating actions to address common issues. Emphasizing networks, flexibility, and informal structures, governance operates across various scales, shaping resource allocation and determining 'who, what, when, and how' [ILEC 2007].

Wetlands, with their complex nature, encompass a multifaceted domain characterized by diverse users, uses, and stakeholders. This complexity necessitates a multilevel governance framework, with overlapping jurisdictions that go beyond central state control [Joshi and Bhandari, 2016]. Effective governance operates across multiple scales, fostering flexibility compared to concentrating authority in one place [Joshi and Bhandari, 2016].

Figure 1 illustrates polycentric wetlands governance, displaying intricate institutional structures and functions. This visualization aids in understanding how such governance operates within a federal restructuring context, spanning from the international to the local level [Narayanan and Venot 2009]. The federal government plays a central role, while the roles of subnational units remain limited. These institutions' functions are guided by global commitments, national instruments, and interactions among key stakeholders.

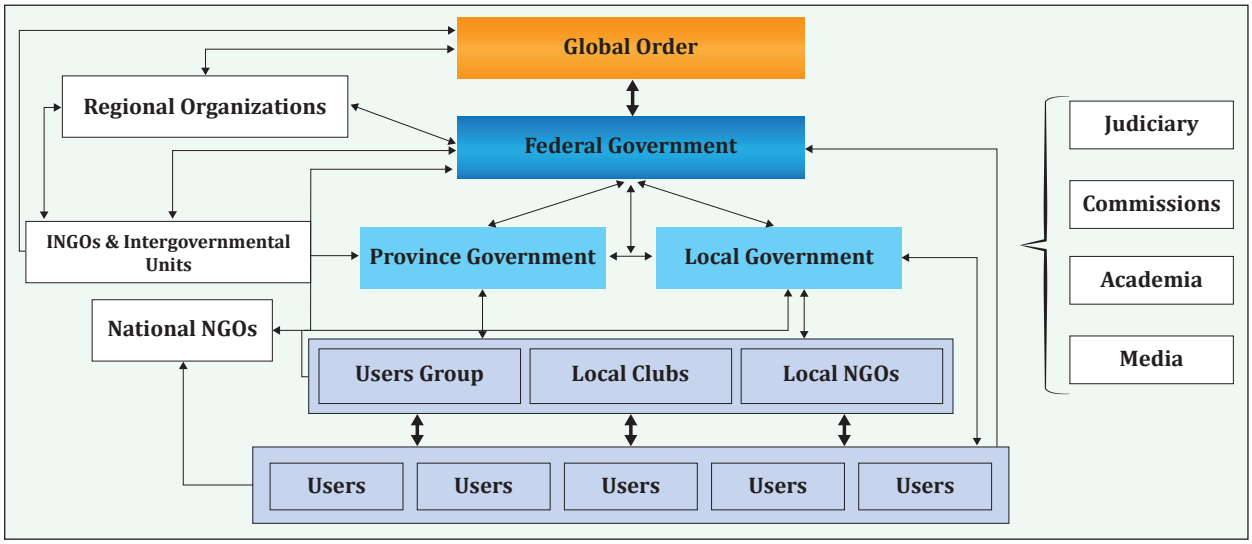


**Figure 1 Polycentric governance mechanism in Nepal (modified, Andersson & Ostrom, 2008; Narayanan & Venot, 2009).**

**National Policies, Strategies, and Regulatory Framework**

Nepal has established policies to fulfill both global and regional commitments, beginning with the National Conservation Strategy 1989 (NCS) and National Biodiversity Strategy 2002 (NBS), which laid the foundation for the National Wetlands Policy 2003 (NWP). However, subsequent policies failed to integrate the NWP's objectives, resulting in neglect of wetlands.

To address this issue, Nepal revised the NWP in 2012, aiming for 'healthy wetlands for sustainable development', which addressed challenges like resource overuse, ownership, stakeholder engagement, and climate change. Milestones such as the Nature Conservation National Strategic Framework for Sustainable Development-2015 (NCNSFSD) and the National Ramsar Strategy and Action Plan (NRSAP) were achieved during this period. The NRSAP, aligned with the NWP-2012 and Ramsar's global strategy, encompasses various management aspects and emphasizes sustainability.

The NRSAP, uniquely dedicated to Ramsar, integrates lessons from integrated management approaches, economics, inclusivity, and ecosystem services. It outlines 15 strategies and 47 key actions, tackling issues like wetlands loss, climate change, transboundary cooperation, and financing. This concerted effort underscores Nepal's commitment to preserving and sustainably using its wetlands (MoEF 2018).

**National Acts, Regulations, and Standards**

A comprehensive legal framework governs wetlands in Nepal, including various Acts and Regulations such as the Aquatic Animal Protection Act-1960 (AAPA), NPWCA (amended 1993), and the Water Resources Act-1992 (WRA). The DNPWC oversees wetlands within Protected Areas (PAs) under NPWCA, while wetlands outside PAs fall under the jurisdiction of the Department of Forests and Soil Conservation (DoFSC) through the Forest Act. However, coordination between these entities for cohesive planning is weak.

The Local Self Governance Act -1999 (LSGA) and Local Government Operation Act 2017 empower local governments, sometimes conflicting with the rights of the Department of Forests (DFO) and local bodies. Provincial and local governments have the authority to establish policies and acts, with Gandaki Province introducing the Forest and Watershed Management Policy-2018 and the Lake Conservation and Development Authority Act-2018 establishing a Lake Conservation and Development Authority (LCDA). Environmental standards and guidelines, including the Nepal Water Quality Guidelines-2005, Industry-Specific Tolerance Limits, and Generic Effluent Standards, also apply to wetlands. While some municipalities are taking steps to manage wetlands, comprehensive information on local government responses is lacking. For example, Gosainkunda Rural Municipality has prepared a Disaster Preparedness Response and Land Use Plan 2021/22, while Pokhara Metropolitan City is investing in lake conservation (Pokharel, 2022).

**Stakeholder Institutions and Participation**

Figure 2 illustrates the stakeholders responsible for implementing Ramsar provisions, functioning across different scales from local to global. In Nepal, wetlands ownership and regulation occur at the federal level, while provincial and local tiers engage with wetlands in varying capacities. Subsidiary actors from intergovernmental, non-governmental, academia, and media sectors collaborate with the government to enhance contributions to Ramsar sites and other wetlands in Nepal.

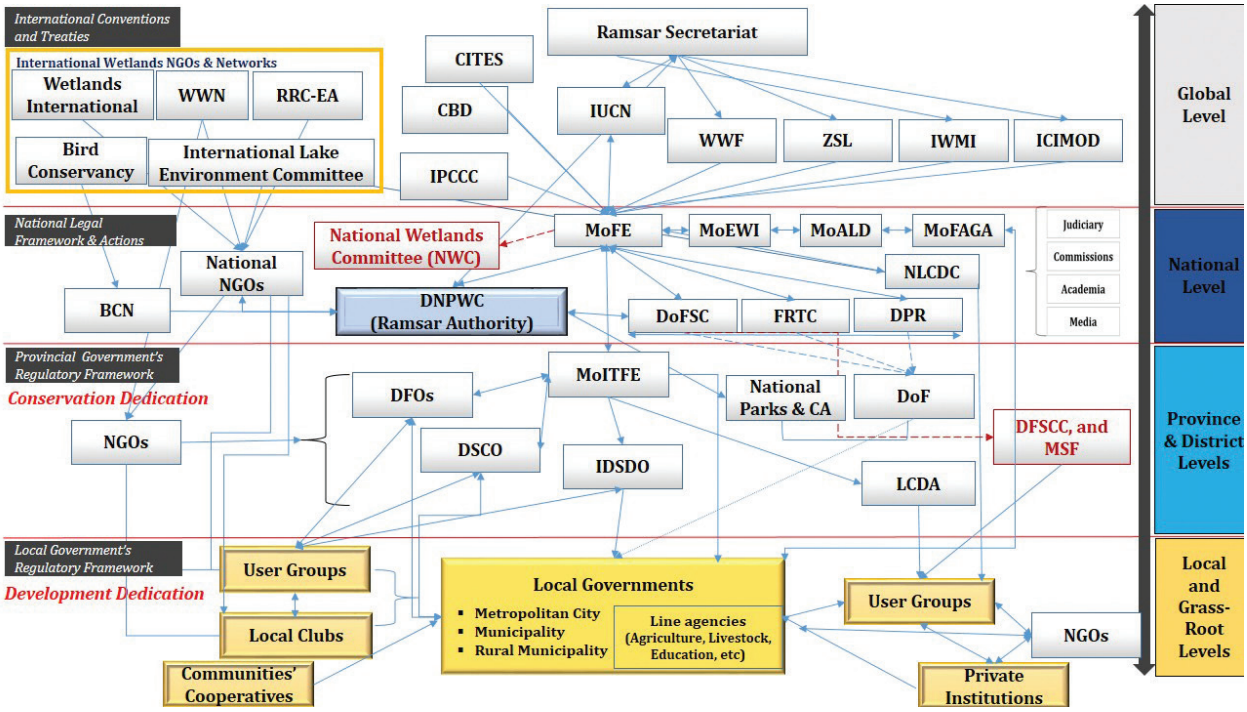


**Figure 2 Institutional arrangements for the Ramsar provisions, and interactions among key stakeholders from the local to global levels (Pokharel, 2022).**

Global entities such as IUCN, WWF, ZSL, IWMI, and ICIMOD play pivotal roles in wetland conservation. They contribute to designating new wetlands within the Ramsar network, generating knowledge, shaping policies, and improving Ramsar sites' structure.

At the federal level, the Ministry of Forests and Environment (MoFE) serves as the focal ministry and head of the Ramsar Administrative Authority, coordinating wetland management through various departments like DNPWC and DoFSC, whereas in the provinces, the Ministry of Industry, Tourism, Forests, and Environment (MoITFE) is key for Ramsar provisions, while district-level offices such as DFOs and DSCOs contribute to wetland management.

Local governments intervene in wetland management primarily through forest, environment, and disaster management aspects. However, there's a fragmented approach to Ramsar provisions, with limited coordination among local bodies. Grassroots user groups and community cooperatives play significant roles in wetland conservation, managing wetlands within forests, and addressing water scarcity issues.

## Conserving and Managing Nepal's Ramsar Site Network

The expansion of Nepal's Ramsar network began in 1987 with Koshi Tappu designated as the first site. Notable designations include wetlands in the Tarai zone like Jagadishpur Reservoir, Ghodaghodi Lake Area, and Beeshazari and Associated Lakes, as well as high-altitude and Himalayan wetlands like Rara Lake, Phoksundo Lake, Gosainkunda and Associated Lakes, and Gokyo and Associated Lakes. Nepal aims to add ten more sites to its Ramsar network by 2024 (MoFE, 2018).

Nepal's diverse wetlands include rivers, lakes, reservoirs, ponds, and marshy lands, covering about 5 percent of the country's total area and possessing a significant water storage capacity of 225 billion m3. The cumulative area of Nepal's Ramsar network is 101,283 hectares (ha), constituting about 0.7 percent of the country's total land. Within this, 34,829 ha are core water bodies, and 66,454 ha are basin cover. Despite covering only 1 percent of the Earth's surface, Nepal contributes 0.04 percent to the global Ramsar network, which spans

256.19 million ha. Annex 2 outlines more detailed information on Nepal's Ramsar sites (Pokharel, 2022).

The effectiveness of conserving and managing Nepal's Ramsar network remains insufficiently addressed, despite Objective 1 of the NRSAP focusing on this aspect (Figure 3). This objective aims to double the national network of Ramsar sites and includes commitments to developing indicators for each site and producing health report cards for their assessment. However, only about 9 percent of the targets related to this objective have been achieved. This limited progress may be attributed to the current level of nationwide investment in certain Ramsar sites and other wetlands by dedicated agencies, provincial, and local governments. Additionally, the government has recently made strides in drafting health report cards, updating Ramsar Information Sheets (RIS), and preparing new RIS for some wetlands to be considered for Ramsar listing, indicating progress toward partially achieving 34 percent of the targets (Pokharel, 2022).

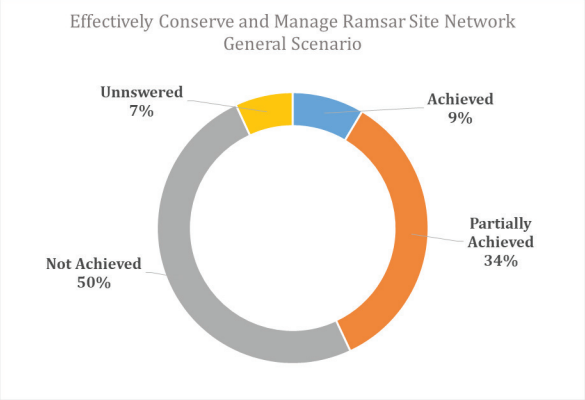


**Figure 3 National Scenario of Effectively Conserving and Managing Ramsar Site Network, Nepal**

Despite these efforts, approximately 50 percent of the targets remain unaccomplished, and some key actions outlined in the NRSAP under this objective have not been addressed. Notably, there has been no progress in doubling the Ramsar network in Nepal during this period.

**Wise use of Managing Ramsar and other wetlands**

Nepal focussed on implementing the wise use principle of wetland resources through five strategies and 22 key actions. These actions include featuring wetlands in federal, state, and local policy strategies, plans, and actions among key sectors; resource mobilization; recognition of the wise use principle; demonstration and dissemination of wetlands functions, services, and benefits; and mainstreaming Communication, Education, Participation, and Awareness (CEPA) in wetlands conservation and wise use. There is a progress of only 10 percent attributed to the collective efforts of institutions and conservation partners (Figure 4). However, mainstreaming the wise use principle of wetlands within sectoral agencies at the federal level remains a significant challenge. Some provincial governments, particularly in Sudurpachhim and Gandaki, have formulated and enforced policy devices to promote wise use principles. For example, Gandaki Province implemented the Lake Conservation and Development Act, which institutionalized the Lake Conservation and Development Authority (LCDA) and allocated regular investments for the wise use of wetlands (Pokharel, 2022).

Communities in Pokhara and other areas have also been actively engaged in the wise use and management of wetlands. Despite these efforts, the current scale of initiatives has not effectively demonstrated the wise use principle of wetlands. Most of the actions outlined under this objective have either been partially addressed or not addressed at all (Pokharel, 2022).

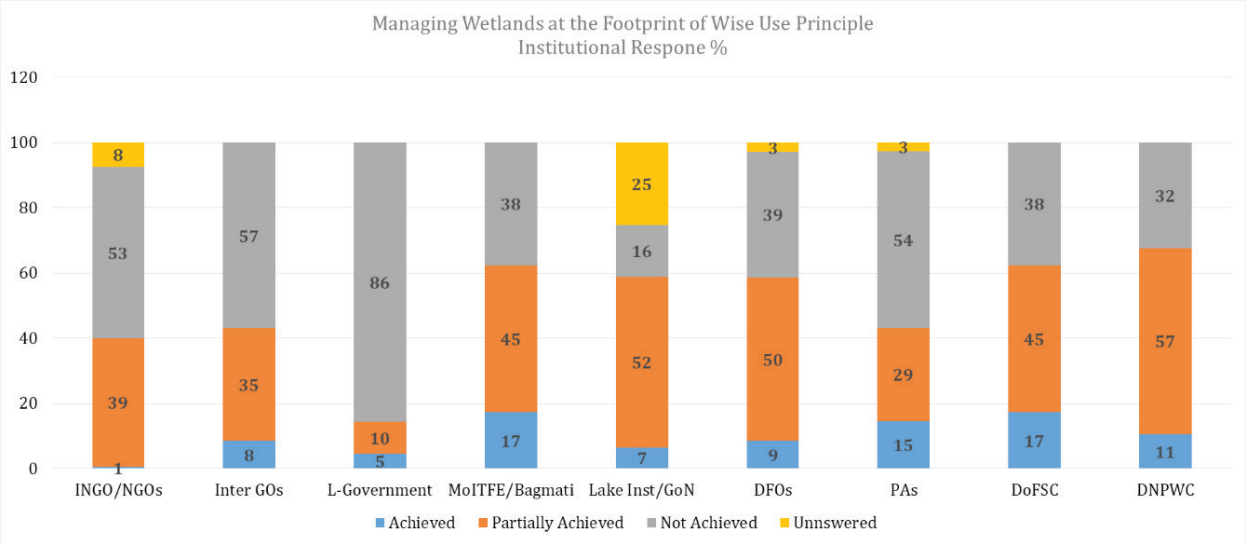


**Figure 4 Institutional Response: Wise Use of Ramsar and Other Wetlands**

## Capacitating Federal & Local Stakeholders

The NRSAP emphasizes the need for a coordination network to foster synergy among multiple tiers of government. It aims to establish a coordination network between local and federal stakeholders, create an online interactive portal for knowledge exchange and issue raising, provide training for technical staff in management plan preparation, develop and implement management plans for Ramsar sites, and establish 'Site Management Committees' at sites (MoFE, 2018)

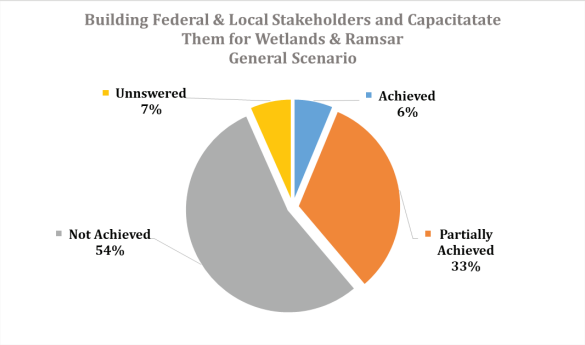


**Figure 5 General Scenario: Capacity Building at Federal & Local Levels for the Ramsar Provision**

However, progress towards achieving these objectives has been limited. While there are global examples of networking Ramsar sites, such as the Ramsar Network in Japan and the World Wetlands Network, Nepal has struggled to establish similar networks at the provincial and local levels. The National Wetland Committee (NWC) established in 2010 has remained inactive for many years, and there has been no progress in creating an online interactive portal. Additionally, while wetland-dedicated agencies occasionally conduct training events for communities, there has been no observed effort to enhance the capacity of technical staff at national and sub-national levels. Furthermore, no progress has been made in forming Ramsar-specific 'Site Management Committees'. Overall, progress towards objective three stands at 6 percent, with most targets either not achieved (54 percent) or only partially achieved (33 percent) (Pokharel, 2022).

Despite these challenges, Nepal has made some progress in preparing site plans for certain Ramsar sites and other wetlands, such as Rara Lake, Phoksundo Lake, Gosainkunda and Associated Lakes, and Taltalaiya.

## Resources Mobilization from National and International Cooperation

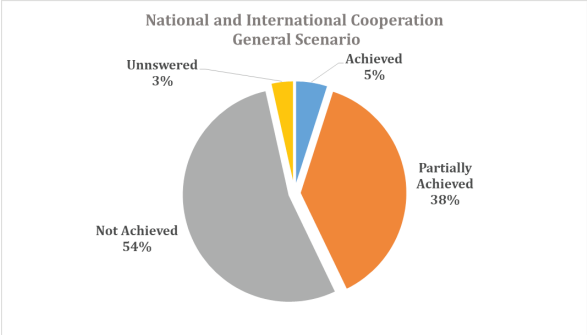


**Figure 6 General Scenario: National & International Cooperation for the Ramsar Provision**

Nepal aims to enhance the conservation of Ramsar sites through national and international cooperation. It focuses on ensuring coordination between national focal points of all nature conservation conventions, establishing relationships with international donor agencies, coordinating with international stakeholders, and securing funds for Ramsar Convention implementation (MoFE, 2018).

However, financial resource challenges hinder the implementation of this objective. Nepal lacks a specific national budget code for wetlands, complicating the evaluation of resources dedicated to wetlands conservation. Limited funding evidence exists from national cooperation and sectoral budgets for wetlands interventions. Although the government has secured grants from international cooperation programs such as the Hariyoban Program, Program for the Aquatic Natural Resources Improvement, Darwin Initiative, Nagao Wetlands Fund, and RRC-EA, these grants are often inadequate for comprehensive Ramsar implementation. Small grants are fully committed to Ramsar activities, but larger projects usually allocate only a fraction of their budget to these efforts (Pokharel, 2022).

Overall, Nepal's efforts to secure funds for Ramsar implementation have achieved about 5 percent of the NRSAP targets, with many key actions remaining undone or only partially completed (Figure 6).

**Monitoring and Evaluation of Ecological Integrity**

The NRSAP focuses on establishing a regular mechanism for determining the ecological status of individual Ramsar sites, producing annual health report cards for these sites, and developing a Ramsar evaluation protocol.

While individual implementing agencies have plans and programs for monitoring and evaluating Ramsar and other wetlands, these mechanisms are inconsistent and lack a unified evaluation protocol. Management or site plans for each Ramsar site do incorporate monitoring and evaluation as integral components, but the absence of a national evaluation protocol means that monitoring mechanisms vary across agencies. Consequently, there is no regular, standardized monitoring of the ecological status of Ramsar sites in Nepal. This lack of a unified protocol and regular monitoring has resulted in 77 percent of the targets remaining unmet. Although government agencies have internal control mechanisms, these have not sufficed for the effective monitoring and evaluation of Ramsar provisions (Pokharel, 2022).

**Status of the Wetlands Governance**

In 2022, CODEFUND accomplished a governance analysis that evaluated individual pillars of wetlands governance following the governance improvement cycle (Nakamura, 2022) with the understanding that an average score of '30' qualifies as good wetlands governance. In this regard, stakeholders responded differently to each pillar. Some agencies have a strong 'institutional pillar,' whereas others have strengths in different pillars.

Table 1 arranges the scores of each pillar of DNPWC and PAs, and DoFSC and its networks related to Ramsar implementation. Here, DNPWC has an average score of approximately '22,' whereas DoFSC exceeds this score with '23.' This indicates that both agencies have average scores below '30,' highlighting that both need to do much for good wetlands governance. In the table, better pillars are marked with blue boxes, whereas weaker pillars are marked with red boxes. Overall governance is presented in terms of scores in the last column, where better average governance is marked green (Pokharel, 2022).

Table 1 Status of the Governance Pillars of the Ramsar Sites, Nepal (Pokharel, 2022)

| Entities | Wetland Governance Pillars | | | | | | Total Score |
|---|---|---|---|---|---|---|---|
| | Institution | Policy | Participation | Technology | Information | Finance | |
| DNPWC | 5 | 4.2 | 3.7 | 3 | 3.3 | 2.6 | 21.8 |
| Koshi Tappu | 3.7 | 3.6 | 2.5 | 2.6 | 2.8 | 2.3 | 17.5 |
| Gokyo and associate lakes | 3.5 | 3.6 | 3.2 | 2 | 2 | 2 | 16.3 |
| Gosainkunda & associated lake | 4.6 | 3.9 | 3.4 | 4.3 | 3.4 | 2 | 21.6 |
| Rara lake | 3.1 | 4.1 | 3.3 | 3.8 | 3.8 | 1.9 | 20.0 |
| DoFSC | 5.3 | 4 | 3.8 | 3.3 | 3.8 | 2.9 | 23.1 |
| DFO Sunsari | 3.5 | 3.7 | 3.5 | 2.9 | 3.5 | 3 | 20.1 |
| DFO Pahalmanpur | 2.8 | 3.1 | 3 | 2.4 | 2.5 | 2 | 15.8 |
| DFO Dhanagadhi | 3.7 | 3.4 | 1.3 | 2.6 | 3.5 | 2.1 | 16.6 |
| DFO Kapilvastu | 4.5 | 4.8 | 5 | 3.7 | 4.6 | 3.3 | 25.9 |
| DFO Kaski | 4.1 | 3.1 | 3.1 | 2.3 | 2.4 | 2 | 17 |
| DFO Ilam | 5.8 | 4.8 | 3 | 4.7 | 4.1 | 2.9 | 25.3 |

**Human Resource and Management for Ramsar Implementation**

The human resource development and management system for wetlands in Nepal is focused on preparing dedicated personnel and wetlands managers, building capacity to respond to national and global events, and linking wetlands programs and actions to global and regional organizations.

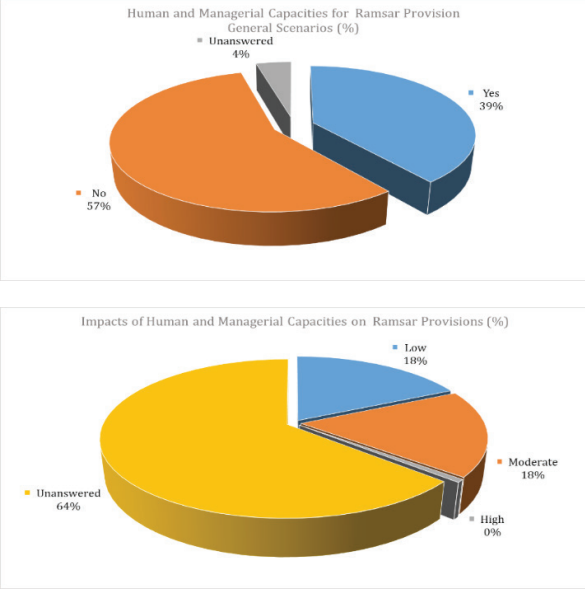


**Figure 7 General Scenario: HR Development and Management Capacity for the Ramsar Provision**

Currently, most institutions offer HR and managerial capacity development opportunities through abroad studies to meet sectoral needs, but wetlands management is not mainstreamed within sectoral departments. Consequently, most government departments and agencies lack expert personnel specifically trained in wetlands management. While some academic institutions offer environmental studies in limnology and freshwater credit courses, such as the Institute of Forestry in Pokhara, these are not widespread.

DNPWC and DoFSC have focal desks for wetlands, but there are no incentives, such as promotions, for staff based on their work in wetlands management. The Forestry Research and Training Center rarely integrates wetlands into its training events for foresters, and there are no regular technical training events dedicated to wetlands.

In terms of international affiliation, DNPWC often links Ramsar provisions to global events like COPs and subsidiary technical meetings of the Ramsar Convention. The NLCDC maintains good connections with international events such as the World Lake Conference. Nepal has hosted several national and international symposiums, such as the National Lake Symposium in 2008, the International Lake Conference in 2018, and the International Wetlands Symposium in 2012 (Pokharel, 2022).

Overall, Nepal has achieved a modest level of human resource development and managerial systems related to wetlands, though this performance has not led to significant higher-level impacts. Many institutions struggle to demonstrate the impacts of their efforts, leaving many questions unanswered (Pokharel, 2022).

**Conclusion**

Nepal's efforts in implementing the Ramsar Convention and conserving its wetlands have shown significant progress and commitment over the past decades. With the designation of numerous Ramsar sites and the alignment of national policies with global conservation objectives, Nepal has made notable strides in preserving its unique wetland ecosystems. However, challenges remain, including fragmented governance, insufficient resources, and limited coordination among different levels of government and stakeholders.

The analysis of governance pillars within key agencies such as the DNPWC and the DoFSC reveals that both agencies have yet to achieve the threshold for good wetlands governance. The average scores indicate a need for substantial improvements in institutional frameworks, resource mobilization, and stakeholder engagement.

Moving forward, Nepal must focus on strengthening its governance structures, enhancing community engagement, and securing financial and technical resources. By integrating evolving issues into wetland management and expanding its Ramsar network, Nepal can better safeguard its wetlands against the threats of climate change and biodiversity loss. Additionally, fostering international and regional collaborations will be crucial in addressing shared environmental challenges and promoting sustainable wetland conservation practices.

In conclusion, while Nepal has laid a strong foundation for wetland conservation, concerted efforts across all governance levels and active participation from communities and international partners are essential to achieving sustainable management and preservation of its vital wetland ecosystems.

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## Annex 1 Global Conventions Related to Ramsar Implementation in Nepal

| Entred into force | Name of Convention | Major obligations |
|---|---|---|
| 13 Jan 1997 | United Notions Convention to Combat Desertification in those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa, 1994. | Combating desertification and mitigation of the effects of drought by adopting on integrated approach to address the physical, biological, and socioeconomic aspects of the processes of desertification and drought<br>Integration of strategies for poverty eradication, and preparation and implementation of the Notional Action Program |
| 13 Jan 1997 | Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal, 1989 | Protection of the environment and adoption of measures to safely transport, dispose, and manage hazardous wastes<br>Controlling illegal traffic in hazardous wastes |
| 4 Oct 1994 | Vienna Convention for the Protection of the Ozone Layer, 1985 | Adoption of appropriate measures for the protection of human health and the environment resulting from modifications in the ozone layer<br>Adoption of measures, procedures, and standards to minimize use of ozone depleting substances<br>Initiation and cooperation to carry out research and scientific assessment on processes that may affect the ozone layer |
| 31 Jul 1994 | United Notions Framework Convention on Climate Change, 1992 | Stabilization of greenhouse gas concentrations in the atmosphere and protection of the climate system<br>Precautionary measures to anticipate, prevent, or minimize the causes of climate change<br>Formulation of notional policies and corresponding measure<br>Promotion, cooperation, and facilitation in research and public awareness on climate change and its effect |
| 21 Feb 1994 | Convention on Biological Diversity, 1992 | Conservation and sustainable use of biological diversity, and equitable shoring of its benefits<br>Preparation and implementation of notional strategies, plans or programs for the conservation and sustainable use of biodiversity<br>Conservation in in- and ex-situ conditions, and promotion of biotechnology and genetic research |
| 4 Jan 1990 | Agreement on the Network of Aquaculture Centers in Asia and the Pacific, 1988 | Expansion of aquaculture development through multidisciplinary research on selected aqua-forming system and transfer of technologies<br>Establishment of a regional information system, and training and upgrade of core personnel for notional aquaculture planning, research, training, extension, and development |
| l7 Apr 1988 | Convention on Wetlands of International Importance Especially on Waterfowl Habitat, 1971 | Designation of wetlands of notional and international importance and conservation, management, and wise use of migratory stock of waterfowl and their habitats |
| 20 Sep 1978 | Convention for the Protection of the World Cultural and Natural Heritage, 1972 | Adoption of effective measures for the protection of cultural and natural heritage through notional and international cooperation |
| 16 Sep 1975 | Convention on International Trade in Endangered Species of Wild Fauna and Flora, 1973 | Protection of natural ecosystems including wild fauna and flora<br>Regulation on trade, import, and export of species listed in the Appendices |
| 12 Aug 1965 | Plant Protection Agreement for Southeast Asia and the Pacific (as amended),1956 | Prevention of the spread and introduction of pests of plants and plant products, and promotion of measures for their control during import and export |

## Annex 2 Ramsar Sites of Nepal

| S N | Name of the site | State | District | Zone | Altitude (m) | Location | Date of Incorporation | | Area (Ha) | | | Management | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Designation | Ratification | Core | Basin | Total | | |
| 1 | Koshi Tappu | 1 and Madhesh | Sunsari, Saptari and Udayapur | Tarai | 90 | 26°39` N 086°59` E | 12/17/1987 | 8/13/2003 | 17,500 | - | 17,500 | Within Koshi Tappu Wildlife Reserve; Governed by DNPWC | Core and basin area not demarcated |
| 2 | Jagadishpur Reservoir | Lumbini | Kapilvastu | Tarai | 195 | 27°35` N 083°05` E | 8/13/2003 | 8/13/2003 | 225 | - | 225 | Outside protected areas; Governed by the DoFSC; Managed by DoI | Core and basin area not demarcated |
| 3 | Ghodaghodi Lake Area | Sudurpashchim | Kailali | Tarai | 205 | 28°41` N 080°57` E | 8/13/2003 | 8/13/2003 | 2,563 | - | 2,563 | Outside PA areas; Governed by the DoFSC | Core and basin area not demarcated |
| 4 | Beeshazari and Associated Lakes | Bagmati | Chitwan | Tarai, | 285 | 27°37` N 084°26` E | 8/13/2003 | 8/13/2003 | 3,200 | - | 3,200 | Within Chitwan National Park; Governed by DNPWC; | Core and basin area not demarcated |
| 5 | Rara Lake | Karnali | Mugu | Himalayas | 3,000 | 29°30` N 082°05` E | 9/23/2007 | 9/23/2007 | 1,060 | 1,620 | 2,680 | Within Rara National Park; Governed by DNPWC | Site plan available; Core and basin areas defined |
| 6 | Phoksundo Lake | Karnali | Dolpa | Himalayas | 3,660 | 29°12` N 082°57` E | 9/23/2007 | 9/23/2007 | 494 | 39,531 | 40,025 | Within Shey Phoksundo National Park; Governed by DNPWC | Site plan available; Core and basin areas defined; Altitude revised. |

| S N | Name of the site | State | District | Zone | Altitude (m) | Location | Date of Incorporation | | Area (Ha) | | | Management | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Designation | Ratification | Core | Basin | Total | | |
| 7 | Gosainkunda and Associated Lakes | Bagmati | Rasuwa | Himalayas | 4,700 | 28°05` N 085°25` E | 9/23/2007 | 9/23/2007 | 1,030 | - | 1,030 | Within Langtang National Park; Governed by DNPWC | Core and basin areas not demarcated |
| 8 | Gokyo and Associated Lakes | 1 | Solukhumbu | Himalayas | 5,000 | 27°52` N 080°42` E | 9/23/2007 | 9/23/2007 | 7,770 | - | 7770 | Within Sagarmatha National Park; Governed by DNPWC | Core and basin areas not demarcated |
| 9 | Mai Pokhari | 1 | Ilam | Midhills | 2,100 | 27°00'N 087°56'E | 10/20/2008 | 10/20/2008 | 90 | - | 90 | Outside protected areas; Governed by the DoFSC | Core and basin areas not demarcated |
| 10 | Lake Cluster of Pokhara Valley | Gandaki | Kaski | Midhills | 622-2,403 | 28.139-28.2061 83.8004-83.9898 | 2/2/2016 | 2/2/2016 | 897 | 25303 | 26200 | Outside protected areas; Governed by the DoFSC | Core and basin areas defined; Integrated basin level plan available |
| | | | | | | | **Total Coverage** | | **34,829** | **66,454** | **101,283** | | |

## Thematic Area 2: Socioeconomic Dynamics of Wetlands

***Presentation 2 - "Socioeconomic Dynamics of Wetland"***

***Presenter: Professor Dr. Rajesh Kumar Rai***

Dr. Rajesh Kumar Rai presented on the topic "Socio-Economic Dynamics of Wetlands". He explained that, based on our understanding and in accordance with a scientific investigation, the factors leading to Wetland Degradation include Infrastructure development, Land Conversion, Water withdrawal, Eutrophication, Pollution, Overharvesting, and Overexploitation, as well as the presence of Invasive species. Nevertheless, the case study of Parbati Kunda, situated in Ammachhodingmo rural municipality of Rasuwa district, has brought to light a distinct driver of Wetland Conversion. The case study of Parbati Kunda offered a compelling illustration of the complex interactions between local beliefs, environmental management practices, and socioeconomic considerations. In 2018, Parbati Kunda in Rasuwa district faced degradation due to the overgrowth of Bojho (*Acorus calamus*), driven by a belief that filling the pond with water might trigger floods and landslides, posing a threat to the downstream village. Consequently, the community abandoned the pond, leading to an accumulation of Bojho biomass as its growth surpassed decomposition. However, by 2023, Parbati Kunda was successfully restored as the local community began utilizing *Acorus calamus*, resulting in the pond being replenished with water.

Dr. Rajesh Kumar Rai's presentation highlighted the deep dependence of indigenous communities on wetland products for various purposes such as food, medicine, livestock feed, and equipment. The case of Singhara (Water Chestnut) in Ghodaghodi Lake highlighted the consequences of reduced human interaction, leading to uncontrolled growth and ecological impact. Dr. Rai introduced the concept of Wetland Social-Ecological Systems (SES), emphasizing the interconnected relationship between human societies and wetland ecosystems. He stressed the need for co-designing wetland policies with local communities, recognizing the importance of place-based relationships and adopting ecosystem valuation models to strengthen wetland governance and conservation efforts. Furthermore, Dr. Rai discussed the significance of regular human interaction with wetlands based on the Intermediate Disturbance Hypothesis, proposing collaborative policy development with local communities. The presentation underscored the importance of place attachment and relational values in shaping wetland governance. It concluded by exploring the creative economy aspect of wetland conservation, showcasing examples such as weaving mats from water hyacinths and creating waste baskets. These practices not only add value to traditional methods but also address environmental challenges through the sustainable utilization of invasive species and waste materials.

In response to Mrs. Smriety Regmi's question about the apparent disparity in contributions to wetland conservation between affluent males and poorer females, Prof. Dr. Rajesh Kumar Rai highlighted a key issue with how we typically value ecosystems. He noted that our valuation often focuses solely on monetary terms, which inherently disadvantages marginalized groups like women and the poor, who may have limited financial resources and decision-making power.

Prof. Rai emphasized that in developing economies, where financial resources are predominantly controlled by males, women often lack the authority to allocate public funds towards conservation efforts. Consequently, their perceived willingness to contribute financially may appear lower, even

though they rely heavily on wetlands for their livelihoods.

Moreover, Prof. Rai suggested that assessing contributions solely in terms of cash payments overlooks the significant non-monetary value of natural resources to marginalized communities. He proposed an alternative approach of evaluating contributions based on labor, considering the time and effort individuals, particularly women and the poor, invest in conservation activities.

In essence, Prof. Rai's response underscores the need to broaden our understanding of ecosystem valuation beyond monetary terms and to recognize the diverse contributions of all stakeholders, especially those traditionally marginalized, in conservation efforts.

Mr. Ram Bichari Thakur, Divisional Forest Officer at the Division Forest Office in Pahalmapur, Kailali, brought forth valuable insights regarding the Ghodaghodi Bird Sanctuary during a discussion with Prof. Dr. Rajesh Kumar Rai. Having worked closely with the bird conservation network, Mr. Thakur emphasized additional drivers of wetland degradation beyond those presented in Prof. Rai's presentation.

He highlighted the adverse impact of dam construction on the wetland habitat, particularly concerning migratory birds. He pointed out that bird census data revealed how rising water levels due to dam construction have flooded essential parts of the wetland, making them uninhabitable. Moreover, the construction has led to a scarcity of food resources for these migratory species. This is evidenced by a significant decline in the number of migratory birds, dropping from 2000 in 2004 to only 800 in the latest census.

Mr. Thakur also drew attention to the disruption caused by large-scale electrification projects, such as high-tension power lines near Ghodaghodi Lake. He explained that these structures have altered the migratory routes of birds, diverting them away from their traditional paths and leading them toward alternative areas. In light of these observations, Mr. Thakur stressed the importance of considering such environmental impacts during dam construction projects. He advocated for a more comprehensive approach that takes into account the preservation of crucial habitats and migratory routes for the long-term conservation of wetlands and their avian populations.

# Socio-economic Dynamics of Wetlands

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***KEYWORDS***

*Accumulation,*
*Decomposition,*
*Intermediate Disturbance,*
*Parbatikunda,*
*Social-Ecological System.*

**ABSTRACT**

There is a common believe that people have dependency on natural resources and keeping human away from ecosystem will preserve the ecosystem as nature has its own process to preserve. Conservation approaches follow the same pathway to protect the ecosystem. In this context, this study presents the case of Parbatikunda of Rasuwa District, Nepal to illustrate how low or no disturbances also degrade wetlands. The results show that in the absence of human interaction, there is an accumulation of resources/ biomass in wetlands. The higher rate of accumulation over decomposition piles up residuals in the wetland, which result in shallowness and shrinkage of wetlands. There is a need to redefine dependency into interdependency, as harvesting of resources contribute to balance the rate of accumulation and decomposition. The traditional resource harvesting practices of Indigenous communities are to maintain faunal population and floral density. Therefore, ecosystem management including wetland require human interventions either continuing traditional harvesting practices or management activities.

## Background

Wetlands have multifaceted role in human well-being. It produces both local and global services to enhance human welfare. The regulatory services such as flood regulation, water purification, and carbon sequestration have a significant contribution to local, regional, and global communities. In addition, it provides habitat to several wildlife species such as birds, reptiles, herbivores, carnivores, and aquatic species. They also provide food for local and indigenous communities, and source of grass. In addition to these, wetlands also serve as cultural and recreational activities. They have strong ties with indigenous and local people and offer spaces for rituals and ceremonies. For instance, people consider Maipokhari of Nepal, a Ramsar site, considered as holy pond and worship all living creatures in the pond (Chaudhary et al., 2019). But wetlands are degrading rapidly.

Their degradation rate is three times and more than one-third of the world's wetlands have already been lost between 1970-2015 (Convention on Wetlands, 2021). The report states that more than one-fourth of all wetlands plants and animals are at risk of extinction as annual rates of loss have accelerated since 2000. The consequence of wetlands degradation and/ or loss has socio-economic implications. It increases the flood risk, decrease water quality, and threaten livelihoods of local people, who rely on wetland resources (Adhya & Banerjee, 2022; Ghosh et al., 2024). For instance, a decrease in water quality may affect the productivity of the agriculture field. This may have negative implications for the cultural practices of local and indigenous communities. Changes in water quality and the invasion of exotic species have negative impacts on socio-economic benefits. This can be exemplified by

the change in value in several wetlands of India, before and after the wetland degradation more than 500 times (Ramachandra et al., 2011).

The socio-economic dynamics of wetlands degradation are complex and can be influenced by various factors. Widely identified drivers of wetland degradation are the construction of roads and infrastructure; agricultural expansion; cutting of forests; industrial pollution; river canalization; and over-harvesting (Asselen et al., 2013; Butt et al., 2021). Furthermore, climate change is also considered as another driver of wetland degradation. There are several attempts to preserve wetlands by addressing these drivers. Several multistakeholder initiatives are made. Most of these are focused on reducing human influence by keeping people away from wetlands.

There are also wetlands, which are far from these drivers but degrading. Those wetlands far from human interference are also degrading. This fact may resemble the theory of intermediate disturbance hypothesis (Wilkinson, 1999). The hypothesis suggest that an ecosystem can be in better position in terms of species richness, with intermediate disturbance compared to low disturbance and over disturbance.

Therefore, our previous assumption of ecosystem degradation including wetlands is not only driven by overpressure on resources. This may be due to the disconnection of interaction between humans and wetlands (Sarwar Hossain & Szabo, 2017). In the past, indigenous people were living with these resources without compromising the condition and health of ecosystem. They have sustainable practices in species conservation, water body protection, and catchment area management while harvesting wetland resources (Adhikari & Poudel, 2022). There was a harmony between wetlands and indigenous people.

Therefore, social, and ecological systems are not independent. They are interdependent as described by the theory of social-ecological system. The system emphasized that humans should be considered as a part of, not apart from, nature (Berkes et al., 2008). Restricting people from using wetland resources may not help to preserve the wetland ecosystem. Therefore, both systems – social and ecological- are interconnected and their relationship is reciprocal (Figure 1). This means one's presence may affect another, and their absence also affects another system.

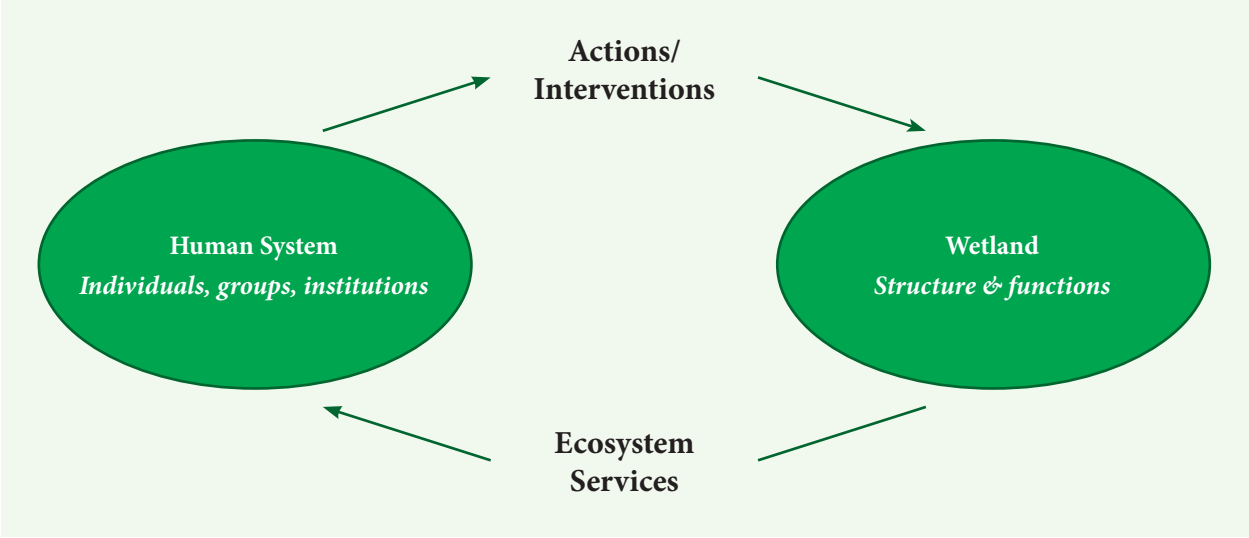


**Figure 1: Social-Ecological System of Wetlands**

The figure shows that human system, which may have individuals, groups and institutions have actions. Their actions influence ecosystem structure and processes, which is related to ecosystem functions. A change in functions also influences ecosystem structure and processes. This may affect the production and flow of ecosystem services, which affect human welfare. This may affect societal institutions and values, which direct human actions and interventions. Therefore, a change in the state of one system may affect the state of another.

Understanding this complex relationship between social and ecological systems is very important to manage wetlands. This paper discusses this new dimension of socio-economic dynamics, which affect wetlands.

## Context

Aamachhodingmo (Parbatikunda) is a natural freshwater lake situated in Aamachhodingmo Rural Municipality, Ward 3, Gatlang Village in Rasuwa District of Bagmati Province of Nepal 2,600 m altitude. The lake is worshiped by Hindus and Buddhists, considering a part of goddess Parbati. The water is used for drinking by locals and there is an annual festival during "Janai Purnima". Hindu pilgrims visit, mainly after worshiping Gosaikunda. Buddhists, particularly local people, change *Lungdar* (prayers flag) around the lake. Therefore, the lake has high spiritual value along with supplying drinking water to local people. It is home to 25 wetland plant species, nine tree species, 10 macroinvertebrate taxa, 37 bird species, and about six mammal species (J. A. Moravek et al., 2019).

In 2019, when we visited the lake area, only about 10 percent of the total lake area was underwater (Figure 2). The rest of the surface area is above water level with few trees and the domination of *Acorus calamus*. A baseline survey conducted in 2016 shows that more than one-third (38%) of the total wetland area, 2,140 $m^2$ is covered by A. *calamus*. The spread of the plant was noticed by villagers about 20 years ago. The baseline study attempted to show the cause of the infestation of A. *calamus* due to nitrogen effluent from agriculture. However, the study is not sure as there is a minimum area under cultivation that involves the use of organic manure.

Some reports also tried to figure out the drivers of A. *calamus* abundance. It is assumed that wetland pollution is due to livestock waste but inconclusive about the exact cause (J. Moravek, 2019). This is because we have a pre-occupied assumption that ecosystems including wetland degradation are mainly due to anthropogenic pressure. Later, local people in coordination with Rural Municipality cleaned the lake as they uprooted plants, dig out clay, and made the wall strong. Now, the lake is full of water in its original stage (Figure 3).

**Figure 2: Parbatikunda in 2019**

We asked local people the reason behind the lake degradation. They said that in the past local people used to harvest A. calamus, which can be sold in the nearby markets as it has high demand. As the lake is just 300 m above Gatlang Village, local people realized

that the full of water in the lake is a threat to their village. Later on, they decided not to have lake with full of water, so they stopped to collect A. *calamus*. The baseline study also realized a change in species composition and water quality.

After having informal ban on harvesting A. *calamus*, local people realized that the plant is gradually spreading over the lake and causing the shrinkage of lake. This is mainly due to the fact that the accumulation of biomass is more than the decomposition rate in the absence of human intervention. As there was no harvest, the aboveground biomass of A. *calamus* increased substantially. This is the main reason behind the degradation of Parbatikunda in Rasuwa district.

**Figure 3: Parbatikunda in 2023**

## Discussion

The interaction between human society and wetlands must be seen as their reciprocal relationship, rather than dependency. The collection of materials by local and indigenous communities as a part of their tradition and livelihood is not only for the welfare of humankind. It also benefits the wetland ecosystem too. Otherwise, it accumulates biomass in the wetlands, which result in higher level of nutrients inputs. Nutrient loading accelerates primary productivity, which shifts in vegetation patterns and nutrient cycling (Sánchez-Carrillo et al., 2011). After decomposition residuals gradually accumulate in the bottom of the lake, which results in shallowness and shrinkage.

The trend in Parbatikunda shows that not only over-exploitation of wetland resources is harmful but also the over-protection or lack of human interaction is harmful for the wetland resources. Usually, in intense disturbances good colonizers appear and in rare or small disturbances good competitors appear (Liao et al., 2022). It is the same case in Parbatikunda that good competitors like A. calamus and large trees were there. May be in long run it will be converted into forests, and then wetland will be disappeared. Therefore, the belief that

protection can maintain and preserve the ecosystem also does not work properly. This is because the ecosystem is not in equilibrium. Ecosystems are non-equilibrium, and they require disturbances to bring them back into their original state (Mori, 2011). This can be achieved through management or interaction.

Management interventions or allowing Indigenous communities to continue their practices to harvest resources can be attributed as intermediate disturbance. This can create an ecotone between low and high disturbances, so both good colonizers and good competitors can get suitable habitats to thrive (Ward & Stanford, 1983). This increases species richness under the intermediate disturbance. This clearly suggests that the practice of indigenous communities helps to maintain biodiversity in the lake.

## Conclusion

The results of this study indicate that extreme conditions both protection and harvesting are not appropriate for ecosystem management. Indeed, ecosystems are not in an equilibrium state, so they require disturbances to maintain their original state. Leaving them without any human disturbances may produce a favorable environment for good competitors and over-harvesting allow good colonizers. In both cases wetland will be degraded and in the long run will be lost. Therefore, either continuation of traditional wetland resource harvesting practices or management interventions are required to maintain the wetland ecosystem.

This study also suggests that the existing belief of human dependency on wetland ecosystems and keeping away from the ecosystem may help to protect may not actually contribute to its preservation. Harvesting wetland resources also helps to maintain ecosystem health by maintaining accumulation and decomposition rates. This contributes to check the natural succession process and maintain the state of ecosystem. Therefore, there is a reciprocal relationship between resource harvesting and ecosystem health. Understanding this complex yet beneficial relationship is crucial for effective ecosystem management

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## Thematic Area 3: Wetland Environment (Biodiversity Conservation and Watershed Management)

**Presentation 3 - "Wetland Biodiversity in Nepal"**

**Presenter: Mr. Dipak Jnawali**

Dipak Jnawali's presentation on "Wetland Biodiversity in Nepal" provided a comprehensive overview of the rich biodiversity present in Nepalese wetland ecosystems. Notable statistics highlighted include the diverse array of indigenous fish species, phytoplankton, zooplankton, mollusks, amphibians, and a significant proportion of nationally threatened birds and endemic vertebrates. These findings underscored the critical role wetlands play in supporting a wide range of species and maintaining ecological balance within the landscape.

The presentation delved into the multifaceted importance of wetlands, describing them as vital biological supermarkets, essential components of the landscape's kidney, and crucial habitats for various forms of life. He emphasized that wetlands were pivotal for provisioning services such as food, fresh water, fibers, and fuels, while also playing significant roles in regulating, supporting, and providing cultural services to communities. Despite their significance, he pointed out that wetlands face numerous threats, including encroachment, resource extraction, pollution, invasive species, and the adverse impacts of climate change, necessitating robust conservation efforts.

He outlined the efforts to conserve wetlands, highlighting government policies, research initiatives, awareness campaigns, and collaborative endeavors involving various stakeholders. The presentation emphasized the evolution of national policies and strategies aimed at protecting wetlands, dating back to the 1960s, and stressed the importance of coordinated efforts to address the challenges faced by these ecosystems. Overall, the presentation underscored the need for collective action to safeguard wetlands, their biodiversity, and the invaluable services they provide for both ecosystems and human well-being.

# Wetland Biodiversity in Nepal

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***KEYWORDS***

*Bio-genes,*
*Hotspot,*
*Ramsar,*
*Threats,*
*Wetland Fauna,*
*Wetland Flora.*

**ABSTRACT**

Wetlands are very crucial ecosystems, renowned for their productivity and provision of essential environmental services. In Nepal, where ten wetlands have earned global recognition as Ramsar Sites, the country is also home to numerous other wetlands of extreme importance. These ecosystems support a thriving diversity of plant and animal life, including a number of endemic species. Yet, they are under severe threat from pollution, invasive species, overexploitation, and alterations in hydrological patterns, endangering biodiversity conservation efforts. Since ratifying the Ramsar convention in 1987, Nepal has been proactive in wetland conservation, led by the Ministry of Forests and Environment as a focal ministry. This commitment is reflected in various policies and plans, such as the National Wetland Policy 2012, and the National Ramsar Strategy and Action Plan (2020-2024), emphasizing integrated management approaches. Collaborative efforts with diverse organizations including many national and international non-governmental organizations additionally strengthen conservation efforts. However, to address these pressing challenges, urgent collective action requires increased awareness and coordinated efforts across all levels. Through clear and comprehensive strategies encompassing conservation, restoration, and sustainable management practices, we can safeguard the continued existence of wetlands and the invaluable biodiversity they harbor. This will ensure their vitality for future generations. This article is based on the thorough review and comprehensive examination of various published and unpublished materials from both national and international sources. It presents insights into the current status of internationally significant wetlands in Nepal, highlighting their biodiversity value, as well as the biodiversity within Nepal's wetlands. Furthermore, it addresses the threats faced by these wetlands and discusses efforts in their conservation and management.

## Introduction

There are two types of aquatic ecosystems: marine and wetland ecosystems. Wetlands are ecosystems, in which water is the primary factor controlling the environment and the associated plant and animal life. The Ramsar Convention defines wetland as areas of marsh, peat lands or water, whether natural or artificial, permanent or temporary with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tides does not exceed six-meter (Dugan, 1990). The Nepali term for wetlands is "Simsar", which means lands with a perennial sources of water. Swampy rice fields, water-logged areas, and ponds are also understood as wetlands in the country. National Wetland Policy 2012, defined wetlands as "Wetlands denote perennial water bodies that originate from underground sources of water or rains. It means swampy areas with flowing or stagnant fresh or salt water that are natural or man-made, or permanent or temporary. Wetlands also mean marshy lands, riverine floodplains, lakes, ponds, water storage areas, and agricultural lands."

Although wetlands cover only around 6 percent of the Earth's land surface, 40 percent of all plant and animal species live or breed in wetlands. Wetlands are recognized as some of the Earth's most productive ecosystems, providing crucial services to human society (Ghermandi et al., 2008). These lands with perennial water supply are highly productive and biodiverse. Apart from their primary role in water supply, wetlands are well-known for their additional ecosystem functions, such as groundwater recharge, carbon storage, and flood prevention. More than a billion people across the world depend on wetlands for their livelihoods which is about one in eight people on Earth. They support a rich variety of plants and animals by offering suitable habitats and are essential for the livelihoods of local and indigenous communities (MoFE, 2018). Considered sacred and valuable for their cultural, economic, ecological, and aesthetic significance, wetlands are integral parts of the biosphere, benefiting both humanity and other living beings in the ecosystem.

Out of the 42 wetlands types classified by Ramsar, Nepal lacks coastal and marine wetlands (IUCN, 2004), but has 19 natural and 10 man-made inland wetland types (Siwakoti, 2007). Hydrologically, Nepal's wetlands are considered Himalayan wetlands regardless of size or geography, as each water source they receive is connected to the water dynamics of the Himalayas (Pokharel and Nakamura, 2012).

## Current Scenario of Internationally Important Wetlands and its Biodiversity Value

Nepal has a history of over 36 years of designating Wetlands of International Importance, starting with the declaration of Koshi Tappu as the country's first Ramsar site on December 17, 1987. With the addition of the Lake Clusters of Pokhara Valley on February 2, 2016, Nepal now holds a total of 10 Wetlands of International Importance (Figure 1), covering a combined area of 60,561 hectares. Out of Nepal's total area of 147,516,100 hectares, approximately 819,277 hectares are comprised of various forms of wetlands, such as lakes, rivers, ponds, reservoirs, and marshy lands. Within this wetland area, a total of 60,561 hectares have been designated as Ramsar Sites (DoFD, 2012). Among Nepal's 10 Ramsar sites, the Lake Clusters of Pokhara Valley, covering a total area of 26,106 hectares and including Phewa, Begnas, Rupa, Khaste, Dipang, Maidi, Gunde, Neurani, and Kamalpokhari, is the largest and most recently declared Ramsar site. Conversely, Mai Pokhari, spanning an area of 90 hectares, stands as the smallest Ramsar site in Nepal (Table 1).

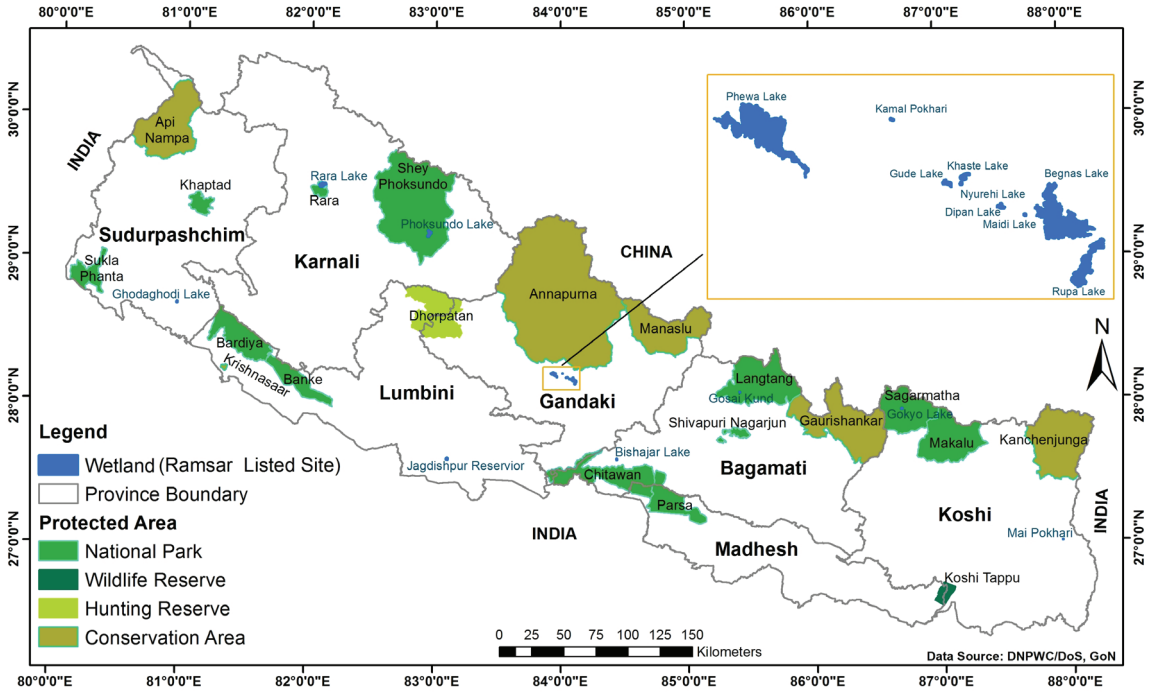


**Figure 1- Ramsar Sites and Protected Areas of Nepal**

The Ramsar Sites in Nepal are spread across all three geographical regions of the country: the High Himalayas, Midhills, and Terai (GoN & MoFSC, 2009) and are classified as high-altitude wetland, mid-hill wetland, and Terai wetlands (Karki, 2007). High-altitude wetlands serve as crucial sources of freshwater for downstream communities (Karki, 2007) and hold significant religious and cultural importance, exemplified by sites like Gosainkunda. Midhill and Terai wetlands play vital roles in supporting the livelihoods of a large population, primarily through economic activities such as fishing, irrigation, and tourism (Lamsal et al., 2017). The Terai wetlands are valued for their cultural and religious significance (DNPWC, 2018).

**Table 1- Ramsar Sites of Nepal and its Biodiversity Value**

| S.N. | Zone, Provinces, Location | Ramsar Listed Wetlands | Ramsar Designation | Biodiversity Value |
|---|---|---|---|---|
| 1 | Terai, Lowland - Koshi (Sunsari, Saptari, Udayapur) | Koshi Tappu | 12/17/1987 | Last remaining population of Bubalus arnee and host for endangered wild birds. Contains plants like *Rauvolfia serpentine, Alstonia scholaris, Oroxylum indicum, Senegalia catechu, Butea monosperma, Dalbergia latifolia,* listed in IUCN and CITES categories. |
| 2 | Terai, Lowland - Sudur Paschim (Kailali) | Ghodaghodi Lake | 8/13/2003 | Wildlife corridor between lowland and Siwalik, supports critically endangered turtle species and vulnerable *Lutrogale perspicillata.* Forests include *Shorea robusta* and *Senegalia catechu.* |
| 3 | Terai, Lowland - Lumbini (Kapilbastu) | Jagdishpur Reservoir | 8/13/2003 | Serves as a buffer zone for bird movements, hosts endangered flora and waterfowl. Dominant species include *Shorea robusta, Madhuca longifolia, Litsea monopetala, Acacia catechu, Bombax ceiba, Terminalia bellirica.* |
| 4 | Terai, Lowland - Bagmati (Chitwan) | Beeshazari and associated lakes | 8/13/2003 | Corridor for endangered species like Rhinoceros unicornis and Panthera tigris. Dominant species include *Shorea robusta, Terminalia alata, Bombax ceiba,* and *aquatic plants* like *Trapa bispinosa, Ceratophyllum demersum, Hydrilla verticillata.* |
| 5 | Himalayas - Karnali (Mugu) | Rara Lake | 9/23/2007 | Habitat for endemic plants and animals, including amphibians. Notable endemic species include *Myriophyllum sp., Primula poluninii, Cirsium flavisquamatum.* Threatened flora include *Dactylorhiza hatagirea, Picrorhiza scrophulariiflora, Paris polyphylla, Podophyllum hexandrum, Taxus baccata, Ceropegia sp*. Fauna include *Moschus leucogaster, Ailurus fulgens,* and *Catreus wallichii* (globally threatened bird species). |
| 6 | Himalayas - Karnali (Dolpa) | Phoksundo Lake | 9/23/2007 | Hosts rare and vulnerable plants and animals. Threatened species include *Picrorhiza scrophulariiflora, Dactylorhiza hatagirea, Dioscorea deltoidea, Aconitum spicatum, Podophyllum hexandrum, Megacarpea polyandra.* Wildlife includes *Panthera uncia* and *Moschus leucogaster*, along with wetland birds like *Rhodonessa rufina, Tadorna ferruginea, Gallinula chloropus, Fulica atra, Mareca penelope,* and *Anser indicus.* |
| 7 | Himalayas - Bagmati (Rasuwa) | Gosaikunda and associated lakes | 9/23/2007 | Hosts many IUCN-listed rare and vulnerable species. Fauna includes *Ailurus fulgens, Moschus chrysogaster, and Uncia uncia.* Endemic plants include *Meconopsis dhwojii, Meconopsis taylorii, Heracleum lallii, Primula ureata, P. sharmae, Pedicularis pseudoregeliana,* and *Rhododendron cowanianum.* |

| S.N. | Zone, Provinces, Location | Ramsar Listed Wetlands | Ramsar Designation | Biodiversity Value |
|---|---|---|---|---|
| 8 | Himalayas - Koshi (Solukhumbu) | Gokyo and associated lakes | 9/23/2007 | Hosts a considerable number of rare and vulnerable species. Endemic plants include *Kobresia fissiglumi, Kobresia gandakienensis, Pedicularis poluninii, Pedicularis pseudoregelina*, and threatened plants like *Picrorhiza scrophulariiflora.* Wetland birds include *Tadorna ferruginea, Mareca penelope, Anas acuta, Fulica atra, Gallinago nemoricola, Scolopax rusticola.* Fauna includes *Panthera uncia* and *Moschus leucogaster.* |
| 9 | Midhills - Koshi (Ilam) | Mai Pokhari | 10/20/2008 | Provides habitat for significant epiphytic orchids and endangered fauna, hosts endemic Sphagnum moss. Faunal species like *Prionailurus bengalensis, Lutra lutra,* and *Japalura variegata* are found here. |
| 10 | Midhills - Gandaki (Kaski) | Lake cluster of Pokhara valley | 2/2/2016 | Hosts globally threatened species of migratory birds. Some threatened species of flora found in the lake clusters include *Alstonia scholaris, Apostasia wallichii, Magnolia champaca, Asparagus racemosus, Bulbophyllum polyrhizum, Cymbidium iridioides, Dendrobium densiflorum, Dendrobium fimbiatum, Cyathea spinosa, Dioscorea deltoidea, Oberonia nepalensis, Oberonia ensiformis, Oroxylum indicum, Papilionantheteres sp., Oryza rufipogon, Tinospora sinensis, Ceratophyllum demersum, Trapa natans,* and *Typha angustifolia.* |

*Source- MoFE, 2018; Shrestha et al., 2020; Factsheet Wetlands of Nepal*

## Biodiversity in Wetland Ecosystem

Biodiversity, an inherent feature of nature, represents the unique characteristics of living systems (Solbrig 1994; Heywood 1995). The most widely recognized definition, adopted by the Convention on Biological Diversity, defines biodiversity as "the variability among living organisms from all sources, including terrestrial, marine, and other aquatic ecosystems, and the ecological complexes they form. This encompasses diversity within species, between species, and of ecosystems" (CBD 1992).

### Diversity at Species Level:

Nepalese wetlands, including Ramsar sites, are vital habitats for a diverse range of flora and fauna. These ecosystems support numerous threatened and endangered species, offering crucial ecological habitats for migratory birds, aquatic life, and other wildlife, thereby significantly contributing to the country's biodiversity. Table 2 shows the floral and faunal diversity of mostly wetland-dependent species.

**Table 2- Diversity of Wetland Dependent Species.**

| Category | Details | Reference |
|---|---|---|
| **Floral Diversity** | | |
| Wetlands house a wide range of plants including unicellular algae, bryophytes, mosses, ferns, and woody angiosperms. Dominant species include *Typha, Phragmites, Cyperus,* and *Scirpus.* Significant fungal and bacterial presence. | | Gopal (2015) |
| Approximately 25% of Nepal's vascular plants depend on wetlands.<br>Includes aquatic and riparian plants adapted to waterlogged conditions. | | MoFSC (2014); Cronk & Fennessy (2009) |
| **Plant Species** | A total of 711 species of plants are wetland dependent belonging to 382 genera across 112 families. Among these, there are 3 species of Bryophytes, 25 species of Pteridophytes and 683 species of Angiosperms (371 Dicot species, 312 Monocot species). | Ghimire et al. (2020) |
| **Algae** | 998 species of algae has been documented.<br>Largest groups: 415 Chlorophyta, 277 Cyanophyta, 235 Bacillariophyta. 29 algal species are endemic to Nepal. | Rai & Ghimire (2020) |

| Category | Details | Reference |
|---|---|---|
| **Faunal Diversity** | | |
| Includes species from protozoa to mammals. Categorized by reliance on wetlands for feeding, breeding, and nesting. | | Gopal (2015) |
| **Mammals** | Presently, Nepal reports a total of 218 mammal species, constituting 4.2% of the global mammalian fauna (Poudyal et. al., 2023).<br>The National Parks and Wildlife Protection Act of Nepal, established in 1973, designates 27 mammalian species under Schedule I as protected mammals (DNPWC, 2013).<br>The key mammal species in Nepal that are dependent on wetlands and face global conservation challange include Pygmy Hog (*Sus salvanius*); Gangetic River Dolphin (*Platanista gangetica*), Wild Water Buffalo (*Bubalus bubalis*), Greater One-horned Rhinoceros (*Rhinoceros unicornis*), Elephant (*Elephas maximus*), and Tiger (*Panthera tigris*); Indian Smooth-coated Otter (*Lutrogale perspicillata*) and Common Otter (*Lutra lutra*), Fishing Cat (*Prionailurus viverrinus*), and Barasingha (*Cervus duvaucelii*) (IUCN, 2004). | Amin et al., 2018; Adhikari et al., 2018; Sharma et al., 2019; Sharma et al., 2021; Dahal et al., 2022; Lamichhane et al., 2023; cited by Poudyal et. al., 2023.<br>IUCN (2004); DNPWC (2013) |
| **Herpetofauna** | Amphibians: 57 species. | Rai et al. (2022) |
| **Fish** | Over 220 species, including 15 endemic and 15 exotic species. 34 species listed as threatened by IUCN. | Khatri et al. (2020); Rajbanshi (2013) |
| **Birds** | 892 species, 42 globally threatened, 172 nationally threatened, 113 listed under CITES. Nearly 200 waterfowl species, many migratory. Notable species: Pink-headed Duck, Greater Adjutant, Sarus Crane. | DNPWC & BCN (2022); Inskipp & Inskipp (1991); IUCN (2004) |
| **Other Species** | 102 phytoplankton, 109 zooplankton, 192 mollusk species. Notable insect: Relict Himalayan dragonfly (*Epiophlebia laidlawi*) is wetland dependent. | MoFSC (2014); IUCN (2004) |

Based on available information, it appears that the majority of globally threatened wetland species in Nepal depend on Terai wetlands. Conversely, most endemic wetland species seem to inhabit the mid-hills or mountain regions (IUCN, 2004).

**Diversity at Genetic Level:**

The genetic diversity of wetlands is a critical component of their overall biodiversity and ecological resilience. Wetlands harbor a vast array of plant and animal species, each with its unique genetic makeup that enables adaptation to diverse environmental conditions. In wetland ecosystems, genetic diversity exhibits at various levels, from individual organisms to entire populations and communities. This diversity arises through processes such as mutation, genetic recombination, and gene flow, which occur within and among populations over time.

Genetic diversity within wetland species is essential for their ability to adapt to changing environmental conditions, such as fluctuations in water levels, temperature, and salinity. Variations in traits such as tolerance to waterlogging, nutrient availability, and resistance to pests and diseases allow species to thrive in diverse wetland habitats. Furthermore, genetic diversity promotes the resilience of wetland ecosystems to disturbances such as habitat loss, pollution, and climate change. Populations with higher genetic diversity are better equipped to withstand environmental stressors and recover from perturbations, ensuring the long-term stability and functionality of wetland ecosystems.

Wetlands serve as vital reservoirs of significant genetic material. The genetic diversity in some groups of fishes is well known (Ward et al. 1994; Lévêque 1997). Among other wetland biota, genetic diversity is common in amphibians and reptiles. Many wetlands

are sources of important genetic material for plant species. For example, the Ajingara marsh in Kapilvastu harbors three species of wild rice, namely *Oryza rufipogon, Oryza minuta* and *Oryza nivara. Hygroryza aristata* is a wild relative of many rice varieties found in the Tarai. These local species provide genetic materials for the improvement of commercial varieties (Bhandari, 1998).

**Diversity at Ecosystem Level:**

Wetlands exhibit a wide range of habitat types, distinguished by factors such as hydrology, geomorphology, water chemistry, soil characteristics, dominant vegetation, and climatic conditions (Finlayson and van der Valk, 1995). In Nepal, these ecosystems are broadly classified into natural and man-made categories. Natural wetlands include lakes, ponds, riverine floodplains, swamps, and marshes, while man-made wetlands comprise water reservoirs, ponds, and deep-water paddy fields. The largest extent of wetlands in Nepal is occupied by irrigated paddy fields, closely followed by rivers (see Table 3). Notably, nearly half (45%) of Nepal's wetlands are located in the High Himalayas, largely due to the presence of glaciers and glacial lakes in this region. Among the major river basins, the Karnali basin hosts the highest concentration of wetlands at 36%, followed by the Koshi basin (Bhandari, 2009).

Nepal hosts a diverse array of wetland ecosystems, with rivers being the most prominent. The country is traversed by approximately 6,000 rivers and rivulets, comprising both permanent and seasonal water bodies. Major river systems like the Mahakali, Karnali, Gandaki, and Koshi play significant roles in Nepal's hydrological landscape, some forming international borders. Originating from either the snow-covered Himalayas or the Tibetan Plateau, these rivers vary in their perennial flow patterns; for instance, while the Arun and Kali-Gandaki rivers originate in the Tibetan Plateau, others remain perennial from Himalayan sources.

**Table 3-Wetland Habitat and its Estimated Area**

| S.N. | Wetlands | Estimated Area (ha) | Percentage (%) |
|---|---|---|---|
| 1 | Irrigated Paddy Fields | 398,000 | 48.6 |
| 2 | Rivers | 395,000 | 48.2 |
| 3 | Marshy Lands/ Marginal Swamps | 12,500 | 1.5 |
| 4 | Ponds | 7,277 | 0.9 |
| 5 | Lakes | 5,000 | 0.6 |
| 6 | Reservoirs | 1,500 | 0.2 |
| | Total | 819,277 | 100.00 |

*Source: Directorate of Fisheries Development, Kathmandu, Nepal (DoFD 2012).*

Lakes and ponds, classified by the Ramsar Convention, add to Nepal's wetland diversity. The country's permanent lakes fall into categories such as glacial, tectonic, and oxbow lakes, with glacial lakes being predominant in high-altitude regions. Nepal's lakes are estimated to hold around 3% of the nation's total water resources, with notable examples including Rara Lake and Shey Phoksundo Lake. Additionally, the mid-hill and mountain regions harbor numerous freshwater lakes and ponds, with the Pokhara Valley hosting well-known subtropical lakes like Phewa, Begnas, and Rupa.

The Terai region of Nepal features several lakes and ponds, with Ghodaghodi, Badhaiya, and Beeshazar among the largest. Marshes and swamps are prevalent in floodplain areas, providing habitat for diverse vegetation and wildlife. Alpine and tundra wetlands situated above 4,000 meters are characterized by non-forested peatlands and shrub-dominated ecosystems. However, comprehensive data on these wetland types is lacking, highlighting the need for further research and conservation efforts.

Human-made wetlands, including cultural ponds and agricultural lands, are also significant in Nepal. Kathmandu Valley, for

instance, boasts numerous ponds of religious and aesthetic importance, while aquaculture ponds are widespread, particularly in the Terai. The country's irrigated agricultural lands and water storage areas, such as the Indrasarovar of Kulekhani, contribute to both agricultural productivity and water resource management. However, the extent and impact of various anthropogenic wetland features, such as canals, drainage channels, and gravel pits, remain largely unquantified.

In summary, Nepal's wetlands comprise a wide range of ecosystems, from rivers and lakes to marshes and human-made ponds. These diverse habitats support rich biodiversity and provide essential ecosystem services, underscoring the importance of their conservation and sustainable management.

## Threats to Wetland Biodiversity

Wetlands are integral parts of their watersheds, and hydrology is the prime driving variable for the generation and maintenance of their biodiversity. Hence, all activities that alter the hydrological regimes, directly or indirectly, influence biodiversity too. The primary threats to wetlands and their biodiversity include diversion, channelization, and the regulation of river flows through the construction of dams, dykes, barrages (weirs), and canals, as highlighted by Dudgeon (2000) and Dudgeon et al. (2006). Additionally, elevated rates of erosion from catchments, attributed to activities such as deforestation, grazing, and agriculture, lead to increased siltation, ultimately altering hydrological regimes and biodiversity. Furthermore, increased silt loads in wetlands directly impact plant and benthic communities, as noted by Wantzen (1998).

Wetlands are directly impacted by activities such as conversion for aquaculture, paddy cultivation, and other land uses. Overexploitation of wetland resources further threatens their integrity. Poaching and the collection of ornamental plants and animals also pose risks to wetland species. Grazing by domestic cattle is common but can lead to degradation in some areas due to overgrazing. Additionally, practices such as sediment extraction influence benthic faunal diversity. Harvesting and cultural practices, as well as urbanization, have been shown to cause large changes in the genetic diversity of fishes (Nelson and Soulé 1987; Goodman 1990; Thorpe 1993). Human activities, including encroachment and the discharge of wastewater directly into wetlands, alter hydrology and nutrient levels, diminishing biodiversity. Furthermore, sedimentation, pollutants, and nutrients from runoff in catchments and adjacent open waters also adversely affect biodiversity.

In Nepal, wetlands are facing threats primarily due to habitat destruction, largely stemming from human activities. According to the National Biodiversity Strategy and Action Plan (MoFSC, 2014), wetland areas in Nepal have decreased by 5.41% as a result of the expansion of croplands. In the Terai region, industrial effluents have been causing degradation of both land and water quality. A survey by IUCN revealed that out of the 163 wetlands examined, 61 percent showed severe impacts from agricultural run-off. Additionally, in Koshi Tappu, many wetlands have transitioned to eutrophic states due to the accumulation of nutrients from both natural sources and human activities (Regmi et al. 2021; Shrestha et al. 2021). The overexploitation of plants and animals within wetlands is also a significant factor contributing to the decline in wetland biodiversity. Instances of illegal activities such as illegal fishing, poaching, and deforestation have been documented in various Ramsar sites across Nepal (Upadhaya et al. 2009; Neupane et al. 2010; IUCN, 2015).

Similarly, Invasive Alien Species (IAS) are emerging as a significant threat to wetland biodiversity in Nepal (Table 4). The rapid proliferation of these invasive species accelerates ecological succession, leading to drastic modifications in wetland habitats, ultimately transforming them into marshy or even dry land. The impact of IAS is particularly pronounced in the majority of wetlands in the hilly and Terai regions, where these species spread rapidly, impacting the habitats of wetland-dependent flora and fauna. For

instance, water hyacinth (Pontederia crassipes) has been present in the country for many years and is widely distributed, presumed to have caused alterations to aquatic ecosystems to some extent (IUCN, 2004). In Koshi Tappu Wildlife Reserve and Chitwan National Park, Mikania mikrantha has posed significant threats to native vegetation and has led to a decline in the biomass production of forage species for Wild Water Buffaloes (Bubalus arnee) and One-horned Rhinos (Rhinoceros unicornis), respectively (Khatri et al., 2010; Subedi, 2013).

**Table 4- Major Threats to the Wetland of International Importance**

| S.N. | Ramsar Listed Wetlands | Major Threats |
|---|---|---|
| 1 | Koshi Tappu | Eutrophication due to agricultural runoff, overgrazing, sedimentation, overfishing, poisoning, invasive alien species |
| 2 | Ghodaghodi Lake | Invasive alien species, overharvesting of aquatic species, overfishing, poisoning, poaching, pollution due to pilgrims, eutrophication |
| 3 | Jagdishpur Reservoir | Eutrophication, invasive alien species, poaching, extensive fishing, siltation |
| 4 | Beeshazari and associated lakes | Invasive alien species, agricultural runoff |
| 5 | Rara Lake | Encroachment, pollution |
| 6 | Phoksundo Lake | Pollution due to open defecation |
| 7 | Gosaikunda and associated lakes | Pollution from tourism activity |
| 9 | Mai Pokhari | Invasion of alien species |
| 10 | Lake cluster of Pokhara valley | Disposal of domestic sewage, eutrophication, sedimentation, invasion of alien species, commercial fishing |

*Adopted from DNPWC and DoFSC (2023). Wetland Health Report Card.*

Global climate change poses serious threats to wetlands due to increased carbon dioxide concentrations, rising temperatures, and unpredictable precipitation patterns (Gitay et al., 2001). These changes are expected to alter plant and animal communities in northern latitudes, impacting wetland ecosystems (Weltzin et al., 2000; Graham, 2003; Keller et al., 2004). In Nepal, rapid warming has accelerated glacier retreat and snowmelt, notably in the Sagarmatha region where glaciers have receded by approximately 14.3±5.9% between 1950 and 2011 (Shrestha and Aryal, 2011; Chaulagain, 2009; Thakuri et al., 2013). Climate-induced shifts in hydrological regimes threaten the water supply and quality essential for wetlands. There are also concerns about the potential range shifts of vulnerable species like the relict Himalayan dragonfly and biome shifts in Nepal due to climate change (Tachamo Shah et al., 2012; MoPE, 2004; Zomer et al., 2014). Furthermore, warming is expected to worsen issues such as invasive species infestations, exacerbating challenges faced by these ecosystems (Rai and Scarborough, 2012).

## Wetland Conservation and Management Initiatives

Wetlands make excellent habitats for wildlife. Because of their connections to the Himalayan water dynamics, Nepal's wetlands are recognized as biological hotspots and supermarket of bio-genes (Pokharel & Nakamura, 2010). Wetland conservation contributes to achieve almost all Sustainable Development Goals (SDGs). It is specifically linked to Goal 6 (Clean water and sanitation); Goal 13 (Climate Action); Goal 14 (Life below water) and Goal 15 (Life on land). These Goals are directly linked to wetland conservation; and interconnectivity with other SDGs is essential to achieve holistic sustainable development.

Nepal has taken a number of steps to conserve and safeguard the wetland ecosystems since ratifying the Ramsar convention in 1987 and designating Koshi Tappu as a Ramsar site of world significance. The Constitution of Nepal (2015) has prioritized conservation of natural resources. The Ministry of Forests and Environment (MoFE) plays a crucial

role serving as the focal ministry for wetland conservation and management in Nepal. Within MoFE, the Department of National Parks and Wildlife Conservation (DNPWC) acts as the Ramsar Administrative Authority, overseeing the management of Ramsar Sites situated within protected areas (PA's) across the country. These Ramsar Sites include the Koshi Tappu (Koshi Tappu Wildlife Reserve), Beeshazari Tal (Chitwan National Park), Gokyo Lakes Complex (Sagarmatha National Park), Phoksundo Lake (Shey-Phoksundo National Park), Rara Lake (Rara National Park) and Gosaikunda and Associated Lakes (Lamtang National Park).

Meanwhile, the Department of Forests and Soil Conservation (DoFSC) manages wetlands outside protected areas which include Ramsar designated wetlands including Ghodaghodi Lake, Jagdishpur Reservoir, Mai Pokhari and Lake Cluster of Pokhara valley and other wetlands of the country. DoFSC operates through its dedicated Wetland Section under the Watershed and Landslide Management Division. This division has undertaken extensive work, including wetland inventory, coordination with related stakeholders for wetland management, conducting national workshops, water sources protection, construction of conservation ponds, wetland conservation and management, and implementing field-level wetland conservation and management initiatives through four Basin Management Centres (Basin Management Center- Koshi, Gandaki, Karnali, and Mahakali). The activities and programs are effectively implemented according to approved budgets and plans. Furthermore, the Federal Watershed Management Resource Center (FWMRC), Kulekhani, Makwanpur of the DoFSC serves as a crucial resource and research hub, focusing on research activities related to the wetlands of Nepal and also implementing wetland and watershed-related conservation and management initiatives.

Various conservation plans and policies in Nepal, including the National Ramsar Strategy and Action Plan (2018-2024), National Wetland Policy (2012), National Biodiversity Strategy (2002), National Biodiversity Strategy and Action Plan (2014-2020), Nature Conservation National Strategic Framework for Sustainable Development (2015), National Land Use Policy (2015), Forest Policy (2015), Forestry Sector Strategy (2016), Aquatic Animal Protection Act (1960), and Soil and Watershed Conservation Act (1982), demonstrate the country's commitment to the conservation and management of wetlands. Integrated management approaches have been emphasized in various plans, such as Nepal's tenth five-year plan (2002-2007), which focused on integrated watershed management. Additionally, the government introduced integrated water resource management approaches in the Water Resource Strategy (2002).

The country has several institutional frameworks at local, provincial, and federal levels to conserve wetlands and their resources. Wetland conservation is primarily the responsibility of the federal government. Wetlands of international importance are managed by the central government due to their status under international treaties. Nonetheless, the management of all the wetlands is a shared responsibility among all three tiers of government. The role of local governments is especially significant, as they are situated in close proximity to the wetlands. Besides this, Partnerships between Intergovernmental parties such as International Union for Conservation of Nature Nepal (IUCN-Nepal), International Centre for Integrated Mountain Development (ICIMOD), World Wide Fund for Nature Nepal (WWF-Nepal), National Trust for Nature Conservation (NTNC), Zoological Society of London (ZSL) Nepal, Bird Conservation Nepal (BCN), and others, have been instrumental in collaborating with the MoFE to undertake initiatives for wetland restoration and conservation. These joint efforts have included the development of diverse inventories and assessments aimed at enhancing understanding and safeguarding these crucial ecosystems.

There are various approaches for the conservation and wise use of wetland in Nepal. Integrated watershed management approach

is one of the best ways to conserve wetland ecosystem along with other resources like forest, land, wildlife, etc. in an integrated way to achieve the objectives of the SDGs. Similarly, integrated water resource management approach, integrated lake basin management approach and cooperative management of lakes have also been adopted in Nepal by various institutions. The concept of Payment for Ecosystem Services (PES) is emerging but not actually practiced in case of wetland conservation in Nepal. There are many best practices of wetland management in Nepal which include community-led conservation initiatives, sustainable livelihood programs, designating key wetlands as protected areas, implementing holistic water resource management strategies as well as construction of artificial wetlands.

## Conclusion and Way Forward

Wetlands are invaluable ecosystems that serve as vital habitats for a wide range of plant and animal species, crucially contributing to biodiversity conservation. However, these habitats face rapid degradation, posing significant threats to their ecological integrity and the services they provide. To effectively address these challenges, it is imperative to transition towards holistic ecosystem management that considers the entire wetland catchment, not just the water-covered area. Moreover, the wise use of wetlands and their biodiversity, alongside conservation, is essential to benefit human well-being while ensuring the sustainability of these ecosystems.

Despite the existing institutional frameworks, effective coordination and cooperation among the three tiers of government remain insufficient. There is a noticeable gap in aligning policies with the constitution, which hampers cohesive and efficient wetland management. To address this issue, policy revisions are necessary to clearly define the roles and responsibilities of each governmental level, to establish robust mechanisms for intergovernmental cooperation, and to ensure that all policies are consistent with constitutional directives. Furthermore, updating these policies to align with the new governance structure will provide a guiding framework for provincial and local governments to manage wetlands effectively within their jurisdictions. Such revisions would enhance the effectiveness of wetland conservation and wise use efforts, ensuring sustainable management of these critical ecosystems across all regions.

Achieving sustainable wetland management requires robust coordination and collaboration among diverse stakeholders at local, national, and international levels. This collaborative effort should prioritize comprehensive strategies encompassing conservation initiatives, restoration projects, and sustainable management practices that include the wise use of wetland resources. It is essential to adopt community-centric approaches that empower local communities through education, sustainable livelihoods, and inclusive governance, fostering ownership and stewardship of wetland resources. In addition, developing and implementing climate-responsive strategies is crucial for enhancing wetland resilience in the face of climate change impacts. This involves leveraging innovative technologies for effective monitoring and surveillance, integrating data analytics and remote sensing to inform adaptive management decisions, and implementing measures that promote ecosystem health and sustainability.

By incorporating these integrated approaches and committing to proactive intervention, we can ensure the continued existence and vitality of wetlands. This effort not only safeguards biodiversity but also promotes the wise use of wetlands and its resources for human well-being, securing the essential ecosystem services these wetlands provide for the benefit of current and future generations.

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## Presentation 4: Watershed Management for Wetland Sustainability

**Presenter: Mr. Badri Raj Dhungana**

In the presentation entitled "Watershed Management for Wetland Sustainability," Badri Raj Dhungana, Joint Secretary at the Ministry of Forests and Environment, presented the crucial aspects of watershed. Covering the general concepts, the presentation elucidated watersheds as topographically delineated areas draining water to a common point, emphasizing their pivotal role in natural resource management. The talk extended to Integrated Watershed Management (IWM), showcasing its multidimensional approach, encompassing social, economic, and environmental considerations for sustainable land use and improved water quality.

The presentation also addressed the interconnectedness of watersheds and wetlands, stressing the need for thoughtful watershed management practices to ensure the health and sustainability of both ecosystems. Mr. Dhungana highlighted the broader scope of IWM, encompassing various developmental aspects, including infrastructure improvement and climate change mitigation. He also pointed to constitutional provisions, national policies, and the draft of the National Comprehensive Watershed Management Strategy as evidence of the country's commitment to environmental conservation and the multifaceted sustainable management of water resources.

Furthermore, the presentation shed light on the Soil Conservation and Watershed Management (SCWM) program, detailing its objectives such as livelihood improvement, water resource development, disaster reduction, climate change resilience, and contributing to the national vision of a prosperous and content society. The discussion emphasized the need for policy support, legal frameworks, budgetary allocations, and institutional collaborations to ensure the effective execution of watershed management initiatives in Nepal.

# Watershed Management for Wetland Sustainability

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***KEYWORDS***

*Ecological Integrity,*
*Holistic Strategy,*
*Integrated Approach,*
*Phewa Watershed,*
*Wetland Conservation.*

**ABSTRACT**

Watershed management plays a crucial role in wetland conservation by ensuring the regulation of water flow, quality, and quantity within a watershed, thus preserving the ecological integrity of wetlands. This approach helps in reducing pollution, preventing erosion, controlling sedimentation, and maintaining hydrological balance, which are vital for sustaining biodiversity and supporting essential ecosystem services like flood control and water filtration. Integrated watershed management (IWM) adopts a holistic strategy that addresses factors such as land use, water quality, and ecological health, promoting the long-term sustainability of wetland habitats. In the context of Nepal, where wetlands are under increasing threat from human activities, climate change, and invasive species, IWM not only protects wetlands but also engages local communities in conservation efforts. The preservation of these ecosystems is critical, as they offer essential resources to many rural communities and are key in maintaining environmental resilience against floods and other natural disasters.

Nepal's policies and institutional frameworks emphasize the importance of watershed and wetland conservation. Various policies like the National Wetland Policy 2013, National Water Resource Policy 2020, and the recent National River Basin Management Strategy 2023 support integrated management approaches. These policies encourage the sustainable use of wetland resources and emphasize the role of wetlands in enhancing biodiversity and supporting local livelihoods. Moreover, efforts such as the declaration of Phewa Lake Watershed as a protected area demonstrate Nepal's commitment to wetland conservation. Collaboration across federal, provincial, and local levels, alongside community engagement, is critical for the successful implementation of watershed management initiatives aimed at preserving the ecological and cultural significance of wetlands across the country. This paper aims to explore the interlinkages between watershed management and wetland conservation, specifically examining the policies and institutions adopted in the Nepalese context to address these critical issues. By highlighting the challenges and opportunities in integrated management practices, this paper seeks to contribute to a deeper understanding of sustainable wetland management in Nepal.

## Introduction

Watershed management is essential for conserving and protecting wetlands because it ensures the holistic regulation of water quality, quantity, and flow within a watershed (Heathcote, 2009). By controlling pollution, preventing erosion, maintaining hydrological balance, and promoting sustainable land use, watershed management prevents harmful contaminants from reaching wetlands, reduces sedimentation, and sustains the ecological integrity of these vital habitats (Pandit et al., 2007; Talib & Randhir, 2017). Watershed management approach not only supports biodiversity and climate regulation but also

enhances flood mitigation and engages local communities in conservation efforts (Malawani et al., 2024), thereby securing the long-term health and functionality of wetland ecosystems (Basuki et al., 2022;).

Despite the critical role watershed management plays in wetland conservation, wetlands themselves are under significant pressure from siltation, sedimentation, invasive species, and human encroachment, all of which threaten their ecological integrity (Gardiner, 1994). These pressures can degrade the quality of wetland environments in the short term by disrupting habitats, reducing water quality, and altering natural processes (Williams, 1993). In the long term, such stresses may lead to the complete loss of wetlands, erasing their vital ecological functions, such as water filtration, flood control, and habitat provision for diverse species (Hu et al., 2017). Therefore, effective management and conservation strategies are crucial to protect these valuable ecosystems from both immediate and future threats.

Watershed management, following an integrated approach, can be an effective technique for sustainably managing wetlands (Biswasroy et al., 2011). This method considers the entire watershed's interconnected systems, addressing various factors such as water quality, land use, and ecological health. By controlling pollution, reducing sedimentation, managing invasive species, and regulating human activities, integrated watershed management helps maintain the ecological balance of wetlands (Ondieki, 2014). This holistic strategy ensures that wetlands continue to provide essential services like water filtration, flood control, and habitat for biodiversity, ultimately supporting their long-term sustainability and resilience (Aglanu, 2014).

In this paper, we mainly discussed the interlinkages of watershed management for wetland conservation, shedding lights on the policies and institutions adopted for watershed and wetland management in Nepalese context.

## Concept of Watershed, Wetlands and Watershed Management

### Concept of watershed

Watershed is simply geographical area which sheds water to a common point. A topographically delineated area of land from which all the water drains to a common point into a stream, channel, a river, a lake, a reservoir or other body of water (Tideman, 1996). A hydrological unit that has been described and used as a bio-physical unit and also, on many occasions, as a socio-economic-political unit for planning and management of natural resources. The terms watershed, drainage area, catchment area, river basin and drainage basin area are synonyms. May differ in use while considering the size of the catchment (Figure 1).

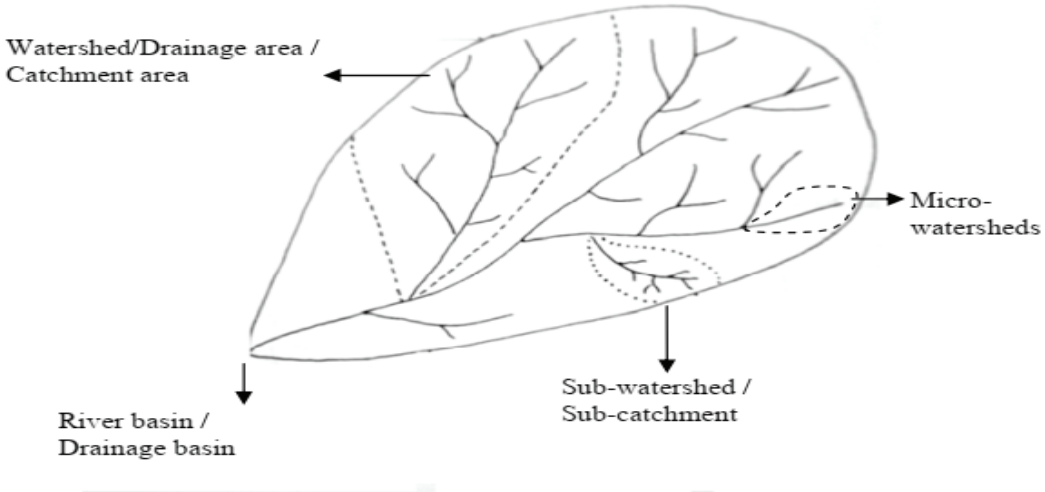


Figure 1. Watershed

**Figure 1: Typical watershed showing various classes of watershed viz. Basin, Watershed, Sub-watershed, Micro-watershed**

**Classification of watershed based on size**

A small watershed forms a part of larger watershed, which in turn forms part of a still larger watershed, until the combined watersheds may become a major river basin draining millions of square kilometers of land.

The size and order of a river are crucial in determining the scale of its watershed. A first-order stream, which has no tributaries, drains a small area known as a micro watershed. When two first-order streams merge, they form a second-order stream, draining a larger sub watershed. As streams of higher order form through successive merging, the watersheds they drain become increasingly extensive. Third-order and higher order streams constitute larger watersheds, encompassing multiple sub watersheds. At the largest scale, a river basin includes the entire drainage area of a major river system, integrating numerous tributaries and streams of various orders and multiple watersheds. This hierarchical structure, from micro watersheds to vast river basins, is fundamental for managing water resources and understanding ecological and hydrological dynamics.

Some scientists have classified the watershed into different categories.

Negi (2003) classified such watersheds as follows.

(i) **Micro-watershed:** catchment of a primary channel,
(ii) **Sub-watershed:** catchment of a secondary channel which consists of one or more micro watersheds,
(iii) **Watershed:** catchment of a larger channel, stream or river which comprises of a number of micro-watersheds and sub-watersheds,
(iv) **River basin:** catchment of a big river comprises a number of large watersheds.

Similarly, on the other hand, Darghouth et al., 2008 has classified watershed units in a discussion paper series by world bank as follows:

**Table 1: Classification of Watershed Units**

| Watershed Unit | Typical Area (Sq.Km.) |
|---|---|
| Micro-watershed | 0.05-0.5 |
| Sub-watershed | 1-10 |
| Watershed | 10-100 |
| Sub-basin | 100-1,000 |
| Basin | 1,000-10,000 |

**Concept of wetlands**

Wetlands are unique ecosystems where water saturation is the primary factor influencing the environment, as well as the plant and animal life that thrive there (Brinson, 1993). These areas can be characterized by their distinct hydrology, soil types, and biota, making them vital for biodiversity and ecological health. Wetlands include marshes, swamps, bogs, and fens, each hosting specific plant species adapted to wet conditions, such as reeds, cattails, and mangroves (Butt et al., 2021). The animal life in wetlands is equally diverse, supporting a wide range of species, including amphibians, birds, fish, and invertebrates, which rely on the wetland habitat for breeding, feeding, and shelter (Mitsch et al., 2015). Furthermore, wetlands provide critical ecosystem services, such as water filtration, flood control, carbon storage, and shoreline stabilization, making their conservation and sustainable management essential for environmental health and resilience against climate change impacts (Xu et al., 2020). Convention (Article 1.1), wetlands are defined as: "areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six meters" (Millennium Ecosystem Assessment, 2005).

Wetland ecosystems are integral components of larger watersheds, playing vital roles in regulating water flow, improving water quality, and supporting biodiversity. Positioned at the interface between land and water, wetlands act as natural buffers that filter pollutants and sediments from surface runoff, thereby enhancing the overall health of the watershed. They contribute to groundwater recharge and provide essential habitats for a wide range of plant and animal species. Additionally,

wetlands help mitigate floods by absorbing and gradually releasing excess water, reducing downstream flood risks (Nayak & Bhushan, 2022). By sequestering carbon, they also play a role in climate change mitigation. Therefore, the preservation and sustainable management of wetlands are crucial for maintaining the ecological integrity and resilience of entire watersheds. Activities in the watershed directly impact the water quality, quantity, and flow reaching the wetlands (Biswasroy et al., 2011). There are intricate connections between upstream activities and downstream wetland ecosystems, meaning that proper watershed management is essential for ensuring the sustainability of wetland services. By implementing sustainable land-use practices, controlling pollution sources, and maintaining natural hydrological patterns, we can protect and enhance the vital functions that wetlands provide, such as water filtration, flood control, and habitat for biodiversity (Leemhuis et al., 2017).

Wetlands play a vital role as highly productive ecosystems, carrying significant ecological, cultural, and economic importance. They are essential for the well-being, safety, and sustainability of both ecosystems and communities. Serving as crucial resources, wetlands are central to the livelihoods of many rural communities, with approximately 10% of ethnic groups in Nepal relying on these resources for their subsistence (Karki & Thomas, 2004; Sharma et al., 2019).

**Ramsar sites in Nepal**

According to the Ramsar Sites Information Service 2024, Nepal is home to 10 designated Ramsar Sites, each contributing significantly to the country's biodiversity and ecological richness. These sites encompass a wide range of ecosystems, spanning from the lowlands to the high Himalayas. Notable lowland sites include Koshi Tappu (17,500 ha), Ghodaghodi Lake (2,563 ha), Jagadishpur Reservoir (225 ha), and Beeshazari and Associated Lakes (3,200 ha). In the Himalayas, prominent Ramsar sites include Rara Lake (1,583 ha), Phoksundo Lake (494 ha), Gosaikunda and Associated Lakes (1,030 ha), and Gokyo and Associated Lakes (7,770 ha). Additionally, the Lake Cluster of Pokhara Valley in the mid-hill region stands out with an area of 26,106 ha, while Mai Pokhari (90 ha) is another significant Ramsar site in the mid-hills. These Ramsar Sites underscore Nepal's dedication to preserving its wetland ecosystems, which are vital for maintaining ecological balance and supporting diverse habitats and communities across the country's varied landscapes.

## Watershed Resources and management

**Watershed Resources**

All watersheds contain many kinds of natural resources: soil, water, forest, wildlife etc. (Wetlands within the watershed are also components of the watershed resources). In developing and managing a watershed, the use of some natural resources will be complementary while others will be competitive. For instance, logging may affect water resources and recreation, whereas changing intensive land use to lesser intensive ones may benefit soil and water resources. Thus, key concern is to use watershed resources as efficiently and perpetually as possible, with minimum disturbance to the watershed as a whole.

Watershed management is the process of formulating and carrying out a course of action involving the manipulation of resources in a watershed to provide goods and services without adversely affecting the soil and water base (Singh et al, 1990). Watershed management is a term used to describe the process of implementing land use practices and water management practices to protect and improve the quality of the water and other natural resources within a watershed by managing the use of those land and water resources in a comprehensive manner. The three main components in watershed management are land management, water management and biomass management. The main objective of watershed management is to manage land, water and other natural resources within the watershed area on a sustainable basis (Wolter, 2017).

**Integrated watershed management**

Integrated Watershed Management (IWM) is the process of managing human activities and natural resources on a watershed basis, taking into account social, economic, and environmental issues, as well as local community interests and issues such as the impacts of growth and climate change (Dixon & Easter, 2018). This holistic approach aims to balance the diverse needs and priorities within a watershed, ensuring sustainable use of resources while protecting and enhancing ecosystem health. IWM involves collaboration among various stakeholders, including government agencies, local communities, industries, and environmental organizations, to develop and implement strategies that address water quality, land use, biodiversity, and climate resilience (Mutekanga et al., 2013). By considering the interconnectedness of upstream and downstream areas, IWM promotes practices that mitigate pollution, manage water resources efficiently, and preserve natural habitats, thereby supporting the long-term viability and health of the entire watershed.

The framework published by Food and Agriculture Organization of the United Nations addresses the urgent need to ensure food security, promote sustainable agricultural practices, and enhance the livelihoods of rural populations (Micheli et al., 2006). It is a comprehensive approach designed to integrate various aspects of conservation, infrastructure improvement, disaster mitigation, and income generation. In Nepal, soil conservation and watershed management encompass a wide range of activities, integrating forestry, agriculture, pasture, and water management practices aimed at controlling erosion. Watershed management can range from targeting specific issues like soil erosion to supporting broader rural development goals of local organizations.

Upadhyay (1985) explained Integration may

- be limited to management of wild-land associated with water resource development (narrow focus).
- management of agriculture, forest and grazing lands associated with water resource development (Broader focus).
- include all aspects of development e.g., agricultural, forest, grazing, health, education, market, transport, credits etc. (Rural development focus). Integration must include optimal range of activities so that below which impact are not created and above which operational complexities retard the progress.

**Necessity of Integrated Watershed Management (IWM)**

Many studies have shown that drinking water may become scarce resource in near future. In the current context too little water and too much water is becoming water induced disaster such as flood, landslide, waterlogging is of the key concerns. Mainly destructive activities such as deforestation, forest fire, mining, unplanned construction, slopping agricultural activities has resulted in negative impacts in downstream region of the watersheds including settlements, agricultural lands and wetlands. On the other hand, changing climate is exacerbating the frequency of such disastrous events in recent years. So, to manage scarce water resource for sustainable livelihood, to mitigate water induced disasters to reduce the negative impacts of upstream activities in downstream integrated management becomes necessary. Watershed is an ideal unit for planning and implementation of adaptation and mitigation activities concerning disaster and climate change. Thus, sustainable watershed management in an integrated way can contribute in developing resilient communities.

## Watershed Management Policies and Institutions in Nepal

In Nepal, watershed management is crucial due to the country's diverse topography and climatic conditions, which contribute to varied and sensitive ecosystems. The Government of Nepal has adopted several policies and institutional frameworks to support integrated watershed management.

**Policy and institutions:**

**i. Constitution of Nepal**

Constitution of Nepal has clearly provisioned exclusive and concurrent rights among the federal, provincial and local level government in the schedule 5 to 9. In schedule 5, conservation and multidimensional use of water resources, national and international environment, wetlands, National Forest Policy, Environmental adaptation, Settlement Development Policy, Carbon Services were listed as concurrent power list among Federal, Provincial, and Local levels.

In schedule 6 and 7, Environment management, Environmental protection, Biodiversity, Natural and non-natural disaster preparedness water use were listed as concurrent rights between provincial and federal government.

In schedule 8 and 9, environmental protection and biodiversity, watershed conservation as an exclusive power are provided to local government.

**ii. National Forest Policy 2019**

National Forest Policy 2019 has envisioned long vision to contribute in developing Nepal's social, economic, and cultural prosperity through a managed forestry sector and balanced ecosystems. It has objectives to enhance productivity and product of forestry sector and environmental services. This policy has clearly mentioned about:

(i) Integrated conservation and management of soil and water conservation to create healthy watershed and productivity of land.
(ii) Chure watershed conservation and management based on upstream downstream linkages.
(iii) Conservation, management, and sustainable utilization of wetlands.

**iii. National Wetland policy 2013**

National wetland policy has envisioned a main goal of conservation and management of wetland areas for sustainable and wise utilization of wetland resources. It has strategic approach of managing wetland resources either as individual wetlands or comprehensively at watershed level through sustainable and wise utilization.

Major policy intervention mentioned are (i) to identify and prioritize the important wetland areas for their conservation, restoration, and management (ii) to integrate conservation and management of wetland areas based on their natural characteristics, either as individual wetlands or at the watershed level (iii) to implement various mechanisms for the regulation of environmental service fees.

**iv. National River Basin Management Strategy 2023**

This policy has vision to ensure environmental sustainability and contribute to national prosperity through comprehensive and sustainable management of water resources. The major objectives of the strategy are (i) To enhance availability and productivity of soil and water resources through comprehensive conservation and sustainable management practices, ensuring equitable and rational utilization of environmental services (ii) To mitigate climate-related challenges by promoting resilience and sustainability through adaptive water resource management, fostering dynamic and clean water systems for environmental balance. It has identified 6 Policies, 13 Strategies, and 32 Action Plans to accomplish the goals and objectives of the strategy. For holistic governance of water resources, coordination, cooperation, and coexistence among all three levels of government will be promoted through institutional and policy reinforcement.

**v. National Water Resource Policy 2020**

This policy has a vision to create economic prosperity and social transformation through sustainable, equitable, and inclusive development and multi-purpose utilization of water resources. It highlighted the need of management and utilization of water resources based on river basin management plans. It has highlighted that management and utilization of water resources will be conducted based on river basin management plans. Further, it has highlighted the need for effective water resource management to control and mitigate water-related disasters.

**vi. Evolution of Institution for Watershed Management**

Department of Soil and Water Conservation was established in the year 1974, which officially started the management of watersheds in the country. In 2018, four Basin management centers were established to manage 4 major river basins of Nepal namely Koshi, Gandaki, Karnali and Mahakali. The evolution of the Department of Soil and Water Conservation is presented in Figure 2 below.

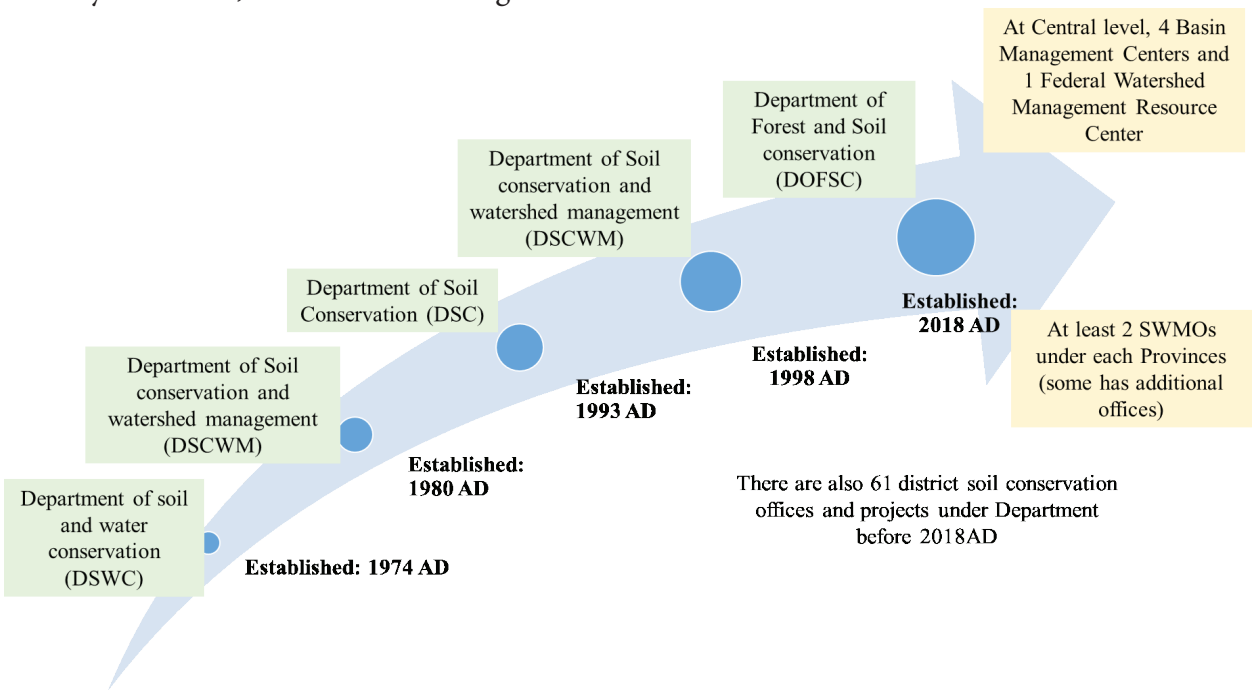


**Figure 2: Evolution of Institution for Watershed Management**

**Potential areas of cooperation between the federal, provincial, and local levels**

Potential areas of cooperation between the federal, provincial, and local levels include policy, legislation, laws, and standards, which involve facilitating necessary simplification in subject-specific technical standards and procedures. This cooperation extends to data collection, information generation, and dissemination, necessitating the development of appropriate infrastructure. In the realm of technology development and knowledge transfer, collaboration and partnership in operational studies and research are crucial, along with continuous interaction for effective technology transfer. Additionally, the coordination of budget, program implementation, and transfer across federal, provincial, and local programs is essential. Continuous monitoring of water resources, including large-scale water resources, water sources, groundwater, and micro-water resources, is another critical area. Lastly, establishing a policy framework for the payment of water services and environmental services is imperative for cohesive and effective management across all levels of government.

**Potential areas for functional collaboration and partnership:**

Potential areas for functional collaboration and partnership encompass a variety of initiatives. These include land use mapping and collaboration in disaster risk mapping, information gathering, and management. Additionally, the preparation of a watershed atlas with sensitivity at the provincial and local levels is essential. Efforts in climate change adaptation and building resilience, such as through the NAPA/LAPA/CAPA continuum, are also crucial. Landscape-level programs focusing on watershed prioritization, mapping, developing technical standards, zoning management, and water source management play a significant role. Demonstration programs, like the development of one city-one watershed management demonstration site, can serve as effective models. Human resource management, along with the development of technical capacity and skills through training

sessions and workshops, is vital. Furthermore, policy and functional collaboration in good governance and management are necessary for cohesive operations. Finally, budget allocation for programs aimed at controlling emergency land erosion and landslides under disaster management is imperative for proactive and effective responses. The implementation of all these activities requires careful organization, active community engagement, and meticulous budget planning. It also necessitates the development of subject-specific and sectoral policies, along with inter-agency coordination mechanisms to ensure cohesive efforts. Regular interaction, collaboration, and partnership among all stakeholders are essential to drive these initiatives forward effectively.

## Declaration of Phewa watershed as a protected watershed to conserve Phewa Lake

Phewa Lake, the biggest lake of the Lake Cluster of Pokhara Valley was enlisted on the Ramsar sites on February 2, 2016. This wetland has been established as an important tourist destination due to its rich biodiversity and beautiful landscapes. It is the most popular and most visited lake in Nepal. The lake also has significant cultural value due to the Tal Barahi temple on a small island at the lake. Despite its national and international significance, the lake area is shrinking due to encroachment and its water quality and quantity are declining due to sedimentation and pollution. The government of Nepal has declared the Phewa Watershed with its area of 123 km2 as Protected Phewa Lake Watershed according to section 3, sub-section 1 of Soil and Watershed Conservation Act 2039 on 28th February 2022. It provides the legal arrangements for the proper management of Phewa Lake and for enhancing the local well-being. Basin Management Center, Gandaki is implementing Phewa watershed management activities in collaboration with government and non-governmental organizations.

## Way forward

Wetlands are part of larger watersheds thus soil conservation and watershed management interventions must be implemented for the sustainability of wetlands. Maintaining healthy watersheds necessitates relevant policy support, legal backing, budget and program support, and the establishment of appropriate institutions for execution. Integrated watershed management needs to consider Livelihood Improvement, Water Resource Development, Disaster Reduction/ Mitigation, Climate Change Resilience, and Adaptation in a holistic way. Furthermore, a robust coordination, collaboration, and cooperation mechanism is essential to ensure the successful implementation of these initiatives in the federal context of Nepal.

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## Concluding Remarks and Closing of the Thematic Session:

Dr. Maheswor Dhakal, the session chair for a thematic session featuring four presentations, concluded the session by providing a comprehensive summary of each presenter's key points. Regarding Dr. Shailendra Pokharel's presentation, Dhakal emphasized the need to augment budgets and programs for wetland conservation, reinforce existing policies, and ensure timely and high-quality reporting of Ramsar documentation.

Moving on to Dr. Rajesh Kumar Rai's presentation, Dhakal highlighted the intersection of environment and economics, exemplified by the case of Bojho and Singhara. Rai's focus on aligning philosophy and action to address changes in wetlands and their reciprocal impact on livelihoods was noted. Furthermore, Mr. Dr. Maheswor Dhakal highlighted Dr. Rai's emphasis on the importance of avoiding both overexploitation and excessive protection of natural resources, advocating for value addition and a nuanced understanding of wetland resource preferences.

Dr. Dhakal then summarized Deepak Jnawali's presentation, which centered on wetland biodiversity, ecosystem services, their significance for human well-being, and the Department of Forests and Soil Conservation's (DoFSC) role in ensuring wetland sustainability. Similarly, Dhakal concluded Mr. Badri Raj Dhungana's presentation by underscoring the critical role of watershed management in maintaining healthy wetland ecosystems. He highlighted Dhungana's emphasis on the necessity of increased budget allocations, manpower, and training for the sustainable management of wetlands.

In conclusion, the thematic Session was a diverse collection of valuable information and expertise. It included discussions on Ramsar Implementation, the Social and Economic Factors affecting Wetlands, and the Environmental Aspects of Wetlands. The presentations by Dr. Shailendra Kumar Pokharel, Professor Dr. Rajesh Kumar Rai, Mr. Dipak Jnawali, and Mr. Badri Raj Dhungana collectively contributed to a holistic understanding of the challenges and opportunities in wetland conservation and management. In this way the thematic session ends.

# V. Panel Discussion- "Sustainable Management of Wetlands"

## Introduction

The panel discussion on sustainable management of wetlands, facilitated by Dr. Naya Sharma Paudel, brought together an esteemed group of experts to delve into the challenges, opportunities, and strategic approaches to wetland conservation. The panelists included Dr. Maheshwor Dhakal, Chief of Participatory Forestry Division at the Ministry of Forests and Environment (MoFE); Dr. Narendraman Babu Pradhan, Conservation Partner and Country Representative of IUCN; Dr. Kalpana Devkota, a wetland expert and former CEO of the National Lake Conservation Development Committee; Mrs. Sita Shahi, representative of the National Lake Conservation Development Committee; and Mr. Lekh Nath Dhakal, Village Champion from the Rupa Lake Conservation Committee.


**Panel Discussion**

The panel discussion among various stakeholders focused on addressing current issues related to the sustainable management of wetlands and devising effective conservation strategies. This diverse panel brought together experts from various fields involved in wetland ecosystems. The primary goals of the discussion were to explore different perspectives on sustainable wetland management, share practical strategies and case studies for effective conservation, and emphasize the importance of community involvement and government support in ensuring the long-term sustainability of wetlands.

## Panel Discussion

**Moderator Dr. Naya Sharma Paudel**

Dr. Paudel began the discussion by asking Dr. Maheshwor Dhakal about the long-term security and legal arrangements for a community-based approach to wetland conservation. Dr. Dhakal responded by emphasizing the principle of "Everyone's property, no one's property." He argued that lakes should be developed not only for conservation but also for productivity, highlighting the crucial role of local community participation. He presented existing policies and initiatives aimed at sustainable wetland management, outlining the challenges and opportunities within this framework.

Addressing Mr. Lekh Nath Dhakal, Dr. Paudel inquired about his practical experiences and successful economic practices in implementing sustainable conservation measures. Mr. Dhakal shared his experiences, demonstrating the successful economic practices in sustainable conservation measures at Rupa Lake. He noted that starting with an investment of 9 lakhs, Rupa Lake now generates fish worth 2 crores annually. He mentioned that a budget of 4.5 billion has been allocated for the lake's conservation and highlighted the national-level standards impacting local communities during the construction of an irrigation dam in Rupa Lake.

Dr. Paudel then asked Dr. Kalpana Devkota about her experiences as the former CEO of the National Lake Conservation Development Committee in dealing with complexities such as socio-economic and political drivers. Dr. Devkota discussed the complexities of managing wetlands amidst socio-economic and political drivers. Drawing from her experience, she outlined strategies needed for balancing ecological systems with community needs. Dr. Devkota stressed the importance of addressing institutional weaknesses and ensuring robust policies and technology for effective wetland management.


Turning to Mrs. Sita Shahi, Dr. Paudel inquired about how sustainable wetland management affects different societies from a socio-economic perspective. Mrs. Shahi emphasized the multifaceted approach required by the National Lake Conservation Development Committee (NLCDC), which includes tourism, conservation, and management perspectives. She noted that the NLCDC is actively protecting 265 lakes, with a focus on those with economic, cultural, and bio-hotspot values. Mrs. Shahi underscored the need for effective vertical coordination mechanisms between diverse communities to ensure sustainable wetland management.

Finally, Dr. Paudel asked Dr. Narendraman Babu Pradhan about the key wetland conservation measures prioritized by the IUCN and whether federalism has brought additional support or introduced more complexity to their work. Dr. Pradhan highlighted the IUCN's prioritized conservation measures for wetlands, emphasizing the engagement of local communities. He noted that coordination and collaboration with the federal government, as well as working at provincial and local levels, have been crucial. Dr. Pradhan called for the mainstreaming of existing policies at the national level, stressing that sustainable conservation efforts should extend beyond the recognized Ramsar sites to other lakes across Nepal.

## Discussion on Participants Queries

The panel discussion highlighted critical questions and offered in-depth insights regarding the conservation challenges facing Nepal's wetlands. Mr. Krishna Prasad Sigdel, a PhD scholar, expressed his concern over the vulnerable condition of wetlands especially the lake cluster of Pokhara valley pointing to the weaknesses within the institutions responsible for wetland conservation. He further questioned the future of these ecosystems, given the uncertain institutional framework.

In response, panelist emphasized that effective conservation of wetlands requires strong institutional collaboration and the integration of sustainable principles at every level of governance. They highlighted that the inadequacy of institutional setting adds challenges to wetland conservation, making it essential to strengthen the coordination among government bodies and other stakeholders. They also emphasized the importance of sustainable practices that bridge ecological integrity with economic needs, providing a path forward for both the preservation of these ecosystems and the resilience of the institutions that safeguard them.

Mr. Sujan Maharjan, representing the BRCRN, raised concerns about the gaps in policy design and implementation. Despite the presence of dedicated experts and interested institutions, he observed gaps in the policy framework that inhibit effective management of wetlands. Mr. Maharjan questioned why policies often include provisions that make them difficult to implement and lack the necessary guidelines for practical execution.

Addressing these points, Dr. Maheshwar Dhakal acknowledged the policy challenges and advocated for an integrated watershed management approach, which would bring together various stakeholders under a unified strategy. Dr. Dhakal pointed out that wetland conservation is a cross-cutting issue involving multiple government bodies, NGOs, and local communities, making coordination a challenge but also an opportunity. He argued for a collaborative approach that includes active involvement from provincial and local governments. Dr. Dhakal also encouraged media outlets to foster open debates on wetland issues, as well as on provincial governments to prioritize wetland conservation within their budget plans. Furthermore, he emphasized the need for the CEPA, STRP, and national and NGO focal points to play active roles, advocating for more dynamic and functional policy support.

Mrs. Smriety Regmi, Soil Conservation Officer from the Department of Forests and Soil Conservation, shared her perspective on sustainable management approaches, suggesting that wetland conservation efforts should consider both ecological and socio-economic aspects. She argued that if wetlands are addressed through a holistic framework, integrating both environmental and economic perspectives, they will be better positioned for long-term sustainability.

Supporting this view, Mr. Lekh Nath Dhakal underscored the economic potential of Nepal's wetlands, proposing a model that would connect lake ecosystems to local economies. He suggested initiatives such as rainbow trout farming in the Himalayas and other fish varieties in the Terai as a means to promote economic activities that also support conservation. Dr. Dhakal added that integrating lakes like Rupa into the economic system could improve the sustainability of these ecosystems while providing livelihood opportunities for local communities. He further advocated for the inclusion of economic development in wetland management policies to ensure that both conservation and community benefits are realized.

## Concluding Remarks

The panelists summarized their discussions and reiterated the need for a comprehensive and balanced approach to wetland conservation. Dr. Paudel noted the importance of addressing

three primary challenges: the complexity of institutional mechanisms, the gap between policies and actual practices, and the necessity of balancing ecological and socio-economic concerns. He stressed that conservation goals would be best achieved through sustained collaboration among stakeholders, a commitment to adaptive management practices, and a policy framework that considers both ecological health and socio-economic opportunities.

The session concluded with a unified call for a sustainable, multi-dimensional approach to wetland management in Nepal. The key takeaways included the need to simplify institutional structures, bridge policy-practice gaps, integrate socio-economic and ecological considerations, and update the Ramsar information system regularly. Mainstreaming these policies at the national level and prioritizing long-term security for community-based conservation approaches emerged as essential goals. Achieving these objectives requires strong governance, adaptive management strategies, and committed collaboration among stakeholders. The valuable insights shared in this discussion will serve as guidance in developing effective, responsible conservation strategies to protect Nepal's wetland ecosystems for future generations.

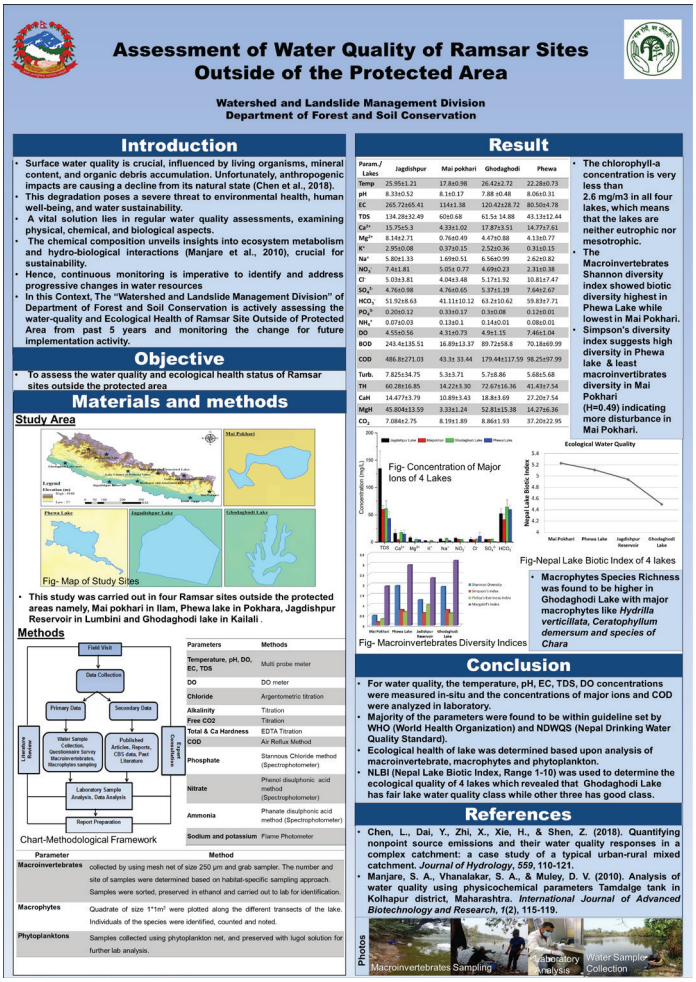
# VI. Poster Presentation

The poster presented during the National Wetland Workshop was also an integral part of the event. They were displayed prominently throughout the workshop, running parallel to all sessions. Each poster provided concise yet comprehensive information, often accompanied by visuals such as photographs, graphs, charts, and enhancing the understanding of attendees.

## Posters

### Poster 1: Assessment of Water Quality of Ramsar Sites Outside of the Protected Area

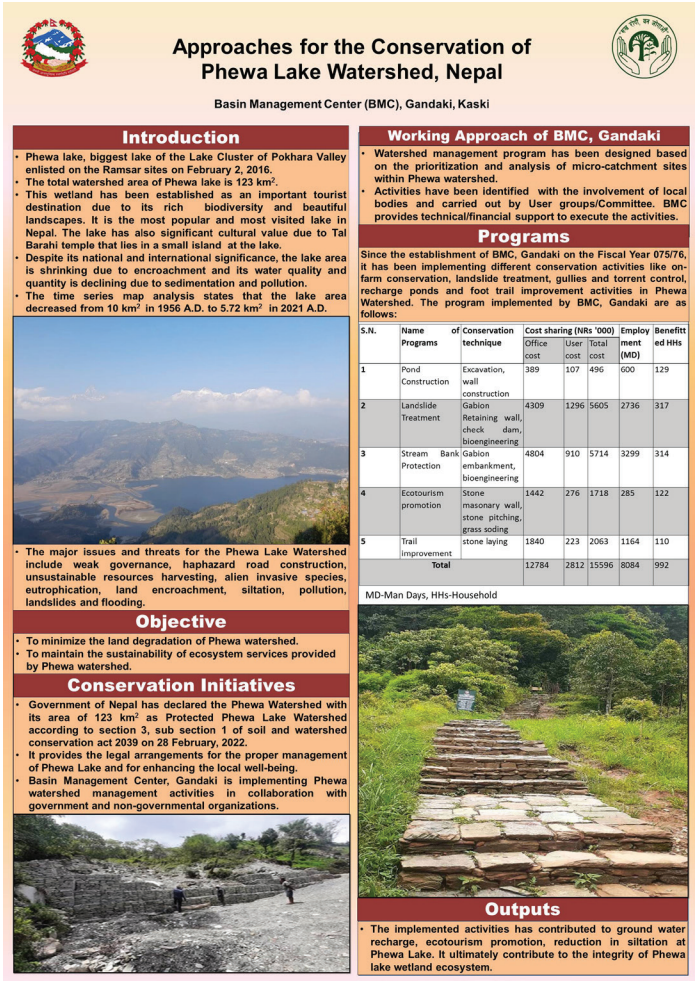
***Watershed and Landslide Management Division***
***Department of Forest and Soil Conservation***




The assessment focuses on the water quality and ecological health status of Ramsar sites outside protected areas, conducted by the Watershed and Landslide Management Division of the Department of Forest and Soil Conservation. Four Ramsar sites were studied: Mai Pokhari, Phewa Lake, Jagdishpur Reservoir, and Ghodaghodi Lake. Data collection involved field visits and primary (water samples, phytoplankton, macrophytes, macroinvertebrates) and secondary data analysis. Parameters analyzed included macrophytes, macroinvertebrates, phytoplankton, and various water quality parameters. Results indicate low chlorophyll-a concentration, diverse macroinvertebrates in Phewa Lake, and the highest macrophyte species richness in Ghodaghodi Lake. Water quality parameters mostly complied with WHO and NDWQS standards. Ecological health was assessed using the NLBI, revealing fair quality for Ghodaghodi Lake and good quality for the other three lakes. Overall, the study emphasizes the importance of regular assessments for sustainable water resource management.

# Poster 2: Approaches for the Conservation of Phewa Lake Watershed, Nepal

*Basin Management Center, Gandaki*
*Department of Forest and Soil Conservation*



## Approaches for the Conservation of Phewa Lake Watershed, Nepal

Basin Management Center (BMC), Gandaki, Kaski

### Introduction

- Phewa lake, biggest lake of the Lake Cluster of Pokhara Valley enlisted on the Ramsar sites on February 2, 2016.
- The total watershed area of Phewa lake is 123 km$^2$.
- This wetland has been established as an important tourist destination due to its rich biodiversity and beautiful landscapes. It is the most popular and most visited lake in Nepal. The lake has also significant cultural value due to Tal Barahi temple that lies in a small island at the lake.
- Despite its national and international significance, the lake area is shrinking due to encroachment and its water quality and quantity is declining due to sedimentation and pollution.
- The time series map analysis states that the lake area decreased from 10 km$^2$ in 1956 A.D. to 5.72 km$^2$ in 2021 A.D.

- The major issues and threats for the Phewa Lake Watershed include weak governance, haphazard road construction, unsustainable resources harvesting, alien invasive species, eutrophication, land encroachment, siltation, pollution, landslides and flooding.

### Objective

- To minimize the land degradation of Phewa watershed.
- To maintain the sustainability of ecosystem services provided by Phewa watershed.

### Conservation Initiatives

- Government of Nepal has declared the Phewa Watershed with its area of 123 km$^2$ as Protected Phewa Lake Watershed according to section 3, sub section 1 of soil and watershed conservation act 2039 on 28 February, 2022.
- It provides the legal arrangements for the proper management of Phewa Lake and for enhancing the local well-being.
- Basin Management Center, Gandaki is implementing Phewa watershed management activities in collaboration with government and non-governmental organizations.

### Working Approach of BMC, Gandaki

- Watershed management program has been designed based on the prioritization and analysis of micro-catchment sites within Phewa watershed.
- Activities have been identified with the involvement of local bodies and carried out by User groups/Committee. BMC provides technical/financial support to execute the activities.

### Programs

Since the establishment of BMC, Gandaki on the Fiscal Year 075/76, it has been implementing different conservation activities like on-farm conservation, landslide treatment, gullies and torrent control, recharge ponds and foot trail improvement activities in Phewa Watershed. The program implemented by BMC, Gandaki are as follows:

| S.N. | Name of Programs | Conservation technique | Cost sharing (NRs '000) | | | Employment (MD) | Benefitted HHs |
|---|---|---|---|---|---|---|---|
| | | | Office cost | User cost | Total cost | | |
| 1 | Pond Construction | Excavation, wall construction | 389 | 107 | 496 | 600 | 129 |
| 2 | Landslide Treatment | Gabion Retaining wall, check dam, bioengineering | 4309 | 1296 | 5605 | 2736 | 317 |
| 3 | Stream Bank Protection | Gabion embankment, bioengineering | 4804 | 910 | 5714 | 3299 | 314 |
| 4 | Ecotourism promotion | Stone masonary wall, stone pitching, grass soding | 1442 | 276 | 1718 | 285 | 122 |
| 5 | Trail improvement | stone laying | 1840 | 223 | 2063 | 1164 | 110 |
| Total | | | 12784 | 2812 | 15596 | 8084 | 992 |

MD-Man Days, HHs-Household

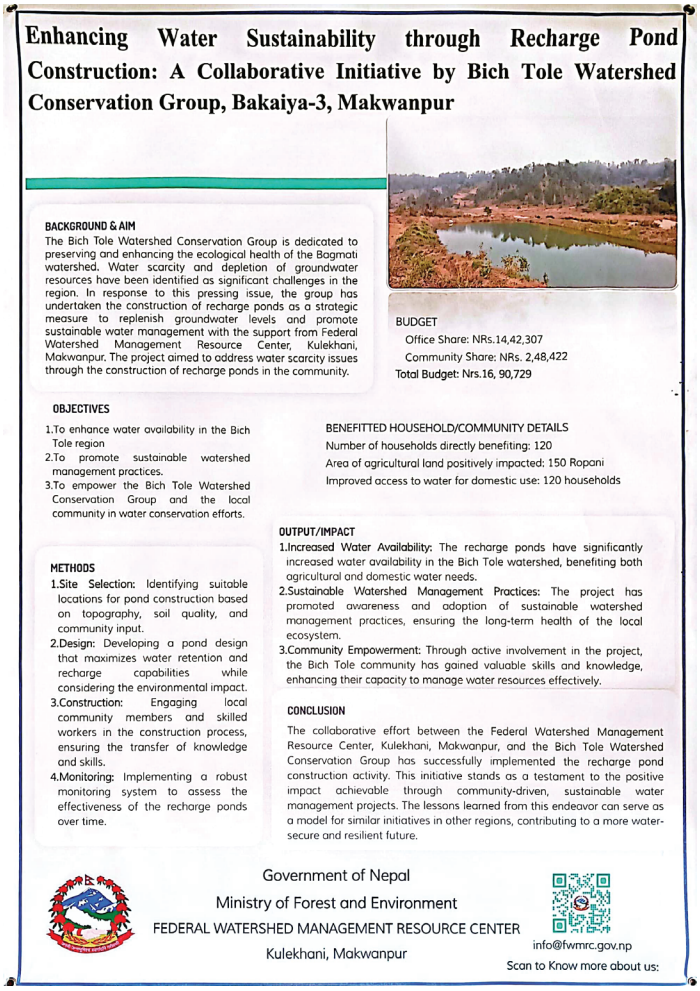
### Outputs

- The implemented activities has contributed to ground water recharge, ecotourism promotion, reduction in siltation at Phewa Lake. It ultimately contribute to the integrity of Phewa lake wetland ecosystem.

The article discusses approaches for conserving the Phewa Lake Watershed in Nepal, which is a significant tourist destination and Ramsar site due to its biodiversity and cultural value. Despite its importance, the lake area is shrinking, and water quality is declining due to various threats like encroachment, pollution, and sedimentation. The objective is to minimize land degradation and maintain ecosystem sustainability. Conservation initiatives include declaring the watershed as a protected area and implementing management activities by the Basin Management Center, Gandaki, in collaboration with government and non-governmental organizations. The working approach involves prioritizing micro-catchment sites, engaging local bodies, and providing technical/financial support. Programs implemented by the BMC include pond construction, landslide treatment, stream bank protection, ecotourism promotion, and trail improvement. These initiatives have contributed to groundwater recharge, ecotourism promotion, and reduction in siltation, thereby benefiting the integrity of the Phewa Lake wetland ecosystem.

## Poster 3: Enhancing Water Sustainability through Recharge Pond Construction: A Collaborative Initiative by Bich Tole Watershed Conservation Group, Bakaiya-3, Makawanpur.

*Federal Watershed Management Resource Center*
*Department of Forest and Soil Conservation*



**Enhancing Water Sustainability through Recharge Pond Construction: A Collaborative Initiative by Bich Tole Watershed Conservation Group, Bakaiya-3, Makwanpur**

**BACKGROUND & AIM**

The Bich Tole Watershed Conservation Group is dedicated to preserving and enhancing the ecological health of the Bagmati watershed. Water scarcity and depletion of groundwater resources have been identified as significant challenges in the region. In response to this pressing issue, the group has undertaken the construction of recharge ponds as a strategic measure to replenish groundwater levels and promote sustainable water management with the support from Federal Watershed Management Resource Center, Kulekhani, Makwanpur. The project aimed to address water scarcity issues through the construction of recharge ponds in the community.

BUDGET
Office Share: NRs.14,42,307
Community Share: NRs. 2,48,422
Total Budget: Nrs.16, 90,729

**OBJECTIVES**

1.To enhance water availability in the Bich Tole region
2.To promote sustainable watershed management practices.
3.To empower the Bich Tole Watershed Conservation Group and the local community in water conservation efforts.

BENEFITTED HOUSEHOLD/COMMUNITY DETAILS
Number of households directly benefiting: 120
Area of agricultural land positively impacted: 150 Ropani
Improved access to water for domestic use: 120 households

**METHODS**

1.Site Selection: Identifying suitable locations for pond construction based on topography, soil quality, and community input.
2.Design: Developing a pond design that maximizes water retention and recharge capabilities while considering the environmental impact.
3.Construction: Engaging local community members and skilled workers in the construction process, ensuring the transfer of knowledge and skills.
4.Monitoring: Implementing a robust monitoring system to assess the effectiveness of the recharge ponds over time.

**OUTPUT/IMPACT**

1.Increased Water Availability: The recharge ponds have significantly increased water availability in the Bich Tole watershed, benefiting both agricultural and domestic water needs.
2.Sustainable Watershed Management Practices: The project has promoted awareness and adoption of sustainable watershed management practices, ensuring the long-term health of the local ecosystem.
3.Community Empowerment: Through active involvement in the project, the Bich Tole community has gained valuable skills and knowledge, enhancing their capacity to manage water resources effectively.

**CONCLUSION**

The collaborative effort between the Federal Watershed Management Resource Center, Kulekhani, Makwanpur, and the Bich Tole Watershed Conservation Group has successfully implemented the recharge pond construction activity. This initiative stands as a testament to the positive impact achievable through community-driven, sustainable water management projects. The lessons learned from this endeavor can serve as a model for similar initiatives in other regions, contributing to a more water-secure and resilient future.

Government of Nepal
Ministry of Forest and Environment
FEDERAL WATERSHED MANAGEMENT RESOURCE CENTER
Kulekhani, Makwanpur
info@fwmrc.gov.np
Scan to Know more about us:

The Bich Tole Watershed Conservation Group, in collaboration with the Federal Watershed Management Resource Center, Kulekhani, Makwanpur, has implemented a project aimed at addressing water scarcity issues in the Bagmati watershed. The project involved constructing recharge ponds to replenish groundwater levels and promote sustainable water management practices. The total budget for the project was NRs. 16,90,729, with contributions from both the office and the local community. The objectives included enhancing water availability, promoting sustainable watershed management, and empowering the local community in water conservation efforts. The project involved site selection, pond design, construction, and monitoring. As a result, 120 households directly benefited from increased water availability for both agricultural and domestic use, with 150 Ropani of agricultural land positively impacted. The project also fostered awareness and adoption of sustainable practices while empowering the community with skills and knowledge in water resource management. Overall, the project serves as a successful example of community-driven, sustainable water management, with potential for replication in other regions to contribute to a more water-secure future.

## Poster 4: Prasiola formosana

*Department of Plant Resource*


The poster, presented by the Department of Plant Resource in Thapathali, Kathmandu, provides comprehensive information about Simali Leu, scientifically named Parsiola formosana, belonging to the family Persiolaceae. It includes its local names as Simali Leu (Nepali) and Nyahaklu (Newari), along with associated vegetation and its availability in specific locations like Roshikhola of Kavre and Dhungakharka. However, it notes the unfortunate extinction of Simali Leu from the stream area around Godawari. The alga is typically found attached to large submerged stones in clear, cold, fresh, and rapidly running streams, at an elevation of 1500-2000 meters. Vulnerability arises from pollution and low water flow due to water channeling to agricultural land. The ideal pH of water for its availability is 8.25. The collection involves the leafy thallus, with specific dimensions noted. It is harvested between the months of Ashoj to Kartik, post-flooding. Medicinally, it is considered an energy giver and a remedy for nerves and veins. Culturally, it holds significance among various communities, who use it in the Bhai-Tika festival as a crunchy dish resembling papad. Nutrient contents include protein (30%), carbohydrate (42%), fat (1%), and fiber (3%), with an average energy of 305 kcal per 100 grams in dried form. The main market for trade is Panauti, Kavre. Additionally, the poster depicts the detailed method from collection to the preparation of special recipe dishes in pictorial form.

## Discussion Session of Poster Presentation:

The Workshop provided a platform for the presentation and discussion of various posters showcasing research and initiatives pertaining to wetland conservation and management. The four posters addressed diverse topics ranging from water quality assessment to cultural significance and conservation efforts of specific wetlands. The discussion during the poster presentation has been presented here.

Attendees at the National Wetland Workshop provided positive feedback on the poster presentation regarding the assessment of water quality and ecological health status of Ramsar sites outside protected areas. They appreciated the thoroughness of the study conducted by the Watershed and Landslide Management Division, which included data collection through field visits and analysis of both primary and secondary data. Attendees particularly praised the inclusion of diverse parameters such as macrophytes, macroinvertebrates, phytoplankton, and various water quality parameters, as it provided a comprehensive understanding of the ecological health of the studied Ramsar sites. Furthermore, they acknowledged the importance of regular assessments for sustainable water resource management, as emphasized in the study's conclusions. Overall, attendees viewed the study as a valuable contribution to the field of wetland management and conservation, providing insights into the current status of Ramsar sites and highlighting areas for future monitoring and intervention. However, some attendees raised critical comments regarding the need for further analysis and interpretation of the data collected. They suggested that while the study provided a broad overview of the water quality and ecological health status of the Ramsar sites, more detailed analysis could help identify specific threats and potential mitigation measures. Additionally, some attendees questioned the methodology used for assessing ecological health, expressing concerns about the adequacy of the NLBI (National Lake Bioindicators) in capturing the full complexity of ecosystem health. They recommended exploring alternative assessment tools or integrating additional indicators to provide a more holistic understanding of the ecological dynamics at play. Despite these critical comments, attendees generally agreed that the study was a significant step towards understanding and conserving Ramsar sites outside protected areas, and they encouraged further research and monitoring efforts in this direction.

Attendees at the National Wetland Workshop praised the comprehensive approach outlined in the poster presentation discussing conservation efforts for the Phewa Lake Watershed in Nepal. They commended the collaborative efforts between governmental and non-governmental organizations, particularly in declaring the watershed as a protected area and implementing management activities. Furthermore, attendees highlighted the importance of community involvement, emphasizing the positive outcomes achieved, such as groundwater recharge and ecotourism promotion. They recommended continued monitoring and knowledge sharing to ensure the sustainability of the conservation initiatives and to facilitate replication in similar contexts, acknowledging the project's valuable contribution to wetland conservation efforts in Nepal. In addition, attendees appreciated the range of programs implemented by the Basin Management Center, including pond construction and stream bank protection, which were seen as crucial for addressing specific threats to the watershed. The success of these initiatives in reducing siltation and maintaining ecosystem integrity was noted as significant progress towards achieving the project's objectives. Overall, the poster presentation garnered positive feedback for its effective strategies and tangible outcomes, with attendees expressing optimism about the potential for continued success in conserving the Phewa Lake Watershed and its valuable ecosystem.

Attendees at the National Wetland Workshop positively commented on the poster presentation regarding the Bich Tole Watershed

Conservation project by the Federal Watershed Management Resource Center, Department of Forest and Soil Conservation. They appreciated the collaborative efforts between the Bich Tole Watershed Conservation Group and the Federal Watershed Management Resource Center, noting the successful implementation of the project aimed at addressing water scarcity issues in the Bagmati watershed. They commended the project's focus on constructing recharge ponds to replenish groundwater levels and promote sustainable water management practices, emphasizing the tangible benefits seen in increased water availability for both agricultural and domestic use. Furthermore, attendees praised the holistic approach done by the Federal Watershed Management Resource Center, which involved site selection, pond design, construction, and monitoring, highlighting its effectiveness in empowering the local community with skills and knowledge in water resource management. Overall, the project was recognized as a successful example of community-driven, sustainable water management, with attendees expressing optimism about its potential for replication in other regions to contribute to a more water-secure future.

Attendees at the National Wetland Workshop offered positive feedback on the poster presented by the Department of Plant Resource in Thapathali, Kathmandu, regarding Simali Leu. They appreciated the comprehensive information provided about the alga, including its scientific name, local names, associated vegetation, and availability in specific locations. Attendees also found the depiction of its cultural significance and medicinal uses insightful, particularly its role in the Bhai-Tika festival and its reputed medicinal properties. Furthermore, they praised the inclusion of detailed collection and preparation methods, presented in pictorial form, which made the information easily understandable and accessible to a wide audience. However, some attendees raised concerns about the vulnerability of Simali Leu to pollution and habitat loss, particularly its extinction from certain areas like the stream around Godawari. They emphasized the need for concerted conservation efforts to protect the species and its habitat from further degradation. Additionally, some suggested the inclusion of information about ongoing conservation initiatives or strategies to mitigate threats faced by Simali Leu, to inspire action and involvement from stakeholders. Despite these critical comments, attendees recognized the importance of the poster in highlighting the significance of Simali Leu and promoting its conservation, and they encouraged continued efforts in this regard.

Overall, the poster presentations were recognized as valuable contributions to wetland conservation efforts, with attendees expressing optimism about their potential impact and encouraging further research and monitoring in these areas.

## Conclusion:

Poster presentation added depth and richness to the overall workshop by showcasing the initiatives and efforts done in wetland conservation and management. These posters collectively contributed to the understanding and promotion of wetland conservation and sustainable management practices in Nepal.

# VII. Closing Session

## Closing Remarks: Mr. Shiva Kumar Wagle, DG, DoFSC

He acknowledged and appreciated the chief guest, the distinguished guests, all the dignitaries, experts and all the staffs and officials for their active participation and contribution in the workshop. He emphasized that despite participants coming from various sectors and levels (local, federal, central), they are united under the common agenda of "wetland conservation and management in Nepal." Highlighting the importance of cooperation and coordination, he stressed the need for synergy among the three tiers of government and all stakeholders involved in wetland management, as collaboration is crucial for achieving effective conservation outcomes.

He also emphasized the critical role of integrated watershed management in wetland conservation of wetlands noting that a comprehensive approach to managing watersheds is essential for maintaining the hydrological balance essential for wetland health. Emphasizing the importance of an integrated approach, he highlighted the need for alignment between policy, institutions, and actions to achieve effective outcomes in wetland conservation. He shared that the condition of wetland resources is degrading in Nepal despite various efforts due to weak institutional mechanisms and weak implementation of conservation activities.

He also emphasized on the importance of formulating a National Wetland Act to provide a structured framework for the integrated management of wetlands in Nepal. Acknowledging the value of traditional knowledge and practices, he emphasized their importance in guiding activities related to wetland restoration and management. When communities are involved and aware of the benefits of wetland conservation, they are more likely to support and participate in initiatives aimed at preserving these valuable ecosystems. Overall, he underscored the importance of unity, collaboration, effective governance, and respect for traditional knowledge in achieving sustainable wetland management in Nepal.

### Conclusion

The diversity of insights and suggestions from the participants provided a broad perspective on various approaches to managing wetlands. The realization of the importance of watershed management for sustainable wetland resources is crucial, as watersheds play a significant role in the health and functionality of wetlands. Integrating wetland conservation goals into broader watershed management plans ensures that conservation efforts are aligned with broader environmental and developmental objectives. This holistic approach not only protects biodiversity and ecosystem services but also supports local livelihoods and contributes to broader sustainable development goals. Furthermore, emphasizing the integration of wetland conservation with the active participation of the local community as well as all the relevant stakeholders is the key to ensuring long-term success and sustainability. This inclusive approach not only enhances conservation outcomes but also promotes sustainable development, improves livelihoods, and strengthens community ownership of natural resources for future generations. By addressing institutional fragmentation and establishing a clear framework for environmental governance, Nepal can enhance its capacity to manage natural resources sustainably, mitigate environmental risks, and achieve its national development goals in alignment with global commitments. The workshop's success in identifying potential areas for intervention and collective action is also noteworthy. This comprehensive list will likely serve as a roadmap for future initiatives aimed at conserving and managing wetlands effectively. Overall, the workshop was a positive step forward in raising awareness, fostering collaboration, and identifying actionable steps to support the sustainable management of wetland resources in Nepal.

## Summary of the Workshop/Take-Home Message

1. Wetlands are among the most productive ecosystems, but their condition is deteriorating due to various natural and human-induced factors. This decline is being further intensified by changes in climate patterns.

2. Addressing these drivers and pressures requires concerted efforts in conservation, restoration, and climate adaptation strategies to safeguard invaluable wetland ecosystems and the services they provide.

3. Nepal is a party to various global frameworks such as international agreements and conventions and in order to align national commitments, the country need to harmonize the global and domestic policies. For this, Nepal has prepared National Adaptation Plan (2021-2050), National Climate Change Policy 2019, National Ramsar Strategy and Action Plan (2018-2024), National Wetland Policy 2002, National Biodiversity Strategy 2002, etc.

4. Harmonizing national-level policies with global commitments involves translating broad international agreements and frameworks into operational acts and guidelines that can be effectively implemented at the national level. A National Wetland Act is essential for this purpose.

5. A comprehensive institutional framework for environmental governance is necessary to clarify the mandates, roles, and responsibilities of each government agency or department involved in wetland management

6. Effective management of wetlands, especially in Nepal where they play a crucial role in biodiversity conservation, water resource management, and community livelihoods, requires integrated watershed management. Nepal can enhance the resilience of wetland ecosystems, mitigate the impacts of climate change, and ensure sustainable use of natural resources for present and future generations by integrating watershed management.

7. Integrating traditional knowledge and practices into wetland restoration and conservation efforts at the local level in Nepal can significantly enhance the effectiveness and sustainability of these initiatives.

8. Effective stakeholder collaboration by involving all three tiers of the government, Civil societies, private sector, NGOs, and CBOs in wetland management, not only enhances conservation outcomes but also promotes social equity, resilience, and sustainable development in Nepal.

# Annexes

# Annex I: Program Schedule
# "NATIONAL WETLAND WORKSHOP SCHEDULE"

| Date: Feb 02, 2024 International Wetland Day | | Venue- Park Village Resort, Budhanilkantha Kathmandu |
|---|---|---|
| Master of Ceremony: Mr. Bishnu Prasad Shrestha, Under Secretary, DNPWC | | |
| **Time** | **Activity** | **Responsibility** |
| 8:00-8:30 | Banner at Babarmahal | DNPWC |
| 8:30-9:30 | Workshop Registration and Breakfast | DoFSC |
| 09:30-11:30 | **Opening Ceremony/ Inaugural session**<br><br>Dignitaries in Dias | Chair Person: Mr. Shiva Kumar Wagle, DG,<br>Department of Forests and Soil Conservation (DoFSC)<br>Chief Guest: Honorable Minister Dr. Birendra Prasasd Mahato, MoFE<br>Special Guest: Dr. Krishna Prasad Oli, Chairperson, NTNC<br>Guests: Division chiefs (6) of MoFE<br>Guests: DG-DNPWC, DG-FRTC, DG-DPR, DG-DoE, Chief-REDD Implementation center,<br>Keynote Speaker-DG, DNPWC<br>DDGs of DoFSC, Representative from TU/IoF<br>Representatives from Conservation Partners |
| | Workshop Inauguration | Chief Guest, Hon. Minister, MoFE |
| | Welcome Remarks, Objectives/Scopes of the workshop with presentation | DDG, Watershed and Landslide Management Division, DoFSC |
| | Gharial Release in West Rapti River | Live Video by DNPWC |
| | Keynote Speaker (Wetland policy, institutions and practices in Nepal) | Dr. Sindhu Prasad Dhungana, DG, DNPWC |
| | Opinion /Remarks | Dr. Ghanashyam Gurung, WWF<br>Book Launch by Minister of MoFE<br>• *Blackbuck Conservation Action Plan (2023-2027)*<br>• *National Wildlife Health Action Plan (2023-2032)*<br>• *Population assessment of SPNP's Snow leopard and prey*<br>Dr. Maheshwor Dhakal, Joint Secretary, MoFE<br>Dr. Krishna Prasad Oli, Chairperson, NTNC<br>Dr. Birendra Prasasd Mahato, Minister, MoFE |
| | Concluding remarks and closing of the opening ceremony/ inaugural session | Mr. Shiva Kumar Wagle, Director General,<br>Department of Forests and Soil Conservation (DoFSC) |
| 11:30-12:30 | Lunch | |
| **Thematic Sessions** | | |
| ***Theme 1: Ramsar Implementation – Global and National Scenario*** | | |
| 12:30-12:50 | Presentation | Dr. Shailendra Kumar Pokharel |
| ***Theme 2: Socio-Economic Dynamics of Wetland*** | | |
| 12:50 – 1:10 | Presentation | Dr. Rajesh Kumar Rai |
| ***Theme 3: Wetland environment (Biodiversity Conservation and Watershed Management)*** | | |
| 1:10-1:20 | Presentation 1 | Mr. Dipak Jnawali (Wetland Biodiversity in Nepal) |

| | | |
|---|---|---|
| 1:20-1:30 | Presentation 2 | Mr. Badri Raj Dhungana (Wetland Management for Watershed Environment) |
| 1:30-2:00 | **Open Discussion/Answering/Feedback/Suggestions** | |
| 2:00-2:20 | Closing by Session Chair | |
| 2:20-2:50 | Tea break | |
| 2:50-4:20 | Panel Discussion: Sustainable Management of Wetland | |
| **Moderator – Dr. Naya Sharma Paudel**<br>1. Dr. Maheshwor Dhakal – Joint Secretary, MoFE<br>2. Dr. Narendra Pradhan – Conservation Partner<br>3. Ms. Sita Sahi – National Lake Conservation Development Committee<br>4. Dr. Kalpana Devkota – Wetland Expert<br>5. Mr. Lekh Nath Dhakal– Village Champion (Rupa Lake Conservation Committee) | | |
| 4:20-4:50 | Closing of the Seminar | |
| 4:50-5:10 | High Tea | |
| 5:10- Afterwards- Departure | | |

# Annex II: List of Participants

## List of Participants

| S.N | Name of Participants | Post | Organization |
|---|---|---|---|
| 1 | Honorable Dr. Birendra Prasasd Mahato | Minister | Ministry of Forests and Environment |
| 2 | Dr. Krishna Prasad Oli | President | National Trust for Nature Conservation |
| 3 | Mr. Shiva Kumar Wagle | Director General | Department of Forests and Soil Conservation |
| 4 | Mr. Badri Raj Dhungana | Joint Secretary | Ministry of Forests and Environment |
| 5 | Mr. Pradip Kumar Koirala | Joint Secretary | Ministry of Forests and Environment |
| 6 | Dr. Maheshwor Dhakal | Joint Secretary | Ministry of Forests and Environment |
| 7 | Dr. Rajendra K. C. | Director General | Department of Plant Resources |
| 8 | Dr. Sindhu Prasad Dhungana | Director General | Department of National Parks and Wildlife Conservation |
| 9 | Mr. Nabraj Pudasaini | Chief | REDD Implementation Centre |
| 10 | Mr. Ganesh Paudel | Deputy Director General | Department of Forests and Soil Conservation |
| 11 | Mr. Dipak Jnawali | Deputy Director General | Department of Forests and Soil Conservation |
| 12 | Mr. Bed Kumar Dhakal | Deputy Director General | Department of National Parks and Wildlife Conservation |
| 13 | Mr. Bijendra Krishna Singh | Senior Soil Conservation Officer | Ministry of Forests and Environment |
| 14 | Mr. Deepak Adhikari | Under Secretary | Ministry of Forests and Environment |
| 15 | Mr. Sujan Maharjan | Under Secretary (Tech.) | BRCRN Project |
| 16 | Mr. Bishnu Shrestha | Under Secretary (Tech.) | Department of National Parks and Wildlife Conservation |
| 17 | Mr. Chandra Shekhar Chaudhary | Under Secretary | Department of National Parks and Wildlife Conservation |
| 18 | Dr. Ganesh Pant | Under Secretary (Tech.) | Shivapuri National Park, Kathmandu |
| 19 | Mr. Bhaba Raj Joshi | Under Secretary (Tech.) | Department of Forests and Soil Conservation |
| 20 | Mr. Haribamsha Acharya | Under Secretary (Tech.) | Department of Forests and Soil Conservation |
| 21 | Mr. Pashupati Mahat | Under Secretary (Tech.) | Department of Forests and Soil Conservation |
| 22 | Mrs. Sumana Devkota | Under Secretary (Tech.) | Department of Forests and Soil Conservation |
| 23 | Dr. Prakash Singh Thapa | Under Secretary (Tech.) | Department of Forests and Soil Conservation |
| 24 | Mr. Sudip Chhatkuli | Under Secretary (Tech.) | Department of Forests and Soil Conservation |
| 25 | Mr. Prakash Nepal | Under Secretary (Tech.) | Department of Forests and Soil Conservation |
| 26 | Mrs. Sita Shahi | Executive Director | National Lake Conservation Development Committee |
| 27 | Mr. Shyam Neupane | Chief | Federal Watershed Mnagement Center, Kulekhani |
| 28 | Mr. Shiva Pokharel | Acting Chief | Basin Mangement Center, Koshi |
| 29 | Mr. Amar Adhikari | Acting Chief | Basin Mangement Center,Gandaki |
| 30 | Mr. Sunil Kumar Gupta | Acting Chief | Basin Mangement Center, Karnali |
| 31 | Dr. Rajesh Rai | Professor | TU/IoF |
| 32 | Dr. Narendra Man Babu Pradhan | Country Representative | IUCN |
| 33 | Dr. Ghana S. Gurung | Country Representative | WWF |
| 34 | Mr. Sailendra Kumar Pokharel | Executive Director | CODEFUND |
| 35 | Dr. Naya Sharma Paudel | Moderator | Freelancer |
| 36 | Dr. Prem Prasad Paudel | Program Manager | DCRL |
| 37 | Mr. Ram Bichari Thakur | Division Forest Officer | Division Forest Office, Pahalmanpur,Kailali |

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| 38 | Mr. Shyam Shrestha | Chief | Soil and Watershed Management Office,Kailali |
| 39 | Dr. Kalpana Devkota | Wetland Expert | |
| 40 | Mrs. Ishana Thapa | Represenative | BCN |
| 41 | Mr. Lekhnath Dhakal | Chairperson | Rupa Taal Conservation Committee,Kaski |
| 42 | Mrs. Laxmi Upadhyaya | Journalist | Gorkhapatra |
| 43 | Mrs. Sirjana Timsina | Journalist | Mirmire Khabar |
| 44 | Mr. Surendra Prasad Adhikari | Forest Officer | Department of Forests and Soil Conservation |
| 45 | Mrs. Indira Mulepati | Soil Conservation Officer | Department of Forests and Soil Conservation |
| 46 | Mr. Binod Gyawali | Soil Conservation Officer | Department of Forests and Soil Conservation |
| 47 | Mr. Mahesh Dhungana | Soil Conservation Officer | Department of Forests and Soil Conservation |
| 48 | Mr. Shailendra Kumar Dulal | Account Officer | Department of Forests and Soil Conservation |
| 49 | Mr. Hari Singh Khadka | Computer Officer | Department of Forests and Soil Conservation |
| 50 | Mr. Sudip Khadka | Soil Conservation Officer | Department of Forests and Soil Conservation |
| 51 | Mrs. Smriety Regmi | Soil Conservation Officer | Department of Forests and Soil Conservation |
| 52 | Mr. Bijay Puri | Soil Conservation Officer | Department of Forests and Soil Conservation |
| 53 | Mrs. Kabita Devkota | Soil Conservation Officer | Department of Forests and Soil Conservation |
| 54 | Mr. Sunil B. K | Agriculture Engineer | Department of Forests and Soil Conservation |
| 55 | Mrs. Januka Siwakoti | Law Officer | Department of Forests and Soil Conservation |
| 56 | Mrs. Muna Niraula | Chemist | Department of Forests and Soil Conservation |
| 57 | Mr. Ramkrishna Gautam | Scientific Officer/Botanist | Department of Forests and Soil Conservation |
| 58 | Mr. Siddhartha Aryal | Forest Officer | Department of Forests and Soil Conservation |
| 59 | Mr. Jayan Shrestha | Engineer | Department of Forests and Soil Conservation |
| 60 | Mr. Bijaya Dhakal | Forest Officer | Department of Forests and Soil Conservation |
| 61 | Mr. Balkrishna Bhandari | Nayab Subba | Department of Forests and Soil Conservation |
| 62 | Mrs. Sudiksha Silwal | Soil Conservation Assistant | Department of Forests and Soil Conservation |
| 63 | Mr. Prakash Neupane | Nayab Subba | Department of Forests and Soil Conservation |
| 64 | Mrs. Seema Neupane | Ranger | Department of Forests and Soil Conservation |
| 65 | Mrs. Parbati Adhikari | Ranger | Department of Forests and Soil Conservation |
| 66 | Mrs. Sharmila Timalsina | Ranger | Department of Forests and Soil Conservation |
| 67 | Mrs. Parbati Lama | Ranger | Department of Forests and Soil Conservation |
| 68 | Mr. Surendra Raj Pant | Scientific Officer | Ministry of Forests and Environment |
| 69 | Mr. Ram Chandra Adhikari | Driver | BRCRN |
| 70 | Mr. Sabanam Pathak | Forest Officer | Department of Forests and Soil Conservation |
| 71 | Mr. Shiv Raj Bhatta | SA-CP | WWF |
| 72 | Mrs. Roshani Adhikari | President | NEFEJ |
| 73 | Mr. Ramesh Basnet | Senior Scientific Officer | Department of Plant Resources |
| 74 | Mr. Pemba Sherpa | Planning Officer | Department of National Parks and Wildlife Conservation |
| 75 | Mr. Prakash Malla | Forest Officer | Department of Forests and Soil Conservation |
| 76 | Mr. Kushal Shrestha | Forest Officer | Ministry of Forests and Environment |
| 77 | Mr. Murari Sharma | Forester | Department of Forests and Soil Conservation |
| 78 | Mr. Krishna Prasad Sigdel | PhD Scholar (Wetland) | |
| 79 | Mr. Pabin Shrestha | Researcher | |
| 80 | Mr. Deepak Gyawali | SDC | Department of Environment |
| 81 | Mr. Dayaram Pandey | Ranger | Department of National Parks and Wildlife Conservation |

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|---|---|---|---|
| 82 | Mrs. Prativa Shrestha | | Prasiddha Media |
| 83 | Mr. Sanjeev Kumar Chaudhary | | Ministry of Forests and Environment |
| 84 | Mr. Raju Lamsal | Body Guard | Ministry of Forests and Environment |
| 85 | Mrs. Sirjana Shrestha | Management Officer | |
| 86 | Mr. Indra Bahadur Maharjan | Mechanic | |
| 87 | Mr. Pawanbarsha Shah | Reporter | NTV |
| 88 | Mr. Binay Dasar | Cameraman | NTV |
| 89 | Mrs. Dil Manju Silwal | Reporter | Seven Star |
| 90 | Mrs. Susmita Karki | Reporter | Seven Star |
| 91 | Mr. Rabindra Maharajan | DDG | Department of Forests and Soil Conservation |
| 92 | Mr. Rajesh Kumar Sah | Forest Officer | Department of Forests and Soil Conservation |
| 93 | Mr. Purushottam Sharma | Under Secretary | Department of National Parks and Wildlife Conservation |
| 94 | Mrs. Pragya Khanal | Conservation Education Officer | Department of National Parks and Wildlife Conservation |
| 95 | Mrs. Puspa Kumari Mishra | Ranger | Department of National Parks and Wildlife Conservation |
| 96 | Mrs. Sujita Kumari Raut | Ranger | Department of National Parks and Wildlife Conservation |
| 97 | Mr. Bal Krishna Khatri | | Ministry of Forests and Environment |
| 98 | Mr. Bishnu Thapaliya | Pro. Coordinator | ZSL Nepal |
| 99 | Mr. Hari Shankar Neupane | Senior Gamescout | Department of National Parks and Wildlife Conservation |
| 100 | Mr. Nikesh Kathayat | WMO | FWMRC, Kulekhani |
| 101 | Mrs. Sita Kumari Pahadi | Office Helper | Department of Forests and Soil Conservation |
| 102 | Mrs. Ambika Paneru | Office Helper | Department of Forests and Soil Conservation |
| 103 | Mrs. Dhana Maya Khatri | Office Helper | Department of National Parks and Wildlife Conservation |
| 104 | Mr. Hari Prakash Shrestha | Driver | Department of Forests and Soil Conservation |
| 105 | Mr. Parshuram Ranabhat | Driver | Department of Forests and Soil Conservation |
| 106 | Mr. Radha Krishna | Driver | DCRL |
| 107 | Mr. Chandra Bist | Driver | |
| 108 | Mr. Barana Guro | Driver | Department of National Parks and Wildlife Conservation |
| 109 | Mr. Ram Budhathoki | Driver | ZSL Nepal |
| 110 | Mr. Shyam Lama | Driver | Department of National Parks and Wildlife Conservation |
| 111 | Mr. Sawan K. Chaudhary | Driver | DFO, Kailali |
| 112 | Mr. Kanchha Man Tamang | Driver | Department of Environment |
| 113 | Mr. Bidur K. Khadka | Driver | Basin Mangement Center, Koshi |
| 114 | Mr. Bhupendra Dangi | Driver | Department of Forests and Soil Conservation |
| 115 | Mr. Purushottam Pahadi | Driver | Ministry of Forests and Environment |
| 116 | Mr. Nirajan Kafle | Driver | Ministry of Forests and Environment |
| 117 | Mr. Padam Ale | Driver | Department of Forests and Soil Conservation |
| 118 | Mr. Pradip Basnset | Driver | Department of Forests and Soil Conservation |
| 119 | Mr. Dhaniram Tharu | Driver | Department of National Parks and Wildlife Conservation |
| 120 | Mr. Laxman Karki | Driver | WWF |
| 121 | Mr. Man Bahadur Syangtan | Driver | Ministry of Forests and Environment |

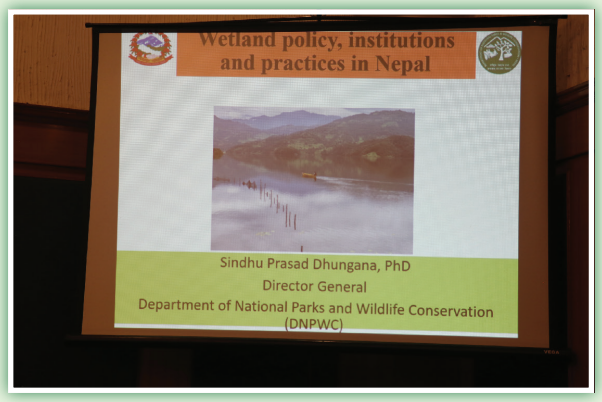
# Annex III: Photo-Plates

# National Wetland Workshop 2024, Planning and Preparation

# National Wetland Workshop 2024, Attendees

# National Wetland Workshop 2024, Inaugural Session






# National Wetland Workshop 2024, Inaugural Session

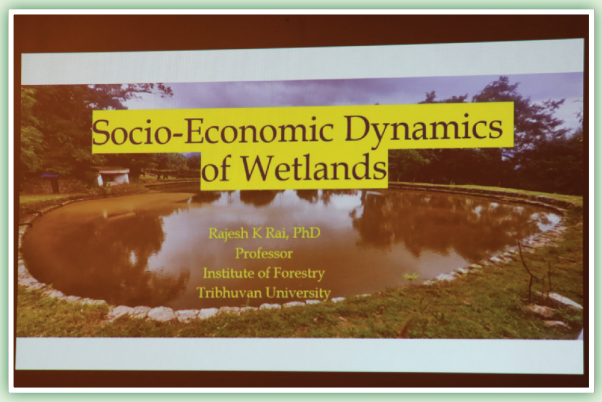




# National Wetland Workshop 2024, Concluding Inaugural Session

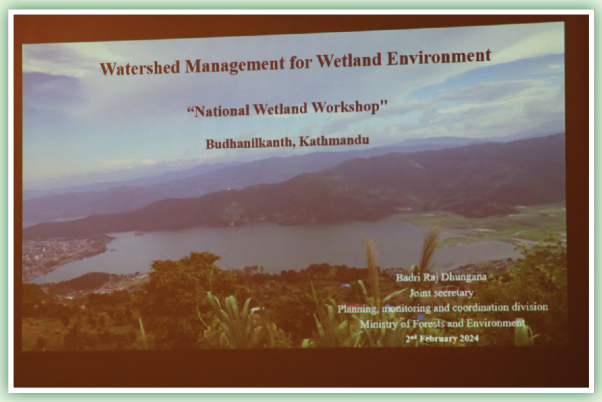

# National Wetland Workshop 2024, Thematic Session












# National Wetland Workshop 2024, Thematic Session Open Discussion and Concluding the Session



# National Wetland Workshop 2024, Pannel Discussion on "Sustainable Management of Wetlands"






# National Wetland Workshop 2024, Pannel Discussion on "Sustainable Management of Wetlands"




# National Wetland Workshop 2024, Closing Session





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