Integration of High Altitude Wetlands into River Basin Management in the Hindu Kush Himalayas

Capacity Building Needs Assessment for Policy and Technical Support

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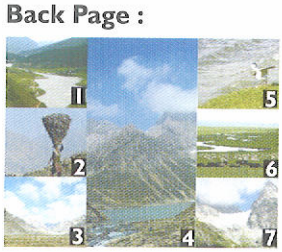

1. Wetlands of Ammochhu River, Bhutan
2. Wular Lake catchments, Kashmir, India
3. Hunder, Ladakh, India
4. Sheshnag, Kashmir, India
5. Rara Lake, Nepal
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List of Acronyms

AWI	Asian Wetland Inventory
CGIAR – CSI	Consultative Group for International Agriculture Research - Consortium for Spatial Information
EU	European Union
HAWs	High Altitude Wetlands
HKH	Hindu Kush Himalayan
GEF	Global Environment Facility
GLOF	Glacial Lake Outburst Floods
ICIMOD	International Centre for Integrated Mountain Development
IRBM	Integrated River Basin Management
IUCN	International Union for Conservation of Nature
JFM	Joint Forest Management
MEF	Ministry of Environment and Forests
MWR	Ministry of Water Resources
RWAs	Resident Welfare Associations
SEPA	Scottish Environment Protection Agency
SRTM	Shuttle Radar Topography Mission
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
WFD	Water Framework Directive
WI	Wetlands International
WISA	Wetlands International - South Asia
WMAs	Water Management Associations
WUAs	Water Users Association
WWF	World Wild Fund for Nature

Contents

Executive Summary

High altitude wetlands accounting for 16% of Hindu Kush Himalayas play an important role in regulating water regimes and providing ecological and economic security to hill communities and huge population living in the plains. They also play important role in mitigating impacts of climate change by acting as carbon sinks. Despite this, the wetlands are under threat due to catchment degradation, changes in hydrological regimes and other human induced pressures. The ecosystem services of high altitude wetlands have not been well recognized and integrated into river basin management.

A review undertaken in consultation with the government representatives of Bhutan, China, India and Nepal indicates that water and wetland management policies and strategies within the HKH region, in general, are sectoral in nature with very limited degree of integration. This limits communication between the two sectors often leading to changes in water regimes detrimental to wetland ecosystems. Lack of effective capacity within the region to assess the intersectoral linkages and their integration in water resources planning and management is the key factor limiting harmonization of these sectors. Balancing water use for human needs and ecological purposes is one of the challenging tasks to be addressed.

Several guidelines have been developed at international level for integration of wetlands into river basin management. Within the Himalayan region, initiatives have been undertaken for inventory and assessment, site level community led conservation and integrating wetlands into river basin management in sub basins of Koshi and Jhelum. There is a need to replicate and upscale such demonstration through shared learning and collaborative research. The experiences within European Union on catchment led water resources management, information sharing, public private partnership and institutional development are of great relevance for the region.

The capacity building strategy should include: (i) creating appropriate institutional mechanism for imparting training to wetland managers, policy planners, decision makers and other relevant stakeholders; (ii) developing online training models and training materials; (iii) develop monitoring and reviewing processes to assess the efficiency of the capacity building process and adaptations as may be necessary; (iv) creating network of wetland managers for collaborative research and knowledge base development; (v) developing tool kits as a mechanism for information sharing about application of Asian Wetland Inventory, hierarchical information at sub-basin wetland complex and wetland levels to monitor changes in ecological character of high altitude wetlands and interpret the changes in terms of upstream – downstream linkages

Introduction

Tso Morari, India

The Himalayas are replete with high altitude wetlands (HAWs) that play important role in hydrological cycle and regulation of water regimes. The region is the source of nine largest rivers of Asia supporting a population of 1.3 billion people (Jianchu *et al.*, 2007). Almost all the tributaries of these river systems arise from high altitude wetlands which are primarily fed by melting glaciers contributing approximately 70% of dry flow (Sarmett *et al.*, 2005). Despite their significant role they play in livelihoods of hill communities as well as those living in the plains, these wetlands are under threat due to degradation of catchments and water diversion leading to changes in water regimes, associated biodiversity and overall ecosystem services. In addition to these drivers and pressures is the impact of climate change which has severe implications on regional water resources. Wetlands all along these river systems provide an adaptive advantage to combat impacts of climate change.

Conservation and wise use of Himalayan HAWs needs regional cooperation. The calls for action emanating from the regional consultation workshops under the Himalayan Initiative (Urumqui 2002, Kathamandu 2003, Sanya 2004, Evian 2004, New Delhi 2006 and Changwon 2007) have repeatedly reconfirmed the need for a regional strategy and a common vision for the wetlands of the Himalayas. In particular, the participants at the Evian Encounter 2004 stressed the need for integrated approaches to water management taking the values and functions of HAWs into account. At the same time, limited experience or capacity to do this within the region was also strongly underlined. As a response, Wetlands International (WI) in collaboration with International Centre for Integrated Mountain Development (ICIMOD) initiated a project on Support for Himalayan Initiative through application of Asian Wetland Inventory (AWI) Approach and stakeholder led catchment management in Bhutan, China, India and Nepal. This European Union Asia Pro Eco funded project aimed at enabling agencies and stakeholders to implement the Himalayan Initiative and share experiences of the successes of the European Union in the region. Capacity building to work towards conservation and wise use of wetlands through stakeholder led catchment management, hydrological and strategic inventory support in the Hindu Kush Himalayan (HKH) region were the key project components. The project focused on four countries with the intention that the results and tools developed could be utilized and adapted by the other countries in the region.

One of the key activities of the project was to establish the basis for integrated strategy for conservation and wise use of the HAWs through a capacity building needs analysis within the focal countries. The assessment was carried out through a series of national level consultations and reviews culminating into a regional consultation workshop held during 26 – 28 March, 2008 in New Delhi. The workshop provided a forum for establishing a baseline of the current degree of integration of wetland wise use in water resource management; identifying practices and tools most appropriate to integrating river basin management and wetland wise use sharing European and Himalayan experiences; and, specifying policy development needs. The regional consultation attended by 37 participants from the government and non government agencies from the four countries, representatives of the Ramsar Convention, and experts concluded with the Delhi Declaration (Annex – 1).

The present paper summarizes the outcomes of the review and consultation processes and outlines the capacity building framework needs in the context of integration of HAWs into river basin management. HAWs within the HKH region have been discussed with emphasis on their ecosystem services, role in river basin management and how the current policies and strategies within water and wetland sectors could best achieve this integration.

Though the process was focused on four countries in the region, it is hoped that the outcome of the review would be useful for others to ensure integration of HAWs into IRBM. The capacity building framework developed could form the basis for strategic support to Himalayan Initiative particularly in the area of institutional networking and augmenting the skill base of wetland managers and policy planners within the region. It is also expected to be of immense use to international policy processes particularly the Ramsar Convention and the Convention on Biological Diversity in outlining the processes for achieving conservation and wise use of wetlands.

High Altitude Wetlands of Hindu Kush Himalayas

Ammochhu River, Bhutan

Distribution and Extent

The Himalayas are the youngest mountainous ranges of the world. HKH form a part of the Greater Himalayas that cover all the high mountain ranges of Central, Inner and South Asia, including the Tien Shan, Kun Lun, Pamir, Hindu Kush, Karakoram and Hengduan, the extensive middle mountain chains that surround them and the high altitude Tibetan Plateau. The HKH region extends to 3,990 sq km between 25° and 40°N latitude and 70° to 105°E longitude and includes the mountain territories of Afghanistan, Pakistan, India, Nepal, China, Bhutan, Bangladesh and Myanmar. The region is bound by highly fertile Gangetic plains to the south and Tarim Basin in the north. To its east is a continental scarp that extends from the Khingan range in northeastern China through the Taihang mountains to the eastern edge of Yunnan – Guizhou plateau and divides the low lying areas of China from the Quinghai Tibetan Plateau. The western margin of the region is marked by the mountains of Hindu Kush range, which segregate the Helmund Desert from the Indus Basin. The Quinghai – Tibet Plateau comprises a major part of the region.

The entire Himalayan region is marked by extremes of altitude, relief and climate. Over a short distance of 150 km, the altitude ranges from 50 m in the plains to over 8,000 m in the high mountains. The extreme relief results in a complex mosaic of topo-climates and ecosystems determined by variations in slope, aspect, altitude, geology and geomorphology. The entire region is interspersed with a range of wetlands which include rivers and associated floodplain marshes, swamps, glaciated lakes, hot springs, seasonal waterlogged areas and man made wetlands. These wetlands characteristically differ by the extremes of altitude, relief and climate experienced within the Himalayan region. Of particular significance are the HAWs, located at an altitude of 3,000 m and above which play a significant role in the hydrological, ecological and socioeconomic security of the entire region and thereby demand a special emphasis in conservation planning and management.

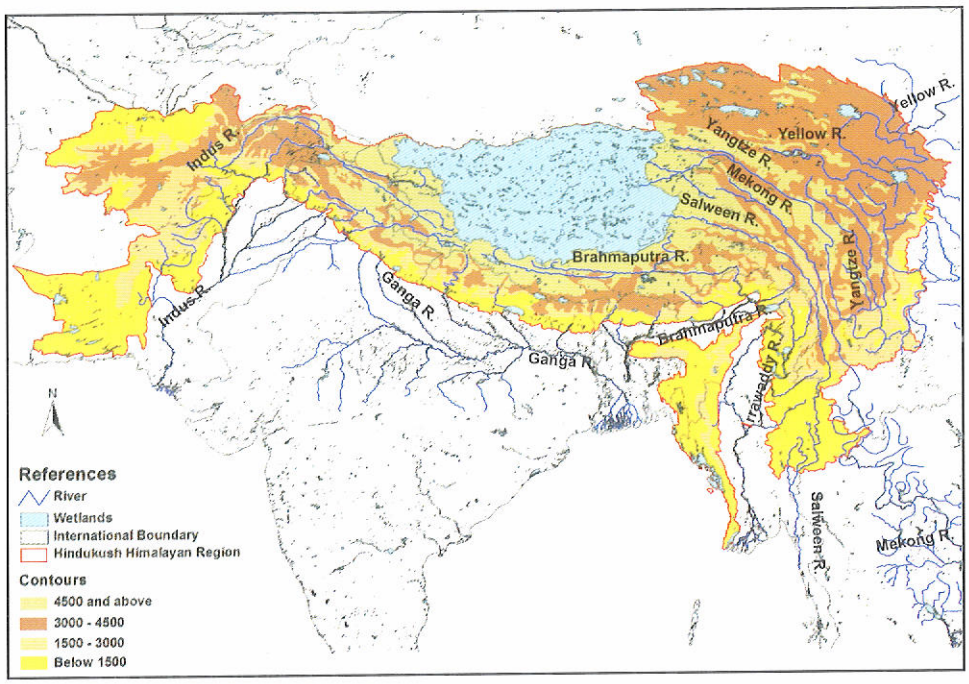
The HAWs in China are distributed in the north, south and southeast part of the Qing-Tibetan Plateau. The alpine climate favours creation of a vast frozen soil layer which is conducive to formation of wetlands in the form of lakes, marshes

and swampy meadows. Known as "simsar" in Nepal (meaning perennial sources of water), glacial and tectonic lakes have been identified of which Panch Pokhari, Dig Tsho, Tonju, Gosain Kund, Bhairav Kund, Tilicho, Phoksundo and Rara are most prominent. Rara is the largest and deepest of the high altitude wetlands of Nepal followed by Phoksundo. HAWs of Bhutan are located within three clusters: (i) lakes in the northwestern part of Jigme Dorji Wildlife Sanctuary (ii) small lakes in western Bhutan and (iii) a cluster of small lakes in eastern Bhutan (IUCN, 1989) . All the major rivers of the country viz the Drangme Chhu; the Puna Tsang Chhu; the Wang Chhu; and the Amo Chhu originate from wetlands. Within India, the HAWs are mostly located within the Leh-Ladakh region in Jammu and Kashmir, and parts of states of Uttaranchal, Himachal Pradesh, Sikkim and Assam. Pangong Tso, Chushul Marshes, Hanle River Marshes, Tso Morari, Tso Kar, and parts of Mehao Sanctuary are key high altitude wetlands in India.

Comprehensive assessments on the extent of high altitude wetlands within the Himalayan region have not been undertaken. The national inventories on wetlands within the region are at various stages of development and use different scales and resolution of information limiting their consolidation into a single information base. Under the current initiative, an attempt has been made to assess the extent of wetlands within the Himalayan region and to delineate high altitude wetlands using an overlay of Global Lakes and Wetlands Database (Lehner and Döll, 2004) and Shuttle Radar Topography Mission (SRTM) 90 M Digital Elevation Data available through CGIAR – CSI (Jarvis *et al.*, 2008). Based on the analysis, the overall extent of wetlands within the HKH region has been estimated to be 665 sq km of which 559 sq km are concentrated within the Quinghai – Tibetan plateau alone. HAWs account for 633 sq km of the HKH region (Map 1). This assessment, however, is limited to the accuracy of the datasets used for analysis and its interpretation. There is a need for systematic, multi-scalar and hierarchical inventorization of these systems to have a correct picture of their extent and distribution.

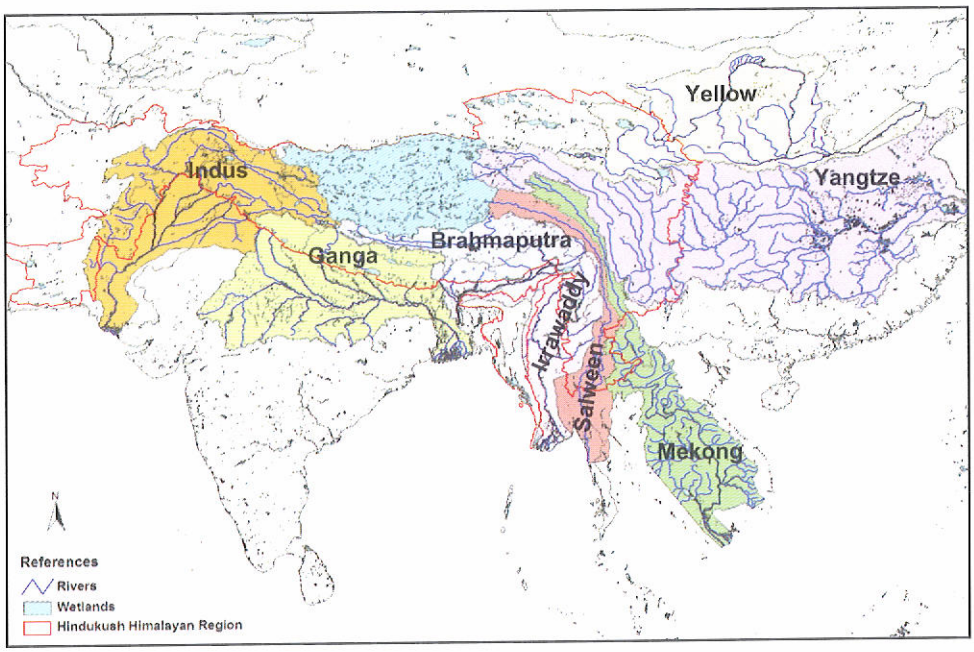
Ecosystem Services and Human Well Being

The ecosystem services provided by the high altitude wetlands need to be understood in terms of their interconnectedness within the river basins and their linkages with biodiversity and socio-economic benefits particularly livelihoods of hill communities. Located at the basin crests, these wetlands play an important role in capturing and retaining snow / ice melt and rainfall, releasing water progressively and therefore act as suppliers and regulators of water for the entire basin. Himalayan glaciers cover approximately 3 million ha, or 17% of the global mountain area. With an area of 35,110 sq km (3, 735 cu.km) as ice they are the largest bodies of ice outside the polar caps (Dyurgerov and Meier, 2005). Such a high concentration of freshwater and ice has aptly earned the region a designation of 'third pole' of earth. The HAWs of the HKH region, by capturing this glacial melt, form the source of eight large rivers of Asia (viz. Indus, Ganges, Bramhaputra, Irrawady, Salween, Mekong, Yellow and Yangtze), basins of which support more than 500 million population (19% of global population) living within India, Bhutan, Afghanistan, Nepal, China, Cambodia, Bangladesh, Pakistan, and Myanmar (Map 2). With the contribution of snow and glacial melt to the



Map 1

High Altitude Wetlands of the Himalayan Region



Map 2

River Basins associated with HAWs in the Hindu Kush Himalayan Region

major rivers in the region ranging from less than 5% of the average flow of the Irrawady River to more than 45% of the Indus River, regulation of flow regimes and flow support in the lean seasons becomes critical to sustenance of economic development in the downstream reaches of their associated basins (Jianchu *et al.*, 2007).

An example of role of Himalayan wetlands in regulating hydrological regimes is demonstrated by the Ruoergai marshes. Located within an altitude of 3400 – 3900 m amsl, these are one of the world's largest high altitude peatlands. Acting like a giant sponge, the Ruoergai marshes soak up snow and ice meltwaters of the Himalayas, and release them steadily to the streams that feed the Yangtze and the Yellow Rivers thereby regulating the flow and preventing sudden flood surges that could endanger those living downstream in the Chinese plains. Loss of extensive marshes that formed contiguous parts of the high altitude wetlands of Jhelum Basin is known to have induced a reduction in hydrological regulation capacity of the wetlands leading to increase in frequency of floods and droughts within the Kashmir Valley (WISA,2007)

The HAWs also play an important role in mitigating climate change by acting as carbon sinks. The peatlands in China are one of the most important stores of carbon in the mountain regions storing 1500-4000 tonnes per ha or up to 8-20 times more than mountain forests and 50-100 times more than mountain grasslands. The peatlands in the plateau store 750 million tonnes of carbon equivalent to 2.7 billion tonnes of CO_2 (equivalent to 7.5 times the annual fossil fuel emissions from the entire transportation sector in China) (Wetlands International-China, 2006). Given the strong pressure for all countries to reduce emissions of CO_2 for reducing the rate of global climate change, it is becoming increasingly important to maintain natural carbon stores such as peatlands.

The HAWs are also associated with high biodiversity values. The relatively young Himalayan mountain ranges have opened up new southward routes of migration and colonization into what was hitherto an island. At the eastern end, through the "Assam gate" came the Chinese and Malayan elements. From the west came some Palaeartic and Ethiopian elements. The Himalaya acted as two-way highway linking Western Africa to Southeast Asia. A range of high altitude lakes within Himalayas act as stopover habitats for paelarctic species migratory from West. Similarly on the East, species migrating from East/Southeast Asia act as stopover for the migratory birds which later get spread over the entire Indian sub continent constituting Central Asian Flyways (Trisal, 1996).

The Ruoergai marshes are an important breeding habitat especially for summering and breeding populations of Black-necked Cranes, *Grus nigricollis*. These birds after breeding within the high altitude wetlands of Tibetan Plateau, fly over to the high altitude wetlands of Bhutan. The high altitude wetlands of Leh-Ladakh are known to support the only breeding colonies of Bar- headed Geese *Anser indicus* and few breeding pairs of Black-necked Cranes to be found outside China . Gokyo and Rara lakes within Nepal are important nesting and roosting sites for several trans-Himalayan migratory birds as Brahminy Duck and Bar-headed Geese. Tso Morari is an important breeding ground for the Bar-headed Geese (*Anser indicus*) and supports significant population of Great

Crested Grebe, Brahminy Duck, Ruddy Shelduck,Lesser Sand Plover, Black-necked Cranes (*Grus nigricollis*) and Black-necked Grebes (*Podiceps nigricollis*) (Mishra and Humbert, 1998; Chandan *et al.*, 2006). In the eastern Himalayas, wetlands situated in Sikkim, Assam, Arunachal Pradesh, Meghalaya, Nagaland and Manipur together with sanctuaries of Brahamputra valley are internationally important for a number of bird species like *Ardea imperialis, Leptoptilos dubius, Francollis qularis, Perdicula manipurensis, Grus niouicollis, Houbaropsis benoalensis, Saxicola jerdoni, Pellorneum palustre, Moupinia altirostris, Prinia burnesii* and *Ploceus meorhynchus* (Crosby, 1996). The high altitude wetlands are also important from the perspective of fisheries, particularly cold water fisheries. Species of *Schizothorax, Orienus, Schizothorichthys* and *Tor* dominate the high altitude wetlands of Nepal and India (Raina, 1999; Swar, 2002) .

Despite being located within relatively sparsely populated areas, the high altitude wetlands are closely linked to culture and livelihoods of several communities, which have traditionally linked their identity and existence to these ecosystems. The Rourgei marshes are home to close to 50,000 nomadic Tibetan herders leading a traditional pastoral lifestyle. High altitude wetlands are centers for cultural and religious identity for several communities. Gosaikund, Damodarkund, Bramhakund, Rinmoksha Daha in Nepal and Sheshnag, Tarsar, Marsar and Gangbal in India are some examples of high altitude wetlands that are revered by the Hindus for occupying special places within their religion and cultures. Similarly, the Buddhists hold high altitude wetlands as Gosaikund in high reverence as several of their teachers as Padmasambhava and Milerepa are believed to have obtained their spiritual insights within these wetlands. Rich scenic beauty located within pristine environs makes these wetlands centres of touristic attractions.

Drivers and Pressures

Continued provisioning of the ecosystem services from the HAWs is subject to their high vulnerability due to anthropogenic and environment driven drivers and pressures. HAWs of the HKH region are under pressure due to drainage for agriculture, tourism related pollution, overgrazing and climate change induced stresses. Several of the high altitude wetlands are used by pastoralists and nomadic tribes for grazing. Limited growing period of vegetation coupled with harsh climate and slow regeneration make these wetlands and adjoining areas susceptible to degradation through increased grazing leading to their rapid siltation.

The entire Himalayan region is facing tremendous pressures due to increasing temperatures. The Himalayan region including the Tibetan Plateau has shown consistent trends in warming over the last 100 years. This has led to rapid retreat in the areas covered by glaciers at rates ranging from 0.3 to 1 m /year. Many Himalayan glaciers are retreating at rates faster than the global average (Dyuregrov and Meier, 2005) (Figure 1). The rates of retreat of Gangotri glacier within the last three decades has been three times the rate of during the preceding 200 years (Srivastava, 2003) (Figure 2). This has induced multiscalar impacts on wetlands in general and HAWs in particular. Assessments carried by WWF-India within the wetlands of Ladakh region have reported rising levels of

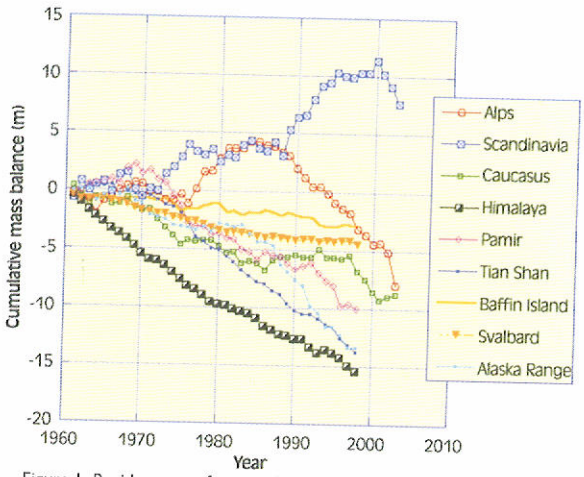


Figure 1: Rapid retreat of greater Himalayan glaciers in comparison to the global average (Dyurgerov and Meier 2005)

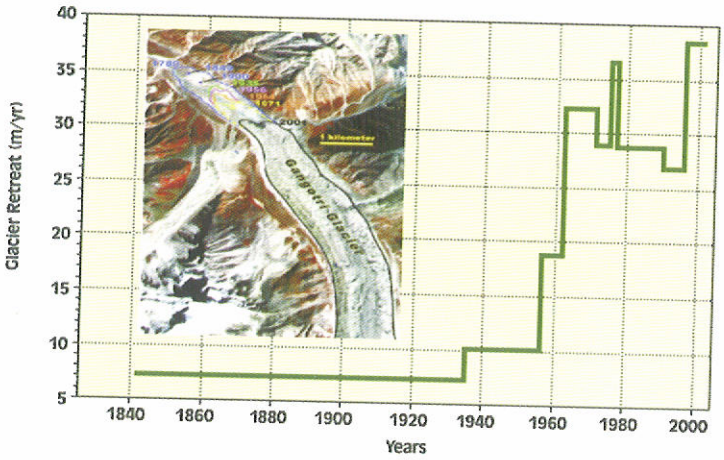


Figure 2: Increasing rate of retreat of the Gangotri Glacier in India

Yaya-Tso and Tso-Morari wetlands. These changes in water levels have led to submergence of breeding islands within the lake vicinity used by the endangered migratory birds like the Black-necked Crane and Bar-headed Geese. On the other hand, the region also faced devastating floods in 2005 and 2006, claiming several lives along with causing massive economical destruction. The local community was caught unawares due to their ignorance about the changing climate. These events in the very recent past have increased the urgency to design adaptation strategies along with raising awareness about the issues at hand.

Changing climate is also inducing a change in overall hydrological regimes within the entire basin. The snow melt begins much earlier leading to shorter winters affecting river regimes, natural hazards, water supplies and peoples livelihoods and infrastructure. Glacial lake outburst floods are other climate change induced disasters that is affecting the Himalayan region. Retreating glaciers create lakes behind the newly exposed terminal moraine, rapid accumulation of water within these lakes can lead to sudden breach of the moraine dam leading to rapid discharge of huge amounts of water and debris, called glacial lake outburst floods (GLOFs). With glacial retreat increasing rapidly within the Himalayas, the incidences of GLOFs is also increasing with a concomitant increase in damages to human lives and assets. The Zhangzhangbo GLOF of 1981 caused damage in the Zhangzangbo and Sun Koshi valleys. It destroyed the Sun Koshi Power Station and the Friendship Bridge at the Nepal-China border, as well as two other bridges and devastated extensive sections of the Arniko Highway, estimated losses more than US $3 million. Four years later, the Dig Tsho GLOF occurred and destroyed the nearly completed Namche Hydropower Plant (with an estimated loss of US $1.5 million), 14 bridges, trails, and cultivated land, and cost many lives. An assessment carried by ICIMOD has led to identification of 200 potentially dangerous glacial lakes in the region with a potential to wash off entire livelihoods through creation of catastrophic floods (Bajracharya *et al.*, 2007.

Water Regimes and Wetlands

High Altitude Wetland, China

Himalayas are the cradle of the major river systems originating from HAWs and flowing through the plains to the coastal areas. All along these rivers are laterally connected with floodplains and associated wetlands regulating flow of water. Numerous exchanges take place between floodplain areas laterally and ground water vertically. The character and behaviour of river at any particular point is dependent upon the interaction of all elements within the river basin. (Refer Figure 3 for schematic representation)

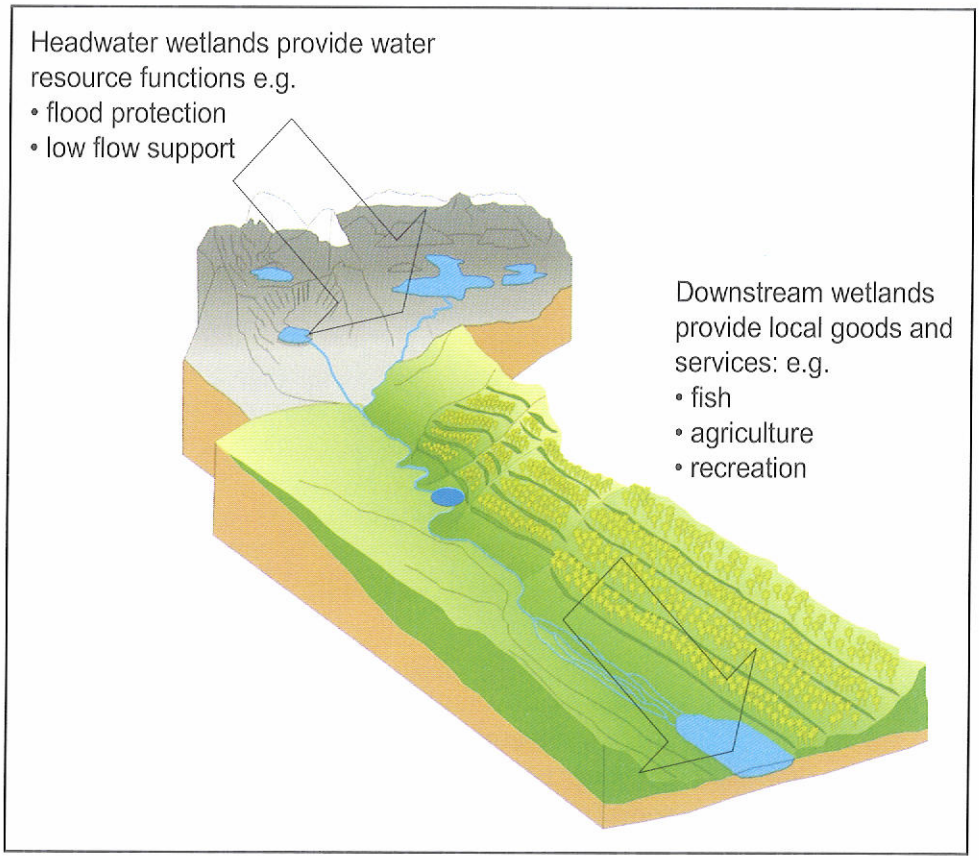


Figure 3

Functions of wetlands within river basins

Wetlands provide a multitude of services by virtue of their natural processes and functions. Their intrinsic hydrological processes buffer against extremes as droughts and floods. In wet period wetlands absorb water and therefore reduce flooding. In the dry period they gradually release water and thus ensure its

availability to surroundings and downstream area. Wetlands are important habitats for plants, animals and microorganisms. Largely because of water, wetlands are sources of life including many endangered and migratory species and form a part of global network of water dependent trans-boundary resources, whose constituents cannot be managed in isolation.

The role of wetlands as suppliers of water, regulators of water flow, suppliers of food, focal points for economic development and climate benefits have not been well recognized and integrated into water resources management. Many river basin authorities and water agencies have insufficient appreciation of the socio-economic values and benefits provided by wetlands in terms of their role in maintaining hydrological cycle, productivity and socio - economic importance. More crucially, many perceive wetlands only as competing users of water with high evaporative demand rather than an essential component of sustainable water management.

Water Needs of Wetlands

Wetland ecosystems are adapted to the hydrological regimes. The spatial and temporal variations in flow patterns and water quality as well as frequency and duration of inundation are often the most important factors determining the ecological character of a wetland. Human modifications of the hydrological regime by abstracting water or altering fluxes can have major detrimental consequences for the integrity of wetland ecosystems. Insufficient water reaching wetlands due to abstracting storage and diversion of water from agriculture, hydropower, industry and drinking water is a major cause of wetland loss and degradation. A key requirement for wetland conservation and wise use is to ensure that adequate water of the right quality is allocated to wetlands at right time for their functioning and contributing to ecosystem services

The major determinant of wetland functioning is the hydrological regime or hydroperiod, which is referred as signature of the wetland. The essential feature of hydrological regime is the balance between inflows and outflows to the wetlands, the soil contours in the wetland and sub-surface conditions. Wetlands don't function in isolation; they are highly dependent upon the upstream conditions within the river basin. Wetlands essentially are not water competitors; instead they are water providers.

Harmonizing Water Uses for Human and Ecological Purposes

The conventional water sector mostly deals with water primarily as a commodity. The problem with the conventional approach to water management is that many of the values which humans derive from water are dependent on the water being a component of health of functional ecosystem. Thus better connection needs to be developed between water supply and water resources which are origin of the supply. In addition to water supply humans have many uses for water as a integral part of the ecosystem. These include maintenance of supply of food, fiber, timber products, recreation, support of cultural and spiritual activities and purification of water. Ecosystems in which water is a

critical component are resilient and can withstand certain degree of impact. However, such disturbance is of finite limits. Exceeding these limits changes the structure and functions of an ecosystem irreversibly leading to irreparable changes in the range, availability and quality of benefits / services which the ecosystem formally provided.

The allocation of water for human and ecological purposes is an important and increasing challenge for the society. The particular challenge is to decide how much water and what quality should be reserved for maintenance of ecosystems through an environmental flow allocation so as to maintain provision of the range of valuable natural goods and services and how much water can be allocated for agriculture, industry and domestic service. To help make this decision, it is essential that costs and benefits of maintaining ecosystems and thus functions be quantified and compared to the costs and benefits of other offstream or indirect uses of water. Almost all wetlands have been modified and managed intentionally or unintentionally through hydrological interventions, flow regulations, channelisation or pollution and land use changes. Returning most rivers and wetlands to their natural state would be impossible due to long established patterns of human use and impacts. Hence environmental flow allocations can not be seen as the flow which maintains or returns a river or other wetland ecosystem to natural state. Rather it is the flow which conserves the functions and attributes of the wetland ecosystem which are desired by the people. This in turn serves the sustained availability of the goods and services of the wetland for people.

It is essential for the principle of making water allocation for wetland ecosystems with real commitment by governments and stakeholders that water allocated to ecosystems could lead to maintaining or enhancing the quality of people lives and should not prejudice provision of basic water supply, sanitation and food security. However, since freshwater supplies are finite, water for ecosystems must in almost all cases, needs to be made available from existing water resources. This in turn means that existing water resources must be allowed and managed carefully and that excessive demand of upstream users should be optimized in order to ensure that allocations can be made for wetland ecosystems with the reasonable degree of assurance. Setting environmental water allocations is a matter of societal choice in which all sectors of society should participate. A comprehensive water allocation policy needs to be developed for authorizing stream uses rather than reduction in flows for economic development with limited objectives.

To ensure that appropriate water allocations are made for and actually reach, wetland ecosystems, four components are necessary:

- decision making frameworks or processes which recognize wetland ecosystems and the critical role they play and which permit wetland ecosystem functions to be identified and valued in the same context as offstream or direct water uses by people;

- appropriate scientific and technical tools for quantitatively determining appropriate water allocations for the maintenance of desired wetland ecosystem functions;
- comprehensive strategies for the implementation of management measures which will support water allocations for wetland ecosystems; and
- appropriate management tools and measures that can be used to manage people's demands and impacts on water resources so that water remains for or is made available to wetland ecosystems

River Basin Approach for Conservation and Wise Use of Wetlands

Rivers are essentially interconnected transport systems in which energy, chemical and biological matter is exchanged with the external environment. The hydrological and ecological continuum in river basins is such that the character and the behaviour of the river at any particular point is dependent upon the interaction of upstream contours particularly land use. The interconnected nature of river system highlights that successful water management requires the adoption of approach, which consider all the activities within an area instead of focusing only on one or few limited objectives. The river basin management approach enables incorporation of both upstream and downstream considerations into decision-making and subsequently the management of water resources. It should also help to avoid the problems associated with isolated often shortsighted use of water and land resources in one area which often have adverse impacts elsewhere within river basin. An integrated approach emphasizes on integrating ecological, economic, social and political factors within the framework of river basin management as a whole. Further, this approach enables the best use to be made of the functions and benefits provided by basins resources.

The rivers are essentially continuous systems that redistribute materials across landscapes and show terrestrial- aquatic interplay all along their lengths. The essential feature of the river system is connectivity from the headwaters to the coastal region both longitudinally and laterally with floodplains and associated wetlands. Vertically it exhibits connectivity with ground water regimes. The wetlands extending from head reaches to the coastal are interdependent and interconnected with each other through water regimes. Any modification within the river system or diversion of water in the upstream area is likely to effect wetlands located within the plains and ultimately the coastal areas. Understanding of this connectivity is critical to rehabilitate and maintain the health of wetland ecosystems within the river system.

Human activities impact ecosystem at different places in the hydrological cycle and thus impact water itself. Hence, the water sector needs to manage water resources in the context of ecosystem management to harness benefits / services of water at the basin level. The common objectives should be largely defined by people and societies dependent on water resources. In principle integrated water resources management emphasizes on protection of resource base for long term sustainability on one hand and the utilization of services provided by

the resource base in order to meet ecological, social and economic development imperatives.

The Integrated River Basin Management (IRBM) framework aims at coordinating conservation, management and development of water and land related resources across sectors within a given river basin, in order to maximize the economic and social benefits derived from water resources in an equitable manner and preserving and wherever necessary restoring freshwater ecosystems. Integration of wetlands within the IRBM is therefore a useful framework for achieving conservation and wise use of wetlands including HAWs and mainstreaming their ecosystem services into wider conservation and development contexts.

A framework for integration of wetlands into IRBM has been developed as a series of Ramsar Convention Water Related Guidance (Ramsar Convention Secretariat, 2007). The guidance emphasizes on water being an integral part of the ecosystem and natural resource and a social and economic good whose quantity and quality determine the nature of its use. The IRBM approach is an example of participatory mechanism for conflict resolutions and allocating water between competing users including natural ecosystems. A critical requirement for integrated river basin management is introduction of the land use and water planning and management with the focus at the river basin scale. Water resources planning and management is a multidisciplinary process and has to be promoted as a collaborative framework among all the agencies operating at different levels within the river basin as well as local communities.

Status of Integration Between Water Management and Wetland Conservation Policies and Strategies

Sichuan Marshes, China

Having established the basis for integrating HAWs into IRBM framework, the current chapter explores the status of integration between water and wetland conservation and management policies and strategies. In general, the approach of water management within the region has been biased towards human uses ignoring the ecological aspects, which have been considered unnecessary or sometimes obstruction in the process of development. Wetlands have been often ignored and not considered as part of water resources family. The role of wetlands in recharging aquifers and maintenance of water quality has been recently recognized bringing water and conservation sectors to develop integrated approaches. Currently the water policies and strategies in the region are more focused on human uses such as drinking water, irrigation, hydro-power and industry. The linkages between water regimes and wetlands has to be clearly understood and reflected in the water policies and strategies.

Water Policies and Strategies

India, China, and Nepal have formally adopted water management policies at government level for human uses considering water as a prime natural resource. Planning and implementation of water resources projects involve a number of socio-economic and environmental considerations.

China's Water Policy initiatives are of special interest. A dramatic shift in water policy thinking occurred in early 1999 with Ministry of Water Resources (MWR) introduction of the resource water conservancy, concept as a major theoretical and methodological departure from conventional approaches. This represents a distinctive new perspective in Chinese water management. It aims at formally recast and reinterpret long-standing social and economic criteria for justifying and measuring the economic and social values and costs of hydropower resources, as well as for water supply, treatment, control, protection, and distribution infrastructure. Wider focus on water as a resource, moreover, clearly anticipates new, more effective institutional mechanisms for policy development and implementation. These will serve to ease the transition from long-standing reliance on centre-driven planning guidelines for goal attainment and performance evaluation. Further, there is formal recognition of the need for greater provincial and local autonomy in choosing appropriate market instruments that can enhance the efficiency of project-specific water use while improving water quality and conservation more widely in agriculture, domestic supply, wastewater treatment, inland navigation, and ecological support.

This fundamental policy shift, now in its early stage, is seen as an essential adjustment that requires new, traditional hydraulic engineering theory and practice. It also calls for the reshaping public attitudes and responsibilities toward water as a resource, thereby promoting new ethical values of protection, conservation and improved scientific management. The emphasis inter alea is on the following:

- irrigation development to enhance agriculture productivity as key area for investments and timely changing in policy, programmes and projects;
- infrastructure development, coordinated efforts by stakeholders in the process of planning and utilization of water resources;
- maintenance of minimal flows in the rivers to be ensured after determining that it will not have negative impacts on biodiversity;
- monitoring water quality and quantity to minimize environmental impacts has to be ensured in case of developmental projects of the capacity of water flows of the rivers based on scientific analysis in collaboration with the department of hydrology and metrology for the purpose of national, regional and district level of feasible irrigation development; and
- management of ground water regimes by development of strategies for their optimum utilization.

National Water Plan of Nepal includes programmes in all strategically identified areas which are expected to contribute to maximize the sustainable benefits of water use (Government of Nepal, 2002). Integrated water resources management has been adopted as one of the objectives of the National Water Plan. The approach follows that water must be viewed from the holistic perspective both in its natural state and in balancing the competing demands on it. More equitable, efficient and sustainable use that emerges provide cross cutting requisite along with horizontal and vertical integration within management framework of the water resources development. Policy principles that are being used to guide Nepal water sector development include:

- holistic management of river basin;
- decentralization of water services delivery, economic efficiency and social equity to guide water resources development and management;
- stakeholder participation, sharing water resources among the riparian countries on equitable basis; and
- institutional and legal framework of coordination and adoption of best existing technologies and practices.

This plan is supported by Nepal's Environmental Policy and Action Plan 1993 (Government of Nepal, 1993) which has five policy objectives:

i) sustainable management of natural resources
ii) population health and poverty reduction
iii) safe guarding national heritage
iv) mitigating adverse environmental impacts
v) legislation, institutions, education and public resources

Bhutan has drafted National Irrigation Policy for sustainable approach to irrigation development involving water users. The policy covers the entire process of irrigation development including operation and maintenance procedures (Royal Government of Bhutan, 2004). A fundamental proportion of the National Irrigation Policy is that farmers are involved and given responsibility for operational maintenance. The policy requires that project beneficiaries associate themselves in formulation of water user association which is an autonomous organization comprising members which are beneficiaries of irrigation development.

Bhutan has formulated guidelines for environmental clearance of projects relating to hydropower, mining, tourism, industries, highways and roads, urban development, transmission and distribution lands, stormwater drainage systems. (Royal Government of Bhutan, 2004).

The National Water Policy of India identifies provision of water for drinking, irrigation, flood control, hydropower, navigation, industrial and other uses in that order, as the primary objectives of water resources development (Government of India, 2002). It proposes planned, integrated, multidisciplinary, scientific, and multi objective development and management of water resources to meet the changing water needs. The policy lays emphasis on maintenance and enhancement of environmental quality and social and economic growth with equity as important considerations in meeting water resources development objectives.

The policy suggests suitable changes at the macro-level in the government and adoption of the river basin approach to the integrated planning and management of water resources. At the micro level the policy suggests the setting up of community organizations throughout the country – Watershed Management Associations (WMAs) in rainfed areas, Water Users Associations (WUAs) in irrigated areas, Joint Forest Management (JFM) committees in forest areas and Resident Welfare Associations (RWAs) in urban areas. These community organisations will be the organisational mechanisms through which people can be involved in the management of water resources. The steps involved in setting up and running the community organisations have been listed in an annexure to the action plan.

A critical review of water policies in general in the region indicates the following gaps:

- No institutional mechanisms to bridge the gaps and information needs by various agencies
- Lack of coordination among ministries of water resources, agricultural and rural development on the one hand and ministries dealing with ecological and social aspects
- Linkages of traditional water harvesting strategies of communities to augment water conservation and its sustainable use
- Lack of specific strategies for conservation of water resources in rivers, lakes, ponds and aquifers considering more than 80% of annual rainfall just during 4 to 5 months
- More emphasis on engineering measures ignoring ecological aspects such as wetlands, environmental flows and use of data generated by the research community
- Role of wetlands in flood control, water purification and other ecological aspects have been indicated but not practically integrated in the water management policies

Wetland Conservation and Wise Use Policies

India, China and Nepal have wetland conservation strategies and policies adopted at government levels for conservation and wise use of wetlands. Nepal has adopted National Wetland Policy in 2003 which also includes conservation and wise use of HAWs (Government of Nepal, 2003). The main objective of the policy is to conserve wetland biodiversity and sustainably utilize its resources for the

communities through participatory process particularly involving local people in the management process. The emphasis in the policy is to address the root cause problems and use scientific knowledge and traditional practices for conservation and management of wetlands. All the three categories of the wetlands including those located in protected areas, government or public lands outside the protected areas and also those located within private lands have been identified for conservation and management purposes. The policy lays emphasis on preparation of national level inventories, conservation of biodiversity, control of invasive species, prohibition regarding activities leading to adverse impacts of wetlands. The policy has also identified the priority for implementation in phased manner.

National Environmental Policy of 2006 as adopted by India has a focus on wetlands emphasising on legally enforceable regulatory mechanism for identified wetlands including those located in Himalayan region (Government of India, 2006). The policy has emphasis on prudent use of strategies for significant catalogue of wetlands with participation of local communities. Integration of wetland conservation and wise use into sectoral developmental plans has been specifically highlighted in the policy. The environmental policy underlines the importance of river systems, ground water regimes, mountain ecosystems as critical to wetland conservation. Integration of conservation and wise use of wetlands into river basin management, involving all relevant stakeholders to ensure maintenance of hydrological regimes and conservation of biodiversity has been specifically mentioned in the policy.

Water law of the people's of Republic of China adopted in 2002, has special focus on restoration of wetlands for sustainable water resource management (Government of the People's Republic of China, 2002). The adoption of effective measures such as protection of vegetation, conservation of water bodies, prevention and control of pollution for water supply, irrigation, fisheries development and flood control. Water function zones along rivers and lakes shall be delineated into zones for graded management. Water quality monitoring, maintenance of natural flows, removal of obstructions for species migration, control of reclamation along the banks for flood absorption as a strategies to combat floods has been specifically mentioned under the law. Water allocation plans are proposed to be developed considering the ecological needs in addition to human uses.

Extent of Integration of Wetlands Into Water Resource Management

Water resources management and wetland conservation have been separately dealt in all the four focal countries. The focus of wetland conservation is primarily on biodiversity conservation without addressing the hydrological linkages. Values and functions of wetlands have not been clearly reflected into the plans and policies of the water resources development agencies. The sectoral developments have led to large gaps in the integration of wetlands into water resources development. Wetlands have been considered by the water resources development agencies as the areas full of disease, danger and difficulty and of little relevance in the context of water resources development. As such, little attempt has been made to conserve wetlands integrating hydrological regimes communicating their values clearly to the water resources developmental agencies. Realizing the limitations of conservation measures, management of water regimes to address the problems of sustainable resource management was undertaken in some wetlands.

Gap Areas

Based on the review of water sector and wetland management plans, policies and strategies within Bhutan, China, India and Nepal, the following gap areas are evident limiting integration of wetlands into river basin management:

Sectoral approach to wetlands and water management with limited degree of integration.
Wetlands and water management are treated as separate sectors with role of wetlands being seen related to biodiversity and water management being related with provisioning for anthropogenic needs, as irrigation, hydropower management and maintenance of domestic water supplies.

Role of wetlands in water management and river basin management not explicitly recognized.
Role of wetlands in water management and river basin management within the Hindu Kush Himalayan countries is poorly understood and therefore not explicitly recognized. This is attributed to lack of systematic inventory and assessment tools which permit mapping of hydrological and ecological processes of wetlands in relationship with the river basin, and thereby identification of management objectives which could effectively synergize multiple functions of wetlands with objectives of water management.

Water allocation strategies focused on human uses without considering ecological requirements.
Water allocation strategies within the focal countries has been traditionally focused on human uses, as irrigation, hydropower development and maintenance of domestic supplies without considering the ecological requirements for maintenance of ecosystem processes and functions. This has, in several circumstances, led to decline in resources and affected livelihoods of communities, and created conflicts between stakeholders.

Focus on role of state and community institutions in management of water resources–with limited role of private sector.
Institutional arrangements for water and wetlands management focus on the role of the governments or the communities, and tend to exclude other institutions, primarily the private sector into management planning and implementation. With India and China being two largest and rapidly growing economies, there is a tremendous opportunity of harnessing the benefits through involvement of private sector in wetlands and water resources management through creation of innovative and sustainable financing opportunities.

The above gaps underline the urgent need for action as ineffective and inadequate integration of HAWs within river basin management enhances vulnerability of large populations and ecosystems – especially on account of climate change.

Best Practices for Integration of Wetlands Into Integrated Water Resources Management

Wular Lake, India

Water and wetland management policies and strategies within the HKH region, in general, are sectoral in nature with very limited degree of integration. This limits communication between the two sectors often leading to changes in water regimes detrimental to wetland ecosystems. However, there are examples within the region that could be used as a basis for integration of HAWs into IRBM framework and are documented in this section. The best practices adopted in Europe have been examined in the context of their feasibility for application the region.

Himalayan Experience

Inventory and assessment

The specific comprehensive attempts to delineate HAWs within the Himalayan region countries have yet to be undertaken. However, efforts to create a national level wetland inventories have been made by India, China and Nepal. Of the four countries, Indian wetland inventory is perhaps at a finer resolution as compared to others (> 2 ha in India as compared to > 200 ha in other focal countries). However, there has been a limited application of hierarchical inventory approach as proposed under Asian Wetland Inventory guidelines proposed by the Ramsar Convention. Absence of linkages of the wetland extent datasets with the hydrological, ecological and socioeconomic datasets limits use of these inventories for conservation and management planning purposes.

An important initiative in this regards is the establishment of Greater Himalayan Database accessible at http://www.ghwis.icimod.org:8081/wetlandsnew1/. The database system, adopting the Asian Wetland Inventory approach creates a series of hierarchical layers at river basin, sub basin, wetland complex and wetland levels addressing ecological, hydrological, geomorphological and social aspects. Koshi Sub Basin within Ganges has been used to demonstrate application of the approach to support conservation planning (ICIMOD and WI, 2008). The database is still in early stages of development, and needs to be further broadbased to enable wide ranging application.

Under the Himalayan Initiative Project, an attempt has been made to develop a framework for vulnerability assessment that could be used to prioritize management planning (Stratford *et al.*, 2008) The assessment uses the data

collected during the wetland inventory in order to assign a vulnerability level to each wetland studied. This information can then be used to prioritize efforts to protect and preserve the wetlands. The vulnerability assessment is seen as a fully integrated part of the wetland inventory and thereby builds on data that would already be collected through the inventory and minimizes the need for further data collection. The basic concept of the vulnerability assessment is represented in Figure 4.

Assessment of wetland values leads to quantification of ecological, economic and social values. For each value identified a High, Medium or Low rating is assigned which is evaluated based on the magnitude and uniqueness of the value. Assessment of threats to wetlands is aimed at various scales and leads to assignment of a High, Medium or Low rating to each identified threat based on the severity and likelihood of occurrence. This information is all entered into the spreadsheet which combines the data and produces the vulnerability assessment. The output from this provides the user with a summary of the values under threat, or have an impact on the greatest number of values and further data collection needs. An example of the output from the vulnerability assessment spreadsheet is indicated in Figure 5.

Site level community led conservation efforts

Several site level conservation initiatives have been undertaken within the KHK region. WWF-India under its freshwater and wetlands programmes has identified HAWs of Ladakh as a priority region. It has carried out local level situation analysis and impacts of development pressures, paricularly changing pasture management practices. It has evolved a conservation strategy involving the armed forces which have a frequent presence at the HAWs and created community conservation trust to take up conservation and management efforts in the future. Similar community led conservation approaches have been demonstrated in management of watersheds of Rara Lake. Within Rourgei marshes, Wetlands International – China has undertaken measures with support of the local government in preventing drainage of the peatlands based on its role in maintenance of hydrological regimes of the downstream reaches (Refer Box I for details). These models outline the relative importance and significance of participation of local communities and use of traditional knowledge in conservation and management of HAWs within HKH region. Loktak Lake on the eastern Himalayas within India is one of the best examples of application of hydrological processes in developing strategies for management planning and application of wise use principles in collaboration with local communities, NGOs and community based organisations (Trisal and Manihar, 2004) . The lead role played by the women in mobilizing communities led to successful interventions for livelihood improvements.

Integration of wetlands into River Basin Management

Efforts for integration of HAWs into RBM within the HKH region of the focal countries have been very limited. Management planning for Wular Lake undertaken by WISA for the state government of Jammu and Kashmir elucidated the role of HAWs in maintaining the overall hydrological regimes and ecological processes within the Jhelum Basin. Accordingly a river basin approach has been outlined for conservation and management of Wular Lake, which emphasises

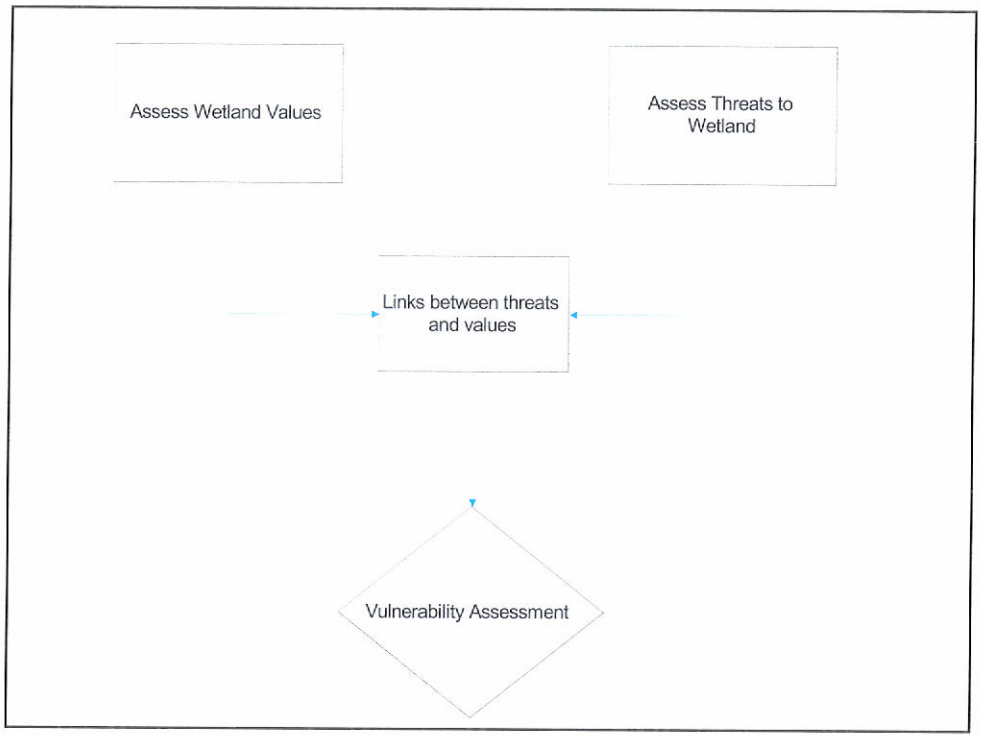


Figure 4

Vulnerability assessment framework

ASSESSMENT TABLE		Threats									
		*** Pollution - pesticides	Pollution - nutrients	*** Pollution - industrial	Pollution - urban/domestic	Pollution - organic waste	*** Siltation/sedimentation	Encroachment - urban/housing	Encroachment - agricultural	*** Flow regime change - reduced low flow	*** Flow regime change - increased flooding
Economic Values	**Economic Impacts**										
Fishing	Loss of fisheries	0	0	0	0	0	0	0	0	0	
Tourism	Loss of tourism	***		***							
Agriculture	Loss of agricultural productive land						0	0		0	
Water for d/s use	Reduced low flows for d/s use									***	
/// Retention of flood water	Increased flood damage to property/commerce (in & d/s)										*/*
Provision of drinking water	Reduced water of suitable quality for PWS	***		***						***	
Sediment trapping	Loss of clear water for downstream dwellers										
Grazing for cattle	Loss of grazing land										
Other economic value											
Other economic value											
Other economic value											
Ecological Values	**Ecological Impacts**										
/// Aquatic fauna	Loss of rare fauna (aquatic)	*/*	///	*/*	///	///	*/*	///	0	*/*	*/*
/// Aquatic flora	Loss of rare flora (aquatic)	*/*	///	*/*	///	///	*/*	///	0	*/*	*/*
Terrestrial/Avian fauna	Loss of rare fauna (terrestrial/avian)	***		***					0	***	***
Terrestrial flora	Loss of rare flora (terrestrial)	***		***					0	***	***
/// Spawning ground	Reduced spawning	*/*	///	*/*	///	///	*/*			*/*	*/*
/// Aquatic habitat	Loss of biodiversity (aquatic)	*/*	///	*/*	///	///	*/*	///	0	*/*	*/*
/// Terrestrial habitat	Loss of biodiversity (terrestrial/avian)	*/*	///	*/*	///	///	*/*	///	0	*/*	*/*

Figure 5

Vulnerability Assessment Matrix

interventions at catchment scale balancing conservation as well as development needs (Refer Box 2 for details). River basin level planning also formed the basis for conservation and management of Loktak and associated wetlands within Manipur River Basin (WISA, 2005).

Public private partnerships

Much of the institutional arrangements for RBM within the Himalayan countries are biased towards the governments with participation by local communities. However, with rapid economic growth, industries are gradually emerging as major water users within the downstream reaches of the basins. Water management initiatives by the corporate sector therefore are significant for achieving sustainable water management in the basin. Efforts in this direction are evident within the corporate sector in India (eg., paper production processes of ITC, water management in Orchid Hotel groups, water reuse by pharmaceutical sectors). Water management approach of industrial sector in India is broadly organized along five principles: a) maintenance of zero discharge of pollutants, b) water saving, c) metering and automatic control, d) recycling, and e) upgrading discharge water quality. The Nepal Chamber of Commerce has also identified water management as crucial for sustainability of business. However, there are still no evidences of effective involvement of corporate sector as a stakeholder in water management through partnerships and incentive systems.

European Experience

Policy framework for integrated river basin management

The European Union Water Framework Directive (WFD) is an important policy framework which mainstreams ecological considerations in water management in an integrated approach (European Union, 2000). The WFD could play a very significant role in providing critical guidance to integrate wetlands into river basin management.

The WFD is intended to provide a structure for the further development of all aspects of water policy in Europe. One of the framework directives innovations is the management of rivers and lakes by river basin - the natural, geographical and hydrological unit - instead of administrative or political boundaries only. River basin planning envisages to take into consideration the role of wetlands play in restoring the natural discharge and the recharge patterns, purifying water and trapping sediments. For each river basin district is proposed to be established and updated regularly. The proposed plan includes an analysis of river basins characteristics, a review of the impact of human activity on the status of waters in the basin and an economic analysis of water use in the district.

The WFD includes explicit objective to maintain and restore flood plains and wetlands. Implementation of the framework has emphasis on the following key issues in the context of wetlands:

- taking account of wetland biodiversity and wetland functions in river basin planning;
- taking account of the water quality and quantity needs of wetland protected areas in river basin planning; and

- addressing wetland restoration needs and potential through implementation of the directive guidelines for river basin management.

The role of wetlands in the WFD has been further elucidated in the Horizontal Guidance (European Communities, 2003). It introduces specific recommendations clarifying the role of wetlands in the RBM process. An application of WFD principles is demonstrated in Wetland Vision, a project implemented in UK by a partnership between English Heritage, Environment Agency, Natural England, The Royal Society for the Protection of Birds and the Wildlife Trust (www.wetlandvision.org.uk). A three stage process viz.: i) analysis of current initiatives and existing visions, ii) identification of environmental requirements of different wetlands and iii) prioritization of targets to support current and future biodiversity has been used for the purpose of creating a 50 year vision for England's freshwater wetlands. The various challenges and issues including climate change, sea level rise, water availability, future farming, natural processes are addressed in consultation with conservation partners, community and beyond.

Integration of wetlands into flood risk management policies is also demonstrated in UK (www.environment-agency.gov.uk). The policy statement highlights the importance of flood risk management through catchment conservation planning for flood mitigation and maximizing opportunities to promote conservation and enhancement of biodiversity. This approach is followed in all capital, routine and non routine maintenance works as part of developmental scheme works prior to seeking funding for such projects. As flood risk management is one of the most common issues within the downstream reaches of the Himalayas, a review of the merits of these policies and implementation experiences could immensely benefit the region.

Integrated river basin management in practice

Sustainable catchment management programme has been initiated through EU funded projects in several countries of the region for restoration of drinking water supplies and improvement of habitat conditions. This has been approached by entering into long term agreements with farmers who define farming plans compatible with the objectives. The process starts with the catchment where water is gathered before storing, treating and distributing to the customers. Several water companies are engaged in catchment conservation for achieving good water quality.

The implementation of such activities have been undertaken in Whitendale, UK in 2005 by adopting methods such as heather bale grip blocking, peat turfing, plastic sheet piling etc. for withholding water effectively in the catchments. The farmers are benefited by more sustainable incomes, improved water quality, wildlife habitat improvement and enhancement of landscape value of the land.

Public private partnership

Public private partnerships are one of the significant innovations within the European countries for management of wetland catchments. This institutional arrangement provides an opportunity for private sector to be engaged in conservation of watersheds which forms the basis of corporate activity, eg

producing mineral water. A payment for ecosystem services derived from the catchments enables sustainable financing and therefore acts as an incentive for adopting sustainable catchment management practices. Some of the examples of public private partnership relevant to integration of wetlands within river basin management are:

Danone experience

An example of public private partnership is presented by Danone, which produces evian mineral water. The Société des Eaux Minérales d'Evian which in 1992 joined with the French government formed an organisation to protect the catchment area of the natural spring experimenting with more environmental friendly farming practices, expanding the nearby sewers, and ensuring regulatory compliance by livestock holdings. The Société now supports two-thirds of the conservation costs in the catchment.

EU wise use of floodplains - EU life environment project

The EU Wise Use of Floodplains project (supported under the EU Life Programme) aimed to address the degradation of floodplains which has contributed to loss of biodiversity and investment in complex, expensive and sometimes damaging flood defence infrastructure. Six case study catchments in France, Ireland, Scotland and England were taken to demonstrate how sustainable management of floodplains could contribute to sustainable management of water within the river basins. This was done to support implementation of WFD within the member countries of the EU.

The presence of a multitude of stakeholders within competing demands of water necessitated adoption of a partnership approach to project implementation. The project partnership involved the government and statutory agencies , non governmental agencies and private sector. Key government and statutory agencies included Agency D'Leau (statutory agency in France for water management), Center for Ecology and Hydrology, English Nature (U.K., Government agency responsible for conservation of wildlife and natural features), Environment and Heritage Service (statutory agency for environmental regulation and protection in Northern Ireland), Environment Agency (statutory agency for environmental protection and regulation of the quality of air, land and water in England and Wales), Ministere De L'Amenagement Du Territoire Et De L'Environment (Government Department of France overseeing implementation of Water Framework Directive), Rivers Agency (statutory agency responsible for management of watercourses in Ireland), and SEPA (Scottish Environment Protection Agency). RSPB (European Conservation Agency), Birdwatch Ireland (conservation organization of Ireland), La Ligue Pour La Protection Des Oiseaux (bird conservation organization) and WWF are the key non government agencies supporting project implementation. SNIFFER (Scotland and Northern Ireland Forum for Environmental Research) and Thames Water Utilities Ltd. (responsible for water and waste treatment in Thames River) are the key private sector players engaged in implementation process.

The Wise Use of the Floodplains project, through its pilot catchments, demonstrated the role of public private partnerships in conservation of

floodplains and their integration within river basin management. Within the Forth catchment in Scotland, the project examined changes within the Common Agricultural Policy to enhance financing to floodplain conservation initiatives. Through workshops within stakeholder groups, number of possible options for future management of floodplains were identified. Necessary processes enabling catchment management were outlined which included development of a forum and an integrated plan with participation of all stakeholders. The Fens Floodplains Project enabled planning for restoration of Fens which were rapidly degrading due to changing climate and expanding population and business around Cambridge. With public private partnership, a strategy has been developed which could recreate wetland environs and restore their hydrological and ecological services. Suggested measures cut across all sectors and include usage of reed beds for wastewater treatment by the local industries. The Erne catchment project aims to address water quality degradation due to agriculture, particularly agri food industries within the catchment. A landscape level land use plan has been developed alongwith identification of appropriate institutional arrangements for implementation of floodplain restoration plan. The project, based on implementation experiences has also led to development of guidance notes, on hydrological impact assessment, participatory processes, policy analysis and options appraisal.

Research and development

Research and development on values and functions of wetlands is critical to support their integration into river basin management. Several centers of excellence have been established within Europe which have research and development focus on wetlands as one of the key mandates. Center for Eco-Hydrology is one such center which undertakes research pertaining to wetlands and their role in wetland management.

One of the emerging areas for research and development is related to climate change, particularly the impacts of climate change in wetlands and their role in adaptation strategies. A modeling exercise undertaken by Center for Eco-Hydrology, UK attempts to identify the changes in wetland vegetation due to changes in hydrological regimes. The assessment has been carried out at six locations including northern and southern Scotland, Wales, northern, southeast and southwest England. Information pertaining to rainfall, evaporation and river flow for thirty years (1961-90) was used to develop scenarios for 2071–2100. Water requirements for various vegetation types were used as a basis for assessing changes in wetland vegetation for a 2100 scenario.

Compatibility

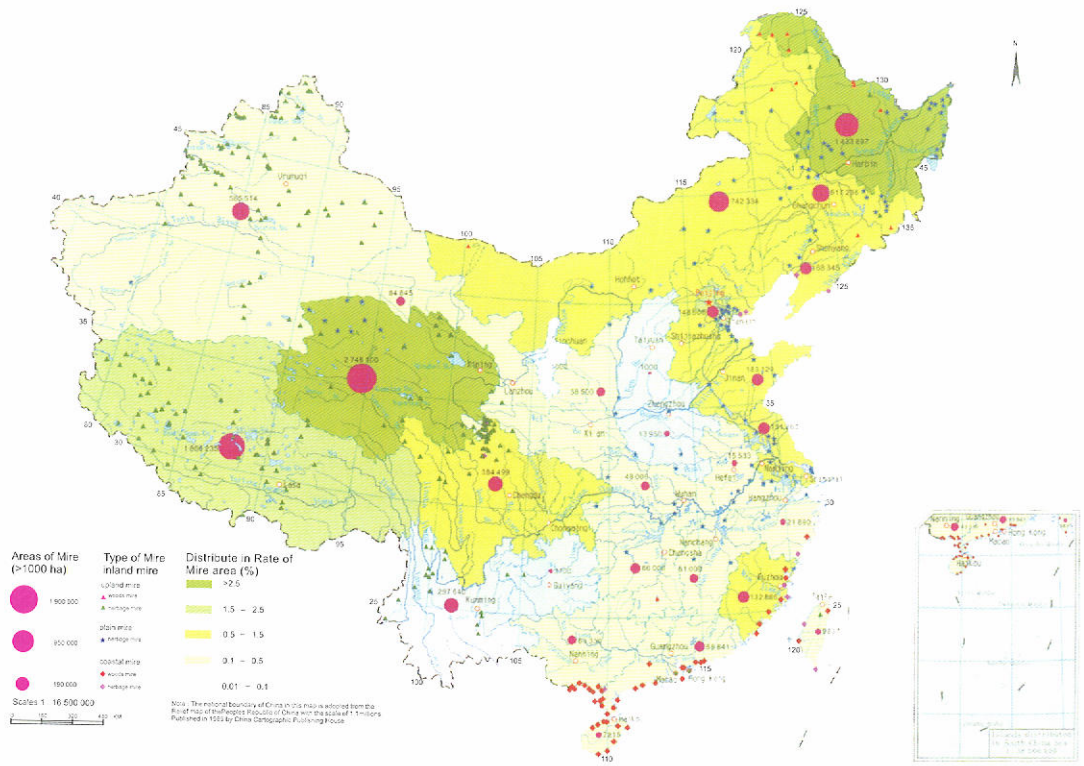
An assessment of the Himalayan and the European approaches indicates strong compatibility of approaches to achieve integration of wetlands in river basin management. Wetlands within Europe as well as in Himalayas support livelihoods through their ecosystem services. The challenges posed by unsustainable development and structural approaches are almost similar in nature, though located within different developmental contexts. The European experiences could therefore contribute to integration of wetlands within river basin management through the the following elements:

Integrated framework for water management: The WDF presents a useful approach to guide water resources development within the region, working across political and administrative boundaries. A similar approach could be used to harmonize water resources development and planning within the Himalayan region.

Public private partnership: Institutional arrangements within Himalayan region in the context of water management are primarily led by the state. The European experiences on public private partnership could be used as an opportunity to involve private sector in basin management complementing the efforts of all stakeholders of the basin.

Assessment of impacts of climate change: Climate change models being developed globally are run at a crude scale within limits their application within Himalayan region with high degree of spatial variability. Experiences of modelining impacts of climate change on wetland environs could therefore be suitably adapted to project changes and define role of wetlands in adaptation measures.

Box 1 High Altitude Peatlands of China



Map 3 Location of Ruoergai Marshes

Ruoergai Marshes located on the south-eastern edge of the Qinghai-Tibetan Plateau (3000-3900 m) are one of the world's largest high altitude peatlands (Map 3). These unique marshes comprise approximately 500,000 ha of peat bogs, sedge marshes, lakes and marshy grasslands, in poorly drained valleys separated by hill ranges, and form the headwaters of Yellow River.

The Ruoergai Marshes play a key role in regulating hydrological regimes of the river, acting as a giant sponge, on its headwaters and gradually releasing water during the lean season. Besides, these wetlands host a diverse Tibetan-Himalayan flora, typical of montane peat bogs and alpine grasslands. It supports a population of 600-900 Black-necked Cranes, *Grus nigricollis*. These marshes are important breeding areas for Ferruginous Duck, *Aythya nyroca* and other threatened bird species (Cinereous Vulture *Aegypius monachus* and Wood Snipe *Gallinago nemoricola*).

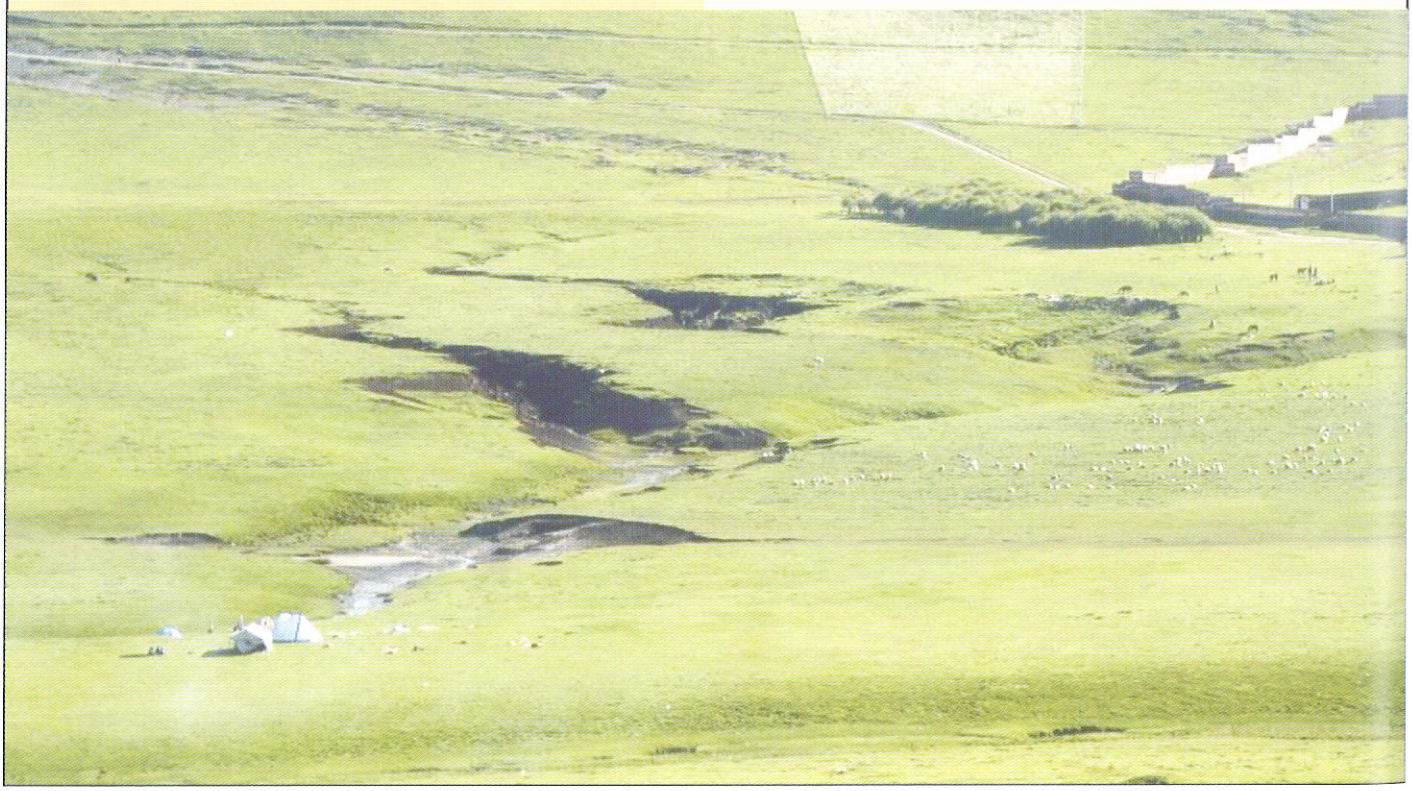
One of the key ecosystem services of these peatlands is their functioning as carbon stores. The peatlands in the plateau store an estimated 750 million tonnes of carbon equivalent to 2.7 billion tonnes of CO_2 (equivalent to 7.5 times the annual fossil fuel emissions from the whole transportation sector in China). The peatlands are also important for the local communities, particularly Tibetan herders, who attach their cultural identity to these marshes.

As in many peatlands around the world, over-exploitation is a major problem in the Ruoergai. The main threats include mining, overgrazing and drainage. During the last few decades the traditional pastoral nomadism has changed to a semi-nomadic, and in some areas, even to a settled system with high concentrations of livestock. This has led to serious over-grazing with enormous negative impacts. Large-scale drainage undertaken in the 1970's, land conversion, and development of infrastructure such as roads have further impacted

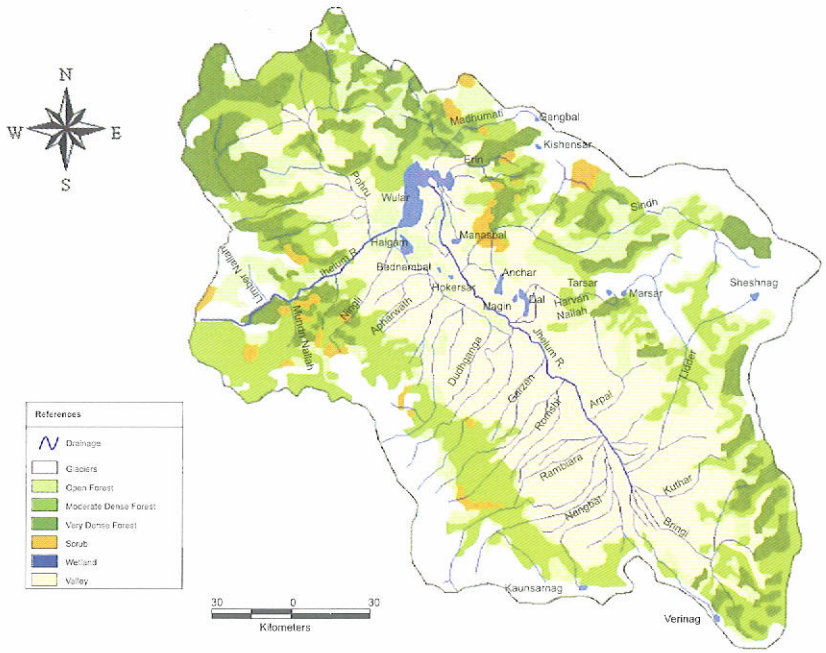
the natural functioning of these ecosystems. Large areas of peatlands have been severely degraded and in some sites the peat layer has been totally lost exposing underlying mineral soils. In some areas such as Hongyuan County there has been a significant reduction in the groundwater table associated with the loss of wetlands. There has been an increased frequency of floods and droughts and even desertification in certain situations.

Responding to rapid degradation of the peatlands, an evaluation of the impacts of different management options in relation to climate change and biodiversity maintenance was carried out as part of Integrated Peatlands Management under Biodiversity and Climate Change project, which was a collaborative effort between Wetlands International, the State Forestry Administration of China, Global Environment Centre, Ruoergai National Highland Wetlands Nature Reserve and Hongyuan Forestry Bureau. The UNEP - GEF supported project aimed at providing recommendations on how Ruoergai peatlands could be managed in the future to maintain their role as carbon stores or sinks, whilst also conserving biodiversity; enhancing information exchange and networking related to peatlands, biodiversity and climate change; and undertaking an initial assessment of the impacts of alternative management practices on peat accumulation, release of climate change gases and biodiversity in the Ruoergai Marshes.

The project estimated the economic value of services of the Ruoergai peatlands at over 20,000 RMB (about € 1800) per hectare per year. As a result of project recommendations, peat mining and drainage are no longer allowed in Ruoergai and the neighboring Hongyuan counties, and a programme of ditch blocking has been undertaken. It is anticipated that water supply to the Yellow and Yangtze Rivers will improve with benefits to downstream communities. It has been agreed that grasslands will be maintained for local Tibetan people who depend on this land for their livelihoods. The information flow provided by the project increased understanding by local officials on the importance of the peatlands for biodiversity, water management, climate change and local economy, resulting in higher participation in management efforts.



Box 2 Wetlands of Jhelum Basin,India



Map 4 Wetlands of Jhelum Basin

River Jhelum which arises from the glaciers within Pir Panjal ranges drains a transnational basin area of 33,000 sq km. The entire area is dotted with wetlands located at different altitudes and latitudes (Map 4). The lakes located between 1585 -1600 m amsl are the valley lakes occuring all along the course of River Jhelum. The Wular, and Dal located within the Kashmir valley are the prominent lakes of great touristic attraction. The second series of lakes present in the lower fringes of Pir Panjal ranges are found in the midst of pine forests within the altitudinal zone of 2000 – 2500 m amsl. The third series located in the altitudes above 3000 m amsl are very high altitude lakes which remain frozen for most of the year Trisal, 1985. All these lakes within the sub basin are interconnected and regulate water flows in the upstream - downstream area.

The sectoral developments, however, have failed to recognize the immense role of wetlands within the Jhelum basin. The valley lakes have been systematically reclaimed for agriculture and settlements (Map 5 and 6). The construction of embankments have led to fragmentation of wetland regimes leading the changes in water flows thereby impacting biodiversity and socio economic benefits.

Huge marshy areas around the Srinagar lakes which used to filter the polluted water and ensuring supply of clean water to the Dal lake have been converted for settlements. Further, expanding Srinagar city led to relocation of the offices and establishment of huge colonies in the suburbs of Srinagar city. Some of these wetlands were used for resettlement of people evacuated from the Dal Lake in the name of conservation. A typical example is that of Wular Lake which historically has played an important role in absorbing the flood waters of Kashmir valley was reduced to half its size by construction of embankments to expand agriculture. Further, willow plantations were undertaken at a massive scale in the Wular Lake for fuel wood supply to the Srinagar city which have led to drastic reduction in its size and water absorption capacity. The erosion from the denuded catchments has further reduced water holding capacity. All these factors have led to loss of water holding capacity and quick drainability of water.

It is interesting to note that when the overall water holding capacity of the lake has decreased, the water flows have enhanced during last 3 to 4 decades which is attributed to climate change. The retreat of

glaciers as a consequence of climate change has drastically changed the hydrological regimes. The early summer flows and frequent droughts and floods are quite apparent (Figure 6). As a consequence of change in hydrological regimes decline in fisheries and economically important plant species have been reported which have adverse impacts on socio-economic aspects that has led to high levels of poverty within wetland communities. Restoration of wetlands within Jhelum Basin is critical to poverty alleviation and reducing hazards due to floods and droughts.

Based on the assessments carried out by Wetlands International - South Asia at Jhelum Basin level Management Plan for Wular Lake has been formulated emphasizing on restoration of the lake and its catchments as an adaptive strategy to the impacts of climate change. The plan envisages establishment of an effective institutional mechanism for coordinated planning and implementation at Jhelum Basin level, engaging stakeholders at various levels. Restoration of hydrological regimes has been proposed by enhancing water holding capacity of the lakes through catchment conservation and water quality improvement. Balancing water for human and ecological purposes is

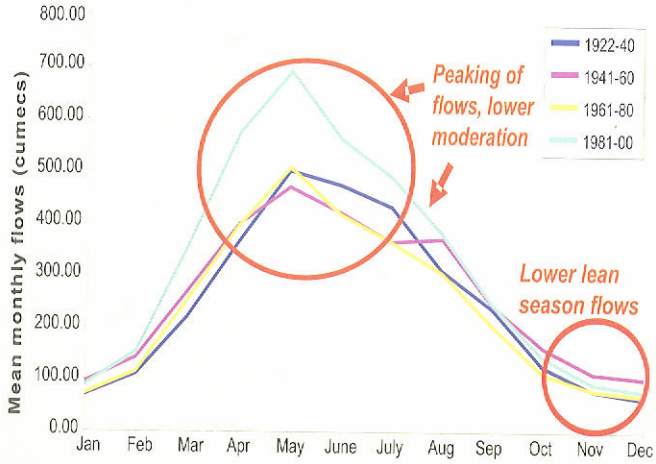
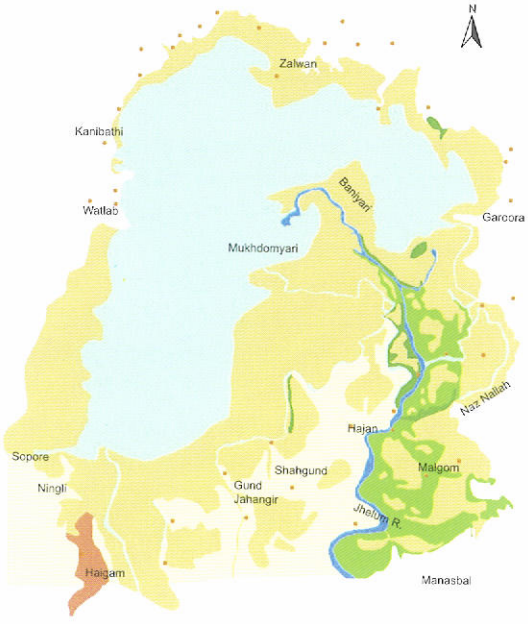
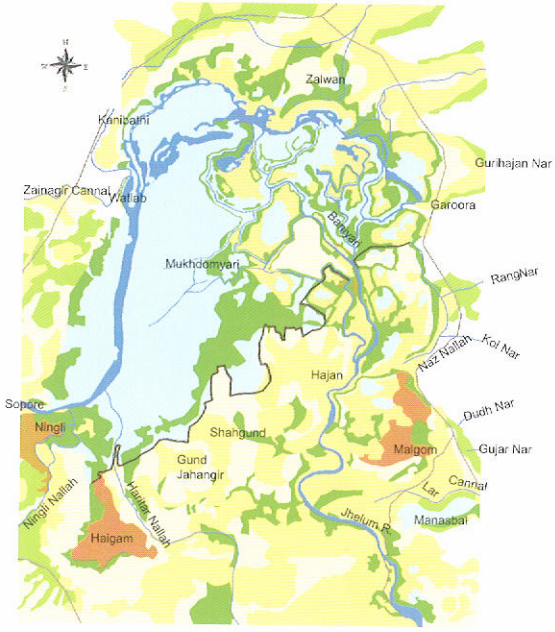


Figure 6 Trends of Mean Monthly Flows of River Jhelum at Baramulla

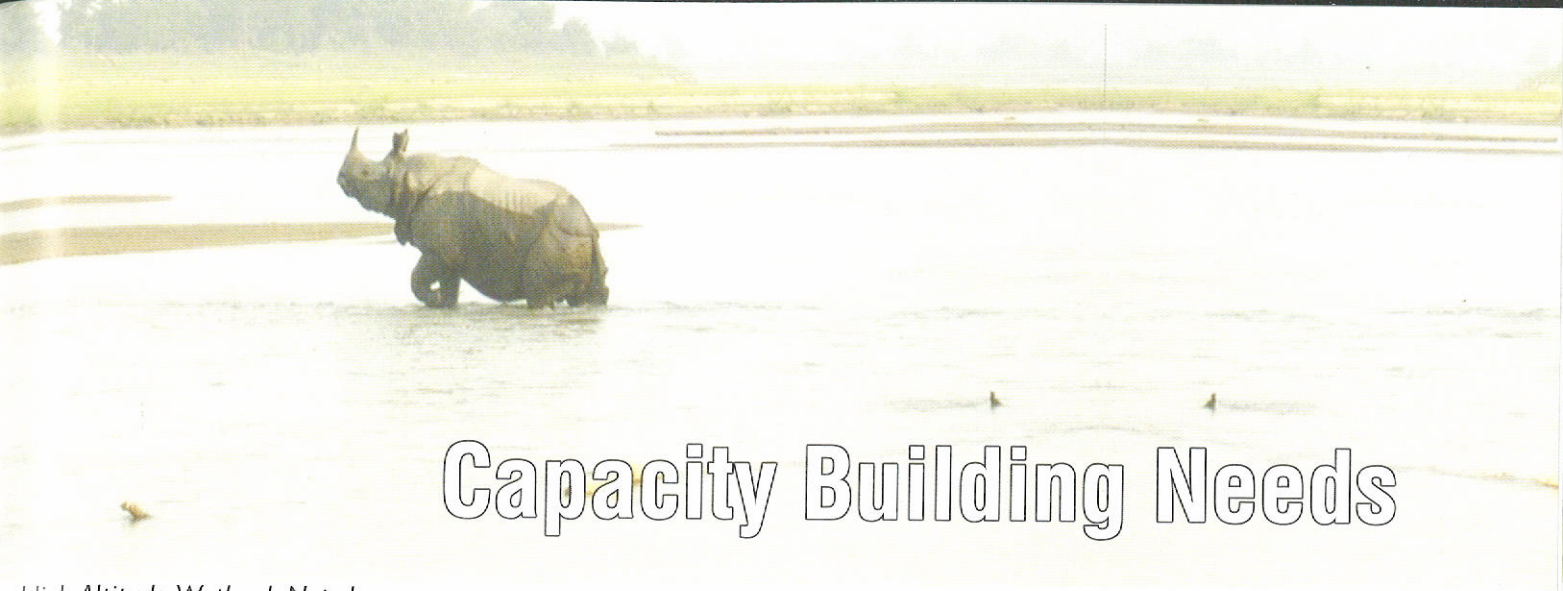
the critical factor for sustainable water resources management. Ecotourism has been identified as a strategy for biodiversity conservation as well as for diversification of livelihood resources. In addition, resource development interventions have been proposed to enhance livelihoods and quality of life of communities.



Map 5 Land Use of Wular (1911)



Map 6 Land Use of Wular (2007)



Capacity Building Needs

High Altitude Wetland, Nepal

The assessment of capacity building needs within the focal countries for integrating HAWs within IRBM was carried out during the regional consultation workshop held during 26 – 28 March 2008 at New Delhi. The participants established the following basis for capacity building:

- HKH region has a significant extent of HAWs which influence the ecological and socioeconomic security within the entire region. They play a tremendous role in regulating flow regimes, maintaining biodiversity, supporting livelihoods of several marginalized communities and are of great socio cultural relevance. Sustainability of economic development within the HKH countries is closely linked to conservation and management of these ecosystems.

- Ecosystem services of HAWs play a great role in determining the sustainability of downstream economic activities within the river basin. Despite this, their management has been mostly ignored and mainly focused on patch centric approaches without linking the conservation plans at the basin level.

- Integrating HAWs within IRBM framework is central to conservation and management of these ecosystems.

- Water management policies and strategies within the focal countries stress on integration of wetlands into IRBM to varying degrees. There are policy and institutional processes in place that could support this integration. However, there is a major gap in policy implementation due to absence of effective capacity at various levels to assess the role of wetlands within river basins and optimize their services within sustainable river basin management framework. Complexity related to basin size, lack of awareness, weak transboundary cooperation and absence of appropriate tools and techniques have been the main reasons for weak implementation of river basin management within the focal countries.

- There is a need for immediate and urgent action on capacity building for integration of HAWs into IRBM considering the multi-scalar and diverse drivers and pressures on these ecosystems. There is growing evidence that loss or degradation of these ecosystems would enhance vulnerability of communities and pose significant threats to the overall development within the HKH countries. On the other hand, conservation of wetlands is an important component of the overall adaptive strategies to mitigate impacts of climate change in the region.

Specific capacity building needs identified by the countries were organized broadly within three clusters, i.e. framework, methods and tools and institutional mechanisms. The needs identified are:

Framework Level Needs

IRBM framework for Himalayan region balancing the socio-political contexts and management planning requirements

Despite acceptability of IRBM as the guiding principle for conservation of wetlands, its implementation within the Himalayan region was limited particularly due to large transboundary nature of the basins as well as conflicting interests in institutional arrangements related to water management. A multi-scalar dual approach was identified as a framework level need which could be characterized as (i) community and stakeholder led wetland and wetland catchment scale approaches to address local livelihood and biodiversity issues and (ii) river basin / major sub basin scale stakeholder led approaches that address integration of HAW ecosystem services into management planning and implementation.

Needs for Methods and Tools

Integration of wetlands conservation and wise use within river basin management would require added capacity through development of a suite of region specific methods and tools described as under:

Inventory and assessment

Development of toolkit to enable systematic hierarchical inventorying of wetlands at multiple scales enabling assessment of values and functions of wetlands within river basin as well as identification of management triggers for conservation and wise use of HAWs. The inventory tools should also enable assessment of livelihood linkages of HAWs within upstream and downstream communities and identification of conflicting interests. Tools are also required to assist monitoring hydrological and ecological processes of HAWs and their overall role in water management at basin level.

River basin level management planning

Tools need to be developed to assist management planning for conservation of HAWs considering their interlinkages within river basin. The management planning should enable integration of wetland values and functions into other sectors such as agriculture, domestic water supply, tourism etc.

Water allocation for human and ecological purposes

With increasing population, anthropogenically driven needs for water are increasing rapidly leading to fragmentation of ecological niches and habitats and in the long run impacting ecological and economic security of communities within the basin. Tools need to be developed to assess water allocation to wetlands to maintain their ecological integrity along with optimizing other human demands.

Valuation of ecosystem services of HAWs

Tools and approaches to assess contribution of ecosystem services of HAW into local, national and regional economy including evaluation of impact of developmental activities on these services at river basin level to develop resource allocation framework for conservation and livelihood improvements.

Incentive systems for balancing conservation and development needs

Tools for rational allocation of policy costs and benefits between upstream service providers and downstream resource users through sustainable incentive systems as payment of ecosystem services rationalized within the current developmental context of High Altitude Himalayan system.

Modeling impacts of climate change

The current models for assessing impacts of climate change use a resolution that cannot detect impacts of climate change at finer scales adapted to the Himalayan region. There is therefore a need to develop suitable models to assess impacts of climate change on overall wetland regimes within the basins of Himalayan region, and specifically on HAWs

Institutional Level Needs

Data access and sharing

There is a need to set up institutional mechanisms for data access and sharing within the countries to enable river basin level integrated responses.

Multisectoral and multistakeholder institutional arrangements

Currently a high level of divide is exists between water and wetland sector managers which limits integration of wetlands within river basin management. There is a need to develop multisectoral and multistakeholder institutional arrangements that could enable conservation planning at multiple scales integrating needs and aspirations of various stakeholder groups.

Conclusions

Tso Kar, India

The review and consultation process undertaken has highlighted the need for integration of HAWs into IRBM and the associated capacity building needs within the focal countries. The key challenge, however, remains implementation of this capacity building framework . The following are some of the recommendations for way ahead in this direction:

Creating a regional inventory of the capacity building needs for the Himalayan region
The current capacity building needs identification process involving four countries needs to be replicated in the remaining greater Himalayan region members to enable collation of a regional inventory of capacity building needs.

Development of a capacity building strategy for framework implementation
The Himalayan Initiaitve should aim to consolidate a capacity building strategy on a priority basis. The strategy should:

- Outline mechanisms for creating appropriate institutional networks of wetland managers, policy planners, decision makers and other relevant stakeholders for capacity building
- Identify appropriate institutions within and outside the region with adequate skills and resources to address the capacity building needs
- Develop on line training modules and materials
- Secure adequate resource base to support the capacity building process
- Develop monitoring and review processes to assess efficiency of the capacity building strategy and adaptation as may be necessary

The implementation of the strategy should be coordinated by the identified Himalayan Initiative Coordination Body on behalf of the regional member countries.

Creating a network of wetland managers for collaborative research and knowledge-base development

A network of wetland managers of the HAWs within the region should be developed to enable information sharing and improving knowledge-base on ecosystem functions and services of these wetland systems. The network should also aim at promoting collaborative research to develop strategies for integration of HAWs into IRBM.

Use of web based AWI tools as mechanisms for information sharing

The inventory and assessment tools developed under the current project could be used as an information sharing mechanism between the member countries. As IRBM forms the basic template of the inventory, the tool would assist the national governments in integrating wetlands into river basin management planning processes. Hierarchical information at sub basin, wetland complex and wetland site levels would enable managers to detect changes in ecological character of the HAWs, and interpret these changes in terms of upstream and downstream linkages.

Delhi Declaration on High Altitude Wetlands and River Basin Management in the Himalayan Region

During the workshop 'High altitude wetlands and river basin management in the Himalayan Region: A regional consultation with Bhutan, China, India and Nepal', held on 27-29th March 2008 in Delhi, India, 37 national and international wetland and water resource management experts representing government, non-government organizations in Bhutan, China, India and Nepal, The Netherlands and the United Kingdom discussed the degree and nature of integration of high altitude wetlands (HAWs) into river basin management in the Himalayan region with particular focus on the afore mentioned countries. The workshop was organized by Wetlands International South Asia Office (WISA) and the International Centre for Integrated Mountain Development (ICIMOD) and financed by the European Union Asia Pro-Eco programme and the Ramsar Convention through their agreement with the Danone Corporation.

The participants of the workshop:

Recognizing that the HAWs of the Himalayan Region represent an internationally vital resource playing significant roles in river basin management in regulating water resources, maintaining biodiversity, supporting regional livelihoods, culture and traditional ways of life and mitigating climate change through carbon storage, which should be conserved and sustainabily used for present and future generations;

Noting that there is considerable and ongoing loss with the threat that this will accelerate in the coming years as drivers such as climate change, energy generation and agricultural production increase the pressures on these ecosystems;

Taking into account

- the decision adopted by the Commission on Sustainable Development at its thirteenth session (CSD13) in April 2005, which emphasised the vital contribution that ecosystems, including wetlands, make to the protection, purification, retention and provision of water resources for water and food supplies and their role in groundwater recharge and flood control on which the well-being and livelihoods of people depend;
- the Ramsar Convention Resolution VII.8, which urges all parties to give priority to the application of guidelines for integrating wetland conservation and wise use into river basin management;
- the Ramsar Convention Resoulution VIII.12 which urges all parties for enhancing the wise use and conservation of mountain wetlands;
- the Ramsar Convention Resolution IX.3 which "Affirms that the conservation and wise use of wetlands is critical for the provision of water for people and nature and that wetlands are a source, as well as a user, of water…";
- the ongoing commitment of stakeholders in the Himalayan region in achieving the conservation and wise use of HAWs as expressed through the activities and reports of the Himalayan Initiative Forum in meetings that have taken place in Urumqi (Aug. 2002), Kathmandu (Sept. 2003), Sanya (Feb. 2004), Delhi (Jun. 2006), Korea (Jul. 2007) and group discussion during Asia regional meeting for COP10 preparation Bangkok (Feb. 2008);
- the focus of the Himalayan Wetlands Initiative to support effective regional cooperation on the conservation and wise use of wetlands in the Himalayas' shared watersheds and river basins as agreed during the Evian (Nov. 2004) meeting;

unanimously concluded:

- that regional co-operation as envisaged under the Himalayan Wetlands Initiative is a valuable mechanism to promote the integration of wetlands into river basin management;
- that whilst there is a considerable body of policy at national level in many countries that provides the opportunity for integration of HAWs into river basin management, its implementation needs strengthening;
- that there are good examples in the region, of approaches to the conservation and wise use of HAWs that are integrated with river management at the wetland and wetland catchment scale but awareness of and access to these experiences is weak;
- that stakeholder led wetland and wetland catchment management that centres on the local community(ies) is a key element of success in the region;
- that despite upstream HAW ecosystem service provision being critically important to the major river systems flowing downstream, there are few examples where HAW wise use and conservation has been integrated into the context of the management of river basins;
- that whilst it is accepted that river basins in the region are large and politically complex the issues related to ecosystem service provision and the forthcoming challenges related to climate change make integration into river basin management approaches critically important;
- that integrating HAWs into river basin management more broadly across the region is restricted by insufficient good demonstrations in the region and access to existing knowledge, practices and lessons learned from the region and from other parts of the world;
- that integrated river basin management in Europe has many valuable lessons to guide and tools to help implement the integration of wetlands into river basin management approaches;
- that wider awareness of existing policy and its implementation needs to be developed at all levels in government, civil society and the private sector following a convergent model that does not rely on either a "top-down" or "bottom-up" approach;
- that access to and the development of tools in the spheres of environmental management, land use planning and stakeholder engagement is necessary to overcome capacity constraints to implementation of policy and its regulation;
- that broad partnerships must be built to address wetland management in the region that include all sectors and as necessary private sector, government and civil society;

and recommended that:

- **the Himalayan Wetlands Initiative should prioritise the integration of wetland wise use into river basin management in the region. Furthermore we would advocate that this approach be adopted**
- **integration of wetlands into river basin management must be achieved through a multi-scale approach that can be characterised as (i) community and local stakeholder lead wetland and wetland catchment scale approaches to address local livelihood and biodiversity issues and (ii) river basin / major sub-basin scale stakeholder led approaches that address the integration of HAW ecosystem services into management planning and implementation.**

Furthermore, the participants of the workshop invite the international community, in particular the multilateral (e.g. World Bank, GEF, EU, UNDP and UNEP) and bilateral donors, the national and regional Water Partnerships to:

- support the countries in the Himalayan region to fill gaps in policy and practice that will lead to better integration of wetlands into river basin management;
- develop the capacity needed to underpin integrating consideration of HAW services into river basin scale management planning and implementation, by supporting:
  - the establishment of guiding principles for basin management for rivers that arise in the high altitude areas of the Himalayan region
  - mechanisms for sharing practices and lessons learned from other river basins around the world where wetlands have been successfully integrated in management
  - the population of a shared regional database such as the greater Himalayan Wetland Information System that inventories and describe the critically important HAWs in all the major rivers of the region
  - demonstrations of the importance of HAWs in river basin management building on ongoing work in major sub-basins such as the Koshi and Jhelum Basins and their role as components of strategies to adapt to climate change and the upstream / downstream relationships between ecosystem services and the security of livelihoods.
- Support transboundary co-operation and the exchange of information and expertise throughout the region to enhance the capacity for wetland conservation and wise use in the context of river basin management.
- Develop the capacity to broaden the implementation of stakeholder led wetland and wetland catchment management in the region by supporting:
  - new and ongoing projects and programmes in the Himalayan region that demonstrate and have the resources to disseminate experiences
  - the development of regionally focused mechanisms and resources to improve the sharing and use of existing and new information arising form implementation in the region
  - the development of capacity for the use of tools to evaluate the vulnerability of HAWs amongst networks and stakeholders.
  - educate and encourage the private sectors for engaging in wise use and conservation of HAWs and river basin management

Enjoin

Wetlands International South Asia and ICIMOD
to play a key role in furthering the issues contained in this Declaration.

New Delhi, India
29th March 2008

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Wetlands International (WI) is a global organization that works to sustain and restore wetlands and their resources for people and biodiversity. It works through its 20 regional, national and project offices in over 100 countries. WI works through partnerships and is supported by contributions from an extensive network of specialist groups and volunteers.

Wetlands International – South Asia is a part of the global network of Wetlands International. It provides scientific and technical support to national governments, wetland authorities, non government organizations and the private sector for wetland management planning and implementation in South Asia

WETLANDS INTERNATIONAL

To sustain and restore wetlands, their resources and biodiversity for future generations

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