



WWF

NP

2011

A Retrospective

High Altitude Wetlands Project

© WWF Nepal

Cover photograph: Gokyo Lake

All photographs © WWF Nepal except photo in page 35 by Olivier Faber

Published by:

WWF Nepal

PO Box 7660, Baluwatar, Kathmandu, Nepal

Email: info@wwfnepal.org

Web: www.wwfnepal.org

Any reproduction in full or in part of this publication must mention the title and credit the above-mentioned publisher as the copyright owner.

This views expressed in this book are solely those of the author and do not necessarily reflect the views of the publisher.

Written and edited by: Veneeta Singha

Cite report as: High Altitude Wetlands Project: A Retrospective. WWF Nepal 2011

Printed by: Water Communication

FOREWORD

The High Altitude Wetlands Projects Retrospective aims to document WWF-Nepal's project experiences and program learning; to review results and lessons learned and to ensure that a wide audience will benefit from and have access to the projects' initiatives and knowledge. WWF – Nepal has pioneered many innovative projects in the fields of ecosystem and species conservation as well as biodiversity and habitat preservation.

High Altitude Wetlands are important sources and resources for water, biodiversity, livelihoods and ecosystem dynamics. In the Himalayan Region, they are crucial freshwater and biodiversity storehouses as well as weather regulators. Fragile and hidden, these freshwater ecosystems are currently being studied and supported by WWF's program priorities and targets.

Understanding and mitigating the impact of climate change on wetlands are imperative for the effective management of high altitude wetlands. In the backdrop of escalating natural and anthropogenic factors that bear on these freshwater sources, WWF- Nepal has now completed two key regional projects on wetlands - the Saving Wetlands Sky-High (SWSH) and the Climate Change Impact on Freshwater Ecosystems in the Himalayas (CCIFEH).

The Retrospective is a compilation and compendium of project objectives, standards, methodology and, importantly, results and successes. It is hoped that this publication will help advance the sustained and continued preservation and wise use of high altitude wetlands in the Himalayas along with avenues for better understanding and knowledge exchange.

ACKNOWLEDGEMENTS

Conservation of high-altitude wetlands and lakes in the Himalayas poses an immense challenge. Recent projections on climate change and its impacts in the areas compound the challenge. The WWF High Altitude Wetlands Project works to meet this challenge in through site-specific work in India, Nepal, Pakistan, Bhutan and China; partnerships for scaling up the work; and a regional forum for trans-national cooperation involving governments and partners.

While this retrospective document highlights the key issues, successes and challenges pertaining to this project, the success of the project was made possible through the contribution and consolidated efforts of a number of partners.

WWF Nepal acknowledges the support of Department of National Parks and Wildlife Conservation (DNPWC), Sagarmatha National Park (SNP), Langtang National Park (LNP), Sagarmatha National Park and Buffer Zone Support Project (SNPBZSP), Langtang National Park and Buffer Zone Support Project (LNPBZSP).

WWF Nepal also thanks the local NGOs/CBOs – Gokyo Lake Management Group, Sagarmatha Pollution Control Committee, Langtang Area Conservation Concern Society and Eco clubs – for effective community mobilization and community-level interventions for the project; Aquatic Ecology Centre of Kathmandu University for scientific research conducted in Gokyo; and Environment and Public Health Organization for waste management interventions in Gokyo.

In closing, WWF Nepal would like to thank WWF Netherlands for the financial support received for the project, WWF International for its technical support, and WWF India for the regional level support.

ABBREVIATIONS

HAWs	-	High Altitude Wetlands
CBO	-	Community Based Organisation
DNPWC	-	Department of National Parks and Wildlife Conservation
ICIMOD	-	International Centre for Integrated Mountain Development
masl	-	Metres above sea level
NGO	-	Non-Government Organisations
NI	-	Network Initiative
SHL	-	Sacred Himalayan Landscape
UNEP	-	United Nations Environment Programme
GLMG	-	Gokyo Lake Management Committee
BZUC	-	Buffer Zone User Committee
BZMC	-	Buffer Zone Management Committee
SNP BZUC	-	Sagarmatha National Park Buffer Zone User Committee
AEC	-	Aquatic Ecology Centre, Kathmandu University
SWSH	-	Saving Wetlands Sky-High
CCIFEH	-	Climate Change Impact on Freshwater Ecosystems in the Himalayas
GLOF	-	Glacial Lake Outburst Flood
METT	-	Management Effectiveness Tracking Tool
IUCN	-	International Union for the Conservation of Nature
DHM	-	Department of Hydrology and Meteorology
ENPHO	-	Environment and Public Health Organization
SEM	-	Scanning Electron Microscope
WHO	-	World Health Organization
SPCC	-	Sagarmatha Pollution Control Committee
LACCOS	-	Langtang Area Conservation Concern Society
IPCC	-	Intergovernmental Panel on Climate Change
NTB	-	Nepal Tourism Board

CONTENTS

FOREWORD	1
ACKNOWLEDGEMENTS	2
ABBREVIATIONS	3

SECTION I

WWF's freshwater program in context	6
WWF's freshwater program overview	6
Himalayan high altitude wetlands - a conservation imperative	7
A statement of program needs and principles	8

SECTION II

Project objectives and activities	10
Project methodology, implementation and outputs	15
High altitude wetlands and climate change in retrospect	17

SECTION III

An evaluation summary of project delivery and interventions	20
Project results, successes and best practices	22

SECTION IV

ervation and wise use of wetlands	30
Project results, successes and best practices	30
A project strategy and achievements review	37
Extending the evaluation and social monitoring dynamic	37
Challenges for the future	38

ANNEX

WWF nepal publications and reports on wetland conservation	41
--	----

SECTION I

WWF'S FRESHWATER PROGRAM IN CONTEXT

The Freshwater Program initiated by WWF Nepal in 2004 finds its scope, foundation and rationale at the intersection of WWF's Global 200 Ecoregions; WWF's Global Freshwater Program; and WWF Nepal's own conservation initiatives such as the Climate Change Program. The research, conservation and documentation of threatened freshwater ecosystems in Nepal are particularly critical given the current backdrop of climate change hazards and the unsustainable use of natural resources.

The ecological processes of freshwater ecosystems and the livelihood structures and functions they support are important not only to the surrounding communities but also downstream - they hold considerable influence on the region's weather, as key water towers and as storehouses of valuable biodiversity. The lakes that are above 3,000 masl in the Himalayan Region also constitute the main sources of rivers such as the Indus, Ganges and Brahmaputra.

The sound management of freshwater ecosystems in Nepal merit considerable attention from all levels of stakeholders given that the deterioration of water bodies and inadequate management and policy interventions are interrelated. Challenges, too, occur at all levels with increasing water scarcity, pollution as well as lack of coping mechanisms and technical know-how resulting in the further destabilization of these fragile ecosystems.

Ecological stresses and concerns leading to phenomenon such as the Glacial Lake Outburst Flood (GLOF) are important factors in understanding and conserving freshwater ecosystems. In addition, the socio-cultural and socio-religious significance of many freshwater ecosystems in Nepal, and in the region, further add to the importance of High Altitude Wetlands (HAWs).

WWF'S FRESHWATER PROGRAM OVERVIEW

Many of the world's major rivers, such as the Ganges, Brahmaputra and Indus originate in the Himalayas. These rivers are the mainstay of many of the region's communities and ecosystems. They have both socio-economic and environmental value with hydropower, transportation, livelihood streams, irrigation and essential water sources dependent, often entirely, on these rivers

WWF's focus on wetlands and the ecosystems that they support has led to an understanding that factors such as climate change, forest exploitation, unsustainable agricultural and tourism-based practices as well as trans-boundary issues greatly affect the dynamics of these wetlands. Consequently, there have been resulting floods, negative impact on biodiversity, pollution and agricultural productivity decreases. Lack of awareness about the ecological, biophysical and socio-economic bases of wetlands has also emerged as critical.

WWF-Nepal's Freshwater Program, which began in October 2004, has been instrumental in conducting essential research on wetlands and developing inventories on HAWs in Nepal's High Himalayas, in collaboration with the government partner, the Department of National Parks and Wildlife Conservation (DNPWC). The RAMSAR Convention on Wetlands is an international treaty for the conservation and sustainable utilization of wetlands. Nepal is one of the 160 contracting countries to the RAMSAR Convention on Wetlands. The RAMSAR List of Wetlands of International Importance now includes 1929 sites worldwide (24 May 2011). WWF-Nepal has supported the declaration of four High Altitude Ramsar Sites out of which two - Gokyo and Gosaikunda - are in the Priority Landscape-level Program, the Sacred Himalayan Landscape (SHL).

Responses and interventions envisaged and coordinated by the Freshwater Program in relation to the above include both technical and social initiatives to raise awareness; develop sustainable wetland management plans; assist and empower wetland communities; and assist with policy and regulatory framework formulation for facilitating conservation and wise use. A science-based approach for these initiatives is also seen as necessary.

HIMALAYAN HIGH ALTITUDE WETLANDS - A CONSERVATION IMPERATIVE

The High Altitude Wetlands (HAWs) of the Himalayan Region comprise and incorporate a unique diversity of water sources, habitats, species and communities. Within the Region, there are significant variations in size, structure and biophysical characteristics. These wetlands are some of the few natural ecosystems that have not undergone rampant human modification. As large reservoirs of freshwater, these wetlands are a central component of the Ganges Basin. An inventory carried out in 2002 by the International Centre for Integrated Mountain Development (ICIMOD) and the United Nations Environment Program (UNEP) lists 2,323 glacial lakes above 3500 masl in Nepal. "The Nepal Himalayas are especially important due to their biodiversity and the integrity of their ecosystems and indigenous communities, including the world's highest peak, Mt. Everest. In addition, the Nepal Himalayas are an important climatic regulator while the large reservoir of fresh water is a crucial component of the Ganges Basin."

In India, the Himalayas constitute an arc spanning arid Mediterranean and wet Chinese Malayan areas. HAWs in this sub-region support the livelihoods and socio-cultural values of many communities. The river basins in the Trans-Himalayas are 4,000 masl while the Greater Himalayas cover the Indus and Brahmaputra Basins. Crucially, population pressure and unchecked developmental activities have increasingly compromised the integrity of HAWs. Climate change effects have surfaced as threats to HAWs and the surrounding communities. The distinct shrinking of some HAWs in this sub-region has prompted conservation programs such as WWF-India's 'Conservation of High Altitude Wetlands of Ladakh Project' initiated in 2000.

In Pakistan, where some of the most spectacular HAW ecosystems exist, several natural and anthropogenic factors have impinged on and continue to endanger them. These include excessive deforestation, water contamination, flash floods, glacial failures, river bank erosion as well as disruptive tourism-related practices. The Utter Lake, home to a famous tourist resort, is surrounded by key valleys, fed by glacial and snow melts and very ecologically-sensitive. The Handrap Lake, covering some 25 ha, is the second most ecologically-active HAW in the northern areas of Pakistan. Significantly, the 'Conservation of High Altitude Wetlands in Northern Pakistan Project' has made considerable progress towards mitigating these threats. The further engagement and involvement of key stakeholders such as CBOs of Handrap and Utter Lakes; Forest/Wildlife, Fisheries and Agricultural Departments; community activists, local schools, academia and research institutions as well as WWF-Pakistan are vital to the participatory conservation and management of HAWs in Pakistan.

In China, the Yangtze Source Area is identified by WWF as Ecoregion 110 with an area of 180,000 km². In addition to being the primary source for China's largest river, the HAW ecosystems in this area are the chosen habitat for many unique and endemic species and also exhibit correlations with other important Ecoregions. While these wetlands are a principal source for water, energy and age-old spiritual belief systems, they face rising threats from changing land use systems, infrastructure development, tourism, human-wildlife conflict, illegal harvesting of rare herbal plants and extreme climatic events resulting from rising temperatures and climate change. Thawing permafrost has also led to wetland degradation. The natural vulnerability and importance of HAWs in the area call for both commitment and appropriate adaptive measures.

In Bhutan, a lack of issue analyses has led to an understanding of the dire need for comprehensive documentation of Bhutan's sacred lakes and wetlands alongside the establishment of local trusts which would oversee HAW conservation and management. Selection of possible RAMSAR sites would also aid the conservation of Bhutan's wetland ecosystems.

A STATEMENT OF PROGRAM NEEDS AND PRINCIPLES

"By 2050, the ecosystems, biodiversity, productivity and hydrological functions of high altitude wetlands and their immediate watersheds rendered fully sustainable along with local livelihoods as a result of science-based participatory conservation and management strategies that are adaptive to climate change while respecting the cultural and religious practices of the communities concerned."

The overarching goal of the HAWs Projects, as outlined in the Project Proposal and submitted to WWF Netherlands, provides a summary of both the causal factors as well as the fundamental preservation of HAWs in the Himalayan Region. Increased international cooperation for the preservation and sustainable management of HAWs is seen as particularly necessary. The current degradation and concomitant endangerment of freshwater ecosystems in the Himalayas require coordinated responses that take into account both institutional and environmental models for conservation, effective management and wise use.

Some of the key programmatic needs identified by WWF-Nepal include the identification and evaluation of institutional models for conservation and wise use. The concerns and issues surrounding HAWs must be made clear to all stakeholders and, thus, engender a fully participatory environment and work ethic. Community-based efforts must also necessarily translate into the cross-fertilisation and sharing of experiences and ideas within the region, thereby increasing impact and replication of best practices. Specialist training in conservation and the broader issues of the program areas would facilitate successful implementation and a model conservation paradigm. The overall function of a regional forum would be to ensure suitable monitoring and consolidation as well as cross-border dialogues and the institutionalization of new knowledge gained on site and in process.

The strategic principles which serve as guides for the projects were identified and developed through assessments and program findings. Firstly, the program will incorporate one or more conservation change mechanisms – these change mechanisms are community-oriented management plans which incorporate local knowledge and norms thereby optimising socio-economic benefits for the wetland communities; institutional arrangements for the proper implementation of the management plans; and, finally, policy support and advocacy that are essential for mainstreaming development and natural resource allocation approaches.

Secondly, the identification and engagement of conservation partners outside of the traditional conservation realm - as both beneficiary and participant - will help widen the network of existing and new partners. Thirdly, the vertical integration of the project through clearly-defined strategies at many levels, including the grassroots and local government, aims to secure the Network Initiative paradigm. Consultative and participatory processes that define appealing conservation models will help realise the potential for replicating and disseminating the conservation change mechanisms. In addition, the project values and work will be firmly grounded in a strong conservation and development coalition. Widespread adoption of the project successes and methods through demonstrations and awareness raising will ensure that the benefits are also widespread and function as catalysts. An appropriate exit strategy is envisaged for the project in keeping with community-based wetland conservation ideals.



SECTION II PROJECT OBJECTIVES AND ACTIVITIES

The Himalayan Glaciers, covering 33,000 km², are termed the ‘Water Towers of Asia’ and feed into many HAWs of the region. A series of regional workshops entitled ‘Wetland Conservation and Wise Use in the Himalayan High Mountains’ was conducted jointly by WWF International, ICIMOD and the RAMSAR Bureau in Urumqi (China), Kathmandu and Sanya (China) from 2002 to February 2004. One of the primary outcomes of these workshops was the renewed call for and emphasis on regional inventorying and dissemination of information on high Himalayan wetlands.

Moreover, the aim of developing and strengthening a long-term vision for the conservation of HAWs took centre stage in the ‘High Altitude Wetland Workshop’ in Mussoorie, India in March 2007 during which participants proposed some common and essential angles with which to take wetland conservation forward. These perspectives also derive from the concerns and specific experiences of countries comprising the region.

The Gokyo Lake System

Lake Gokyo, a high altitude wetland included as a World Ramsar Site, is a unique freshwater system in an area with high biodiversity, socio-cultural and religious values and immense tourism potential. WWF Nepal supported the Aquatic Ecology Centre of Kathmandu University to carry out collaborative scientific research in Gokyo. The project period was from June 2008 till May 2011.

The proposed clusters are targets set for 2050. They include sustainable livelihoods that are adaptive to climate change as well as better habitats and freshwater flows; improved wellbeing of wetland communities brought about by ecological sustainability; sound scientific and participatory approaches to wetland conservation and management; healthier environmental processes that inevitably support healthier habitats and species; and, finally, participatory conservation of wetland ecosystems in conjunction with their immediate watersheds.

The significance of a long-term vision, such as the above, can be seen when superimposed with the often marginalized status of wetlands in the region, particularly in comparison to other components of the Freshwater Sector. Threats to HAWs, such as natural vulnerability and pollution, also pinpoint the need for comprehensive conservation and management strategies.

In Nepal, for example, the importance of HAWs to the hydrology of the entire Eastern Himalayas Basin underscores both the immediacy and magnitude of the environmental problem. HAWs in Nepal are often located in ecologically fragile and unstable zones.

The ever-increasing tourist influx into the Himalayan areas, where many HAWs are situated, brings added pressures. Visitors, pilgrims and local communities alike have exacerbated the problems of pollution and waste. The alpine meadows surrounding these wetlands are also succumbing to overgrazing, ecological depletion and trampling. In addition, the exploitative harvesting of forest resources, such as the *Primula aureata* which is a rare endemic species, and the rising demand for tourism and development infrastructure have contributed to the further degradation of HAWs and wetland catchments.



Gokyo Lake

In summary, the ‘Saving Wetlands Sky High’ (SWSH) and the ‘Climate Change Impact on Freshwater Ecosystems in the Himalayas’ (CCIFEH) Projects – both Regional and Country-specific – are concerted and strategic responses to the highly-sensitive status of Himalayan HAWs and the necessity for preserving them which, in turn, would benefit local and downstream communities; the ecological and environmental balance as well as the sustained wellbeing of these wetlands in the future.

In keeping with the identified and documented needs and threats associated with HAWs, the main objectives of the projects fall in nine thematic engagements. Important to note, earlier program work in the region has helped establish both opportunities and specificities. The first SWSH Project objective for awareness raising is ‘high levels of official and civil society awareness with respect to the status of, the natural and human threats to and adaptive opportunities for managing HAWs on a sustainable basis’. In sequence, the second objective is ‘improved understanding of climate change impacts on HAWs’. The third objective is ‘conservation and wise use of selected HAWs’. The fourth objective, underlined by key consultations and program work, is ‘enhanced regional cooperation for the conservation and wise use of Himalayan HAWs’. The fifth objective – which tie in both the existing knowledge gaps and skills required – is ‘enhanced high altitude conservation and management skills as a result of an enhanced knowledge base’.

The CCIFEH Project incorporates specific outputs and objectives which also correspond to the Global Program Framework and the Living Himalayas Network Initiative. The first objective is that, ‘the biodiversity value and hydrological significance of the Gokyo Lake System is understood and documented’. The second objective is that, ‘community-based adaptation strategies are initiated in Gokyo Lake’. The third objective is that, ‘local communities realize the impact of climate change and the importance of adaptation strategies for the management of the lake system’. The last objective is that, ‘Government Line Agencies (national and local) are empowered to address issues related to climate change impact on freshwater ecosystems at national and international fora’.

Central to many conservation standards, the sixth objective of SWSH is ‘a range of proven and replicable community-based wetland conservation and management models’. The next objective is ‘policy level support for the conservation and wise use of HAWs in at least three target countries’ which brings in the requisite enabling environment for an effective conservation paradigm. The eighth objective is the designation of ‘16 HAWs as RAMSAR sites’. The last objective underscores the need to minimize negative tourism-related impacts on HAWs and reads as ‘appropriately-regulated tourism contributing to the productivity of HAWs in at least two target countries’.

The marked influence which HAWs exert on seasonal, biological and socio-economic cycles alongside the threatened productivity and sustainability of these wetlands (as a result of natural and anthropogenic factors) are given strong emphases in the SWSH and CCIFEH Projects. The ‘knock-on effects’ of the disturbances and endangerment

include disrupted flood and turbidity cycles - which, in turn, negatively impact biodiversity and the economic stability- and the increased pollution, flooding and reduced productivity of downstream infrastructures. However, HAWs also present the potential and bases for better cooperation between nations and communities with significant socio-economic ramifications.

A suitable and inclusive intermediate project objective, suggested in Mussoorie, is 'at least 20 well-managed HAWs in India, Nepal, Pakistan, China and Bhutan benefiting local communities and sustaining freshwater ecological services by 2010'. Activities intended and drawn out to support and fulfil key objectives are the identification of and consultations with relevant stakeholders; training of and support to project partners including communities, civil and religious leaders, decision-makers and NGOs; and on-site technical interventions such as wetland management, environmentally-responsible infrastructure, sustainable harvesting and eco-tourism.

Furthermore, the activities envisaged also specify on site and specific research - vulnerability studies, hydrological research, climate change impact research - as well as integrated communications for target groups such as indigenous communities and schools. Fostering conservation values and providing vital information through environmental awareness and promotion materials, display boards and awareness workshops are especially critical for the success of the projects.

Focussed activities envisaged to support and improve understanding of climate change issues are concentrated on the documentation of both direct and indirect climate change threats on HAWs - such as irregular ice-melting and flash floods - as well as advocacy for raising awareness on pertinent issues and concerns. A consolidated effort, which takes into account the social and environmental capital involved in consonance with the socio-cultural norms and livelihood practices of the local communities, will yield demonstrable results. Additionally, management planning for site identification and selection through threat analyses, institutional capacity building and demonstration of sound tourism models will help ensure efficient resource management and sustainable use of wetlands. The promotion of alternative livelihood approaches as incentives for the wetland communities can also significantly influence successful wetland conservation.

With an increased recognition of the need for facilitating and improving regional collaboration and networking for the conservation of HAWs, four regional meetings were held during which lessons learnt were shared. A cooperative, balanced and promising atmosphere for trans-boundary work on HAWs was stressed and continues to guide much of the ongoing project work. Activities in support of this key objective include preliminary assessments of country potential and the planned use of the Small Grants Fund.



Rara Lake

Research on the socio-economic and bio-physical dimensions of Himalayan HAWs is a standard prerequisite of the projects. The development of common and replicable adaptation approaches, based on research and information exchange, is seen as fundamental to achieving the overarching goal of the projects. Data collection and dissemination on the status, distribution and functioning of HAWs through fact sheets will help in institutionalising and diffusing key project ideas and knowledge. Moreover, a complete knowledge base on HAWs will be built through science-based inventories of HAWs in the region. Factoring in the need to respect local cultural and spiritual constructs, religious and cultural studies as project activities will further enhance understanding and cooperation.

By strengthening the technical capabilities of the regional network, government line agencies, communities and project partners with interventions such as vulnerability assessments of the project areas and responsive training programs, the project will then operate as a well-established and long-term conservation concept. In conjunction, several project implementation and site work models are envisaged to sustain and nurture the programmatic initiatives. They include case studies, appropriate financing models, conservation plans, tourism guidelines and planning mechanisms and conservation monitoring initiatives.

Consultative site selection, documentation and liaison with government agencies are seen as key steps towards the RAMSAR Process and the designation of HAWs as RAMSAR sites. In order to mitigate the negative impact of tourism on HAWs as well as to bring about a paradigm shift in the current tourism scenario, sustainable tourism guidelines will be developed along with awareness raising and training for tour operators and tourism service providers. Conservation information centres are also important for realising the aim of preserving, strengthening and judiciously managing HAWs.

PROJECT METHODOLOGY, IMPLEMENTATION AND OUTPUTS

The conservation of HAWs, in the broader contexts of environmental security and sustainable ecosystem management, is understood as benefitting global biodiversity conservation as well as trans-boundary water management and climate change adaptation. Consequently, the SWSH and CCIFEH Projects were designed and implemented through a rigorous process which involved analyses of the opportunities, challenges, experiences, issues and needs in relation to the conservation and wise use of Himalayan HAWs.

Bearing in mind the critical role that HAWs play in the region's environmental and socio-economic regimes, the key elements and outputs of the project – both regional and country-specific – emphasize participatory engagement at all levels and a science-based approach to implementation. The research, documentation and awareness raising outputs will help increase understanding and appreciation of the HAWs in terms of their ecological, hydrological, socio-economic and socio-cultural dynamics. Often hidden by tough terrains, these HAWs are also important indicators of the environmental balance and health of the region. Climate change, on the other hand, poses one of the single most dangerous threats to the continued well being of HAWs and the surrounding communities.

The project activities outlined above are based on the premise that the corresponding project outputs will correlate with and contribute to the overall goal of the projects. The first objective for awareness raising is complemented by outputs which include high levels of awareness among different stakeholders; partnership-based project demonstrations on wetland conservation and climate adaptive community development; site specific research and communications; training and support materials as well as awareness tools that will eventually foster deeper conservation values.

Climate change impacts on natural ecosystems such as HAWs predicate greater emphasis on vulnerability and hazards. Therefore, the project outputs, in relation to the objective of improved understanding of climate change impacts on Himalayan wetlands, are the documentation of both direct and indirect climate change impact, threats and hazards; science-based advocacy; community-based action plans as coping mechanisms for selected wetlands; and incorporation of climate change threats in development policies and plans.

Among the principle findings of earlier programs and projects, the knowledge gap on Himalayan wetlands will be reduced and remedied through outputs such as inter and extra-regional exchange visits; training; targeted knowledge bases; site documentation and inventories; comprehensive scientific research on HAWs and the development of a scientific foundation/framework for demonstration efforts and communications.

Targeted outputs for institutional capacity building emphasize the need for a capable and efficient environmental constituency. In support of this need and objective, establishment of community-based organizations working for HAW conservation; community-based wetland management demonstrations; formulation of community-based adaptation strategies with emphasis on the vulnerability and fragility of HAWs; development of participatory and replicable wetland management models; identification of sustainable financing models and local and governmental capacity building are the anticipated outputs. Outputs required for policy support include policies promoted in support of wetland conservation, policies influenced by lessons learned on the ground and policies that fully recognize climate change threats to HAWs. In addition, support for developing a national policy on wetlands is vital to the success of wetland conservation efforts.

The declaration and designation of Himalayan HAWs as RAMSAR sites affords critical benefits for conservation and wise use ideals. For example, Nepal became party to the Convention on Wetlands - RAMSAR – in 1987. Two of the four HAW RAMSAR sites are situated in the Sacred Himalayan Landscape of Nepal. For RAMSAR site designation, suggested outputs include documentation and proposal of specific and potential RAMSAR sites as well as RAMSAR Information Sheets on various wetlands.

As a coordinated effort to minimize the negative and ecologically-hazardous impact of tourism in and around Himalayan wetlands while maximizing the benefits, the SWSH and CCIFEH Projects delineate strategic outputs. These include the absence of

adverse tourism impacts on HAWs; fact-finding site initiatives; and monitoring mechanisms as well as significant reductions on the impact of unregulated tourism by factoring in the bio-physical, cultural and socio-religious dynamics of these wetlands. Promotion of eco-friendly tourism principles and values is seen as key to re-shaping the tourism-ecology balance.

HIGH ALTITUDE WETLANDS AND CLIMATE CHANGE IN RETROSPECT

There are over 6,000 rivers in Nepal. The rising demand for water from river and groundwater systems has negatively affected many important freshwater ecosystems. Additionally, pollution and overexploitation of forest resources have further exacerbated this fragile natural dynamic. Wetlands are areas where water is the primary factor controlling the environment and the associated plant and animal life. The Nepali word for wetland is *simsar*. A wetland is also known to be the area where land and water meet.

There are 42 different types of wetlands in the world of which seven can be found in Nepal - these are lakes, ponds, reservoirs, river floodplains, marshlands, swamps and paddy fields. Important to note, wetlands absorb water and store it, thereby slowing the rate of river flow which, in turn, prevents floods as well as droughts. Wetlands also act as a filter system and prevent soil erosion, retain sediments and recharge groundwater. An acre of wetland can store 4.5 to 6.75 million litres of water. Crucially, wetlands provide habitat for diverse flora and fauna and cover five per cent of Nepal's surface area.



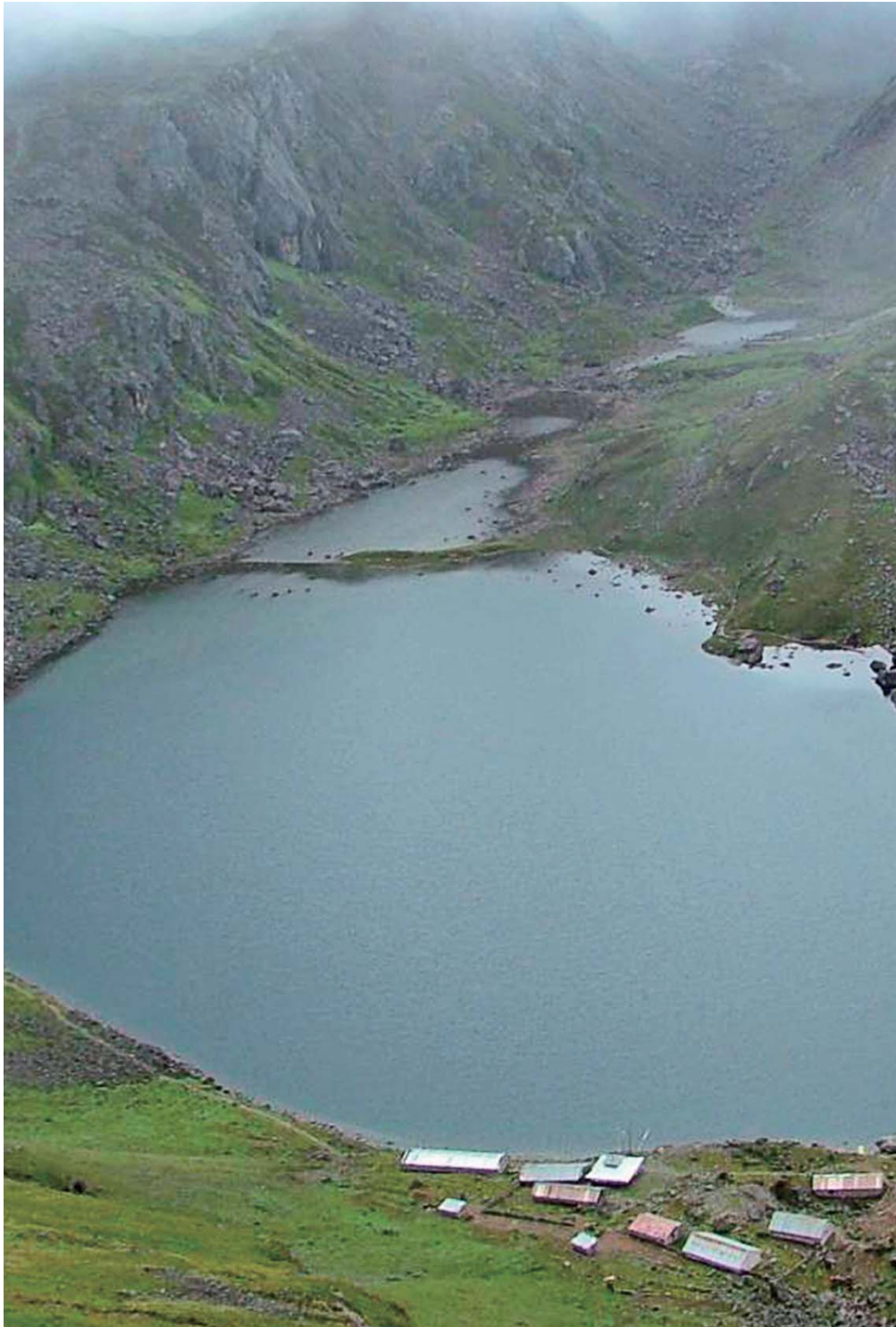
Phoksundo Lake

Many known wetlands are carbon reservoirs. These carbon reservoirs may supply large amounts of carbon to the atmosphere if the water level is lowered. Losses of wetland areas, due to conversion to agricultural land and land degradation, release carbon dioxide into the atmosphere thereby affecting global climate change. The alarming rate at which HAWs in Nepal are being endangered by natural and anthropogenic factors calls for a concerted effort to conserve and effectively manage these ecosystems. Global warming also poses a significant threat to HAWs. Increase in temperature causes glacier retreat and snow melt quickly thus changing the hydrological regime of the area. The impacts of climate change on water resources include changes in water quantity, quality, and timing along with increased vulnerabilities such as droughts, floods and landslides.

The Himalayan Region is very sensitive to climate change. The temperature increase in the Himalayas is known to be higher than in other areas. Thus, HAWs in Nepal are particularly vulnerable to the effects of climate change and, also, because of the fragile mountain ecosystems they are a part of. The impact of climate change on Himalayan HAWs then can be seen as most critical for the ecosystem dynamics of the region, the biodiversity that it supports and the livelihoods of people living both upstream and downstream.



Overview of Gokyo Lake



Gosaikunda Lake

SECTION III AN EVALUATION SUMMARY OF PROJECT DELIVERY AND INTERVENTIONS

The Living Himalaya Network Initiative is among WWF's priority global conservation initiatives and, as the name suggests, aims to reconnect the Eastern Himalayas – to forge a connection and balance between the needs of Himalayan communities and those of nature, in order that the Himalayas continue to breathe life and sustenance into the region while the spectacular and fragile natural systems are preserved.

A Mid-Term Self- Assessment was conducted in October 2009 to gauge and measure project progress while identifying constraints and weaknesses. This evaluation brought together the main benchmarks for assessing project results, outcomes and standards. Crucially, the assessment incorporated the ecological crises as well as the responses and desired effects. Till date, adaptive management forms a key feature of the project delivery mechanisms with continuous reviews and adjustments built into the framework.

The assessment was conducted through communications and consultations with the key project partners, namely: the Department of National Parks and Wildlife Conservation (DNPWC), National Parks and Buffer Zone Management Committees (BZMC), the Gokyo Lake Management Group (GLMG) and the Aquatic Ecology Centre (AEC) of Kathmandu University. Contributions towards the Biodiversity Goals of the Global Program Framework remain fundamental work areas for the SWSH and CCIFEH Projects.

The Mid-Term Evaluation in 2009 assessed the relevance, effectiveness, efficiency, impact and sustainability of the project initiatives and mandate. The overall rating from the evaluation was above average, signifying that the direction and activities were in step with the goals and objectives as well as the site realities. In terms of project relevance, the underlying problem was seen to be clear and urgent with clear definitions of the types of habitats and biodiversity under threat and the status as well as the actual and potential existence of the environmental threats.

Project effectiveness was rated high with a clear, quantifiable and realistic vision for the future encompassing appropriate strategies, approaches and outcomes identified in response to the most urgent threats. Target and logical values were seen to be set in accordance with the project vision based on the proven technical and financial feasibility of the management models and practices. The conservation and project designs were also essential evaluation benchmarks with vital elements such as the capacity for adoption, mechanisms for implementation and incentive schemes evaluated as above average. Access to project sites via infrastructure networks and communications are standard prerequisites and these were adequately in place. Additionally, work plans, work schedules and funding were also on target. Consequently, the degree of program achievement - often one of the most important criteria – was seen to be high.



Research work in Gokyo

Project efficiency - which aligns cost and output ratios with program operations and, also, incorporates the clarity of the program structure, tasks, planning, reporting, staff numbers and logistics - was assessed as high. Impact and sustainability, which are key project delivery outcomes, were seen to be above average taking into consideration the visibility of long-term effects; target beneficiaries and resilience to external factors; and the area and scope for replication and magnification. Significantly, internalized processes, best practices and functions among partners and stakeholders along with a favorable operational context were rated as high.

PROJECT RESULTS, SUCCESSSES AND BEST PRACTICES

In the Global Program Framework, the Footprint and Biodiversity Goals read: 'by 2020, humanity's global water footprint falls below its 2000 level and continues its downward trend, specifically in the areas of: water footprint and, by 2020, biodiversity is protected and well managed in the world's most outstanding natural places such as the Eastern Himalayas'.

Saving Wetlands Sky-High: 2008-2011

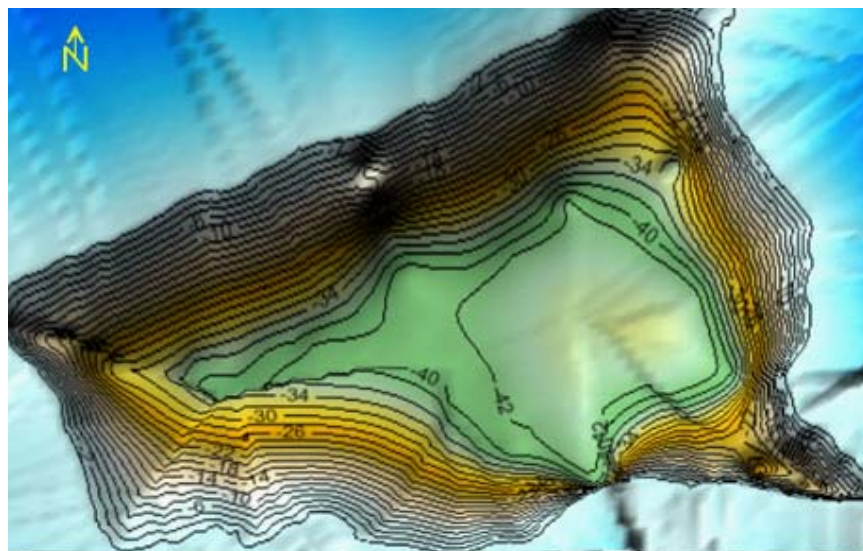
Based on agreed Conservation and Achievement Key Performance Indicators, the SWSH Projects have demonstrated significant project results and successes. The project supported Government declaration of four High Altitude Wetlands : Gokyo, Gosaikunda, Rara and Phoksundo in September 2007. Beginning with the period between July to December 2008, Site Management Plans of two high altitude RAMSAR sites – Gosaikunda and Gokyo – were formulated and endorsed by the Government on 17 October 2008. The Site Management Plans are also integral components of the Management Plans of the Langtang National Park and Sagarmatha National Park respectively. Implementation Guidelines for the Gokyo Site Management Plan were prepared in consultation with the Gokyo Lake Management Group (GLMG) and the Sagarmatha National Park and Buffer Zone Management Committee (SNPBZMC).



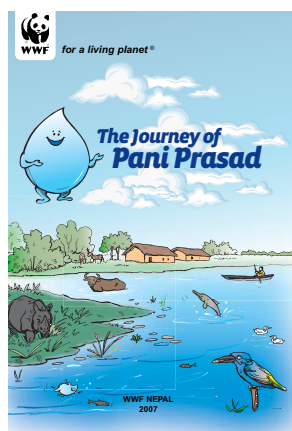
Ramsar certification of Gokyo, Gosaikunda, Rara & Phoksundo

With the express aim of taking the RAMSAR Convention concept to the communities in and around the wetlands, a brochure titled 'Role of RAMSAR Convention on Wetland Conservation' was prepared with DPNWC. The important message of wise resource use, and the benefits that would accrue, forms a key facet of the awareness raising and information access components of the SWSH Project. The critical link between climate change and freshwater storehouses in the Everest Region should also be firmly established among stakeholders and the conservation community. An excursion trip to Gokyo Lake was organized by the SWSH Project for 35 Eco-club students, teachers and representatives of the SNP in order to gain an understanding of the impact of climate change on freshwater storehouses such as the Ngozumpa Glacier - one of the longest and most active glaciers in Nepal.

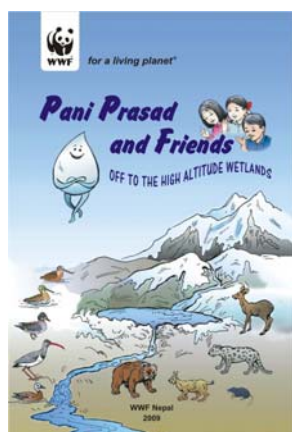
A comprehensive cultural and religious study of Mai Pokhari, a mid-hill wetland in the Eastern District of Ilam declared a RAMSAR site in October 2008, was conducted. The socio-cultural and religious significance and norms associated with many HAWs in Nepal make them key natural and spiritual heritage sites with functioning traditional belief and knowledge systems that are important factors for both conservation and wise use. The SWSH Project made a marked achievement with the first scientific depth measurement of three lakes in the Gokyo Lake System. The measurements were undertaken with Echosounder (a depth-measuring gauge) by a team of scientists from AEC – the maximum depths of the lakes are 33.3, 43, and 62.4 masl respectively. Morphometric and Limnological studies of the three lakes were also undertaken. A study of the diatoms as indicator species for climate change, water chemistry and lake bed sediments was also conducted. First results from the research expedition were presented in a conference organized by the Nepal Academy of Science and Technology in November 2008.



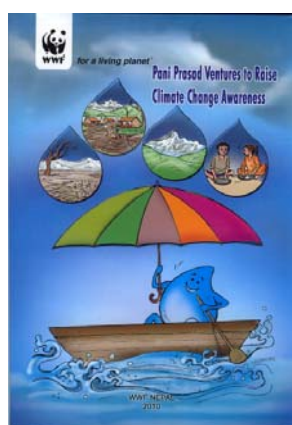
A Bathymetric Map of the 3rd Lake. The maximum depth of the lake is 43 meters



The awareness booklet series 'Pani Prasad' targeted for school students and eco clubs have been very popular. 'Pani Prasad', a fictitious character in the book series, helped spread the message of conservation among young students. 'Pani Prasad and Friends-Off to the High Altitude Wetlands' which focused on climate change impact and HAWs was disseminated through awareness programs in the local schools and Eco-clubs. The earlier 'Journey of Pani Prasad' as well as 'Pani Prasad and Friends-Off to the High Altitude Wetlands' were also translated into Nepali and disseminated widely to Eco-club students. The third series 'Pani Prasad Ventures to Raise Climate Change Awareness' focused on climate change adaptation. The Pani Prasad mascot has also served as a popular conservation advocate in Eco-club Awareness Programs in Kathmandu, Chitwan and Khumjung. More than 14 Eco-clubs in the Khumbu Region benefitted from the project's awareness raising programs on climate change and HAWs. In addition, booklets based on the cultural and religious studies and fact sheets based on the inventory studies were published and disseminated.



Furthermore, an information brochure on Gokyo Lake conservation and management was published and tourist information corners (with pertinent conservation materials) were set up in resorts in the Gokyo area. A documentary titled 'Combating Climate Change in Gokyo' which highlights climate change impact on Gokyo and Freshwater Ecosystems was developed and released during a Climate Change Adaptation Workshop in India in November 2009. This 13- minute documentary in English was aired on Nepal Television and artfully showcased the Gokyo Lake System and captured the impact of climate change on the fragile wetland ecosystem. Additionally, posters of the RAMSAR sites – Gokyo, Gosaikunda, Rara and Phoksundo - were published and disseminated. World Wetlands Day and World Water Day celebrations in different project areas symbolize the project's commitment towards effective awareness raising for the conservation of freshwater ecosystems.



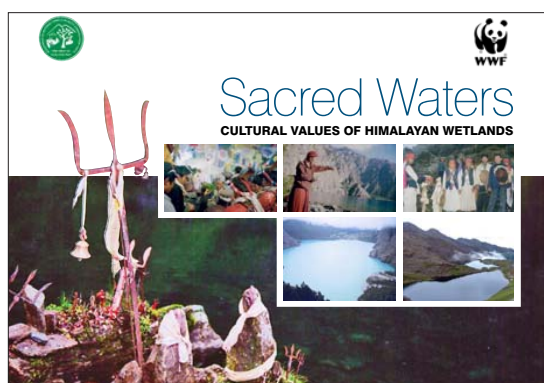
Awareness program in Khumjung, Sagaramatha



Through the Wetlands Inventory Website, prepared in partnership with the Department of National Parks and Wildlife Conservation (DNPWC) – <http://www.wetlandinventory.org.np>, the project has taken important steps to ensure that information on Himalayan HAWs are disseminated and accessible to a wide-ranging audience. A compendium of interesting narratives on local and indigenous people, who preserve wetlands through enduring religious and traditional beliefs, was compiled in a book entitled ‘Sacred Waters: Cultural Values of Himalayan Wetlands’.

Vulnerability to climate change in HAWs has necessitated the development and realization of appropriate and community-based adaptation strategies in these fragile wetlands. Studies on vulnerability assessment and climate change adaptation in Sagarmatha and Langtang National Parks were undertaken in 2007 and 2008 respectively. The principle findings of these studies and assessments were summarized and published as flyers which were then disseminated among wetland stakeholders. A community-based monitoring mechanism was set up by the SNP, SNP BZMC and GLMG which effectively monitors and measures activities such as encroachment, overgrazing, overharvesting and pollution in the wetlands and surrounding areas in Gokyo.

Project initiatives in support of climate change adaptation and research have been instrumental in studying change and phenomena in the project sites. A large number of supra-glacial lakes were observed in Ngozumpa Glacier due to rapid snow melt. Local monitoring of these lakes has evidenced that they covered existing trekking routes en route to the Everest Base Camp via Cholatse. Building on the recommendations of the Waste Management Feasibility Study in Gokyo, Waste Management Technologies, such as the Incinerator, Eco San Toilets and Soak Pit, were demonstrated for the first time in the HAWs. In order to control pollution and manage proper waste disposal during the Gosaikunda Festival, the project partnered with the Langtang National Park (LNP), local



NGOs, local Eco-clubs and army personnel to encourage and institutionalize good practices in religious tourism. The Syabru Buffer Zone Management Committee installed a small-scale incinerator for waste disposal in the Laubrina area of the Gosaikunda site through substantial contributions from local communities.

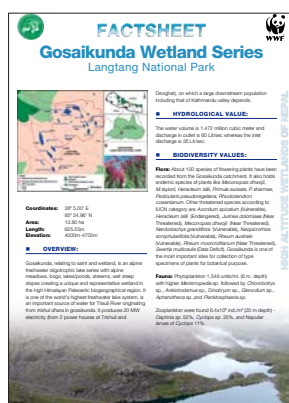
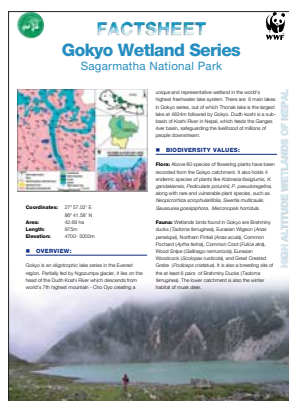
Conservation measures undertaken for the wise use of wetland resources included awareness training for livestock herders in the Gosaikunda area in 2009. The improvement and maintenance of healthy pasture land ecosystems have considerable economic and livelihood implications. Training events to enhance knowledge on good practices in livestock management were conducted in November 2009. Moreover, the project has trained local communities on the values and sustainable harvesting of Non-timber Forest Products and High Value Crops as well as good practices in Water and Resource Management.

The research partnership with AEC on freshwater ecosystems and climate change has also made important progress with hydrological assessments and scientific research studies on lake connectivity, permafrost, water quality and sediment complemented by field visits, samplings and laboratory analyses. Study findings and results were documented and disseminated.

Studies on the cultural and religious significance and norms of the Sun Daha wetland in Dhorpatan Hunting Reserve, the Panch Pokhari wetland in Langtang National Park and Gokyo wetland in Sagarmatha National Park were completed in January 2010.



Gosaikunda Festival management



Inventories of the Panch Pokhari wetland in Makalu Barun National Park, the Dudh Pokhari wetland in Langtang National Park and the Sun Daha wetland in Dhorpatan were also prepared. Fact sheets based on the inventories are in the publication process. These inventories and fact sheets are vital information repositories and serve to facilitate the overall understanding and participatory conservation of HAWs.

Capacity building for wetland conservation forms a key element of the SWSH project. In November 2009, WWF-Nepal and partners from the DNPWC, AEC and DHM attended a Climate Change Adaptation Workshop in Delhi, India to share, exchange and consolidate project knowledge and experiences of different countries in the region. In addition, the National Water Week Program organized by the National Water Week Organizing Committee (a centre-level awareness raising body) included workshops and programs on critical issues related to water, wetlands and climate change. Training, capacity building and awareness programs for local communities on alternative energy sources, such as bio briquettes, to reduce pressures on forest resources have been conducted in the Gosaikunda area.

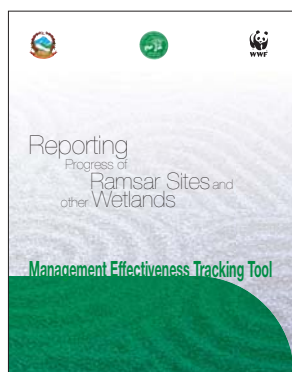
WWF-Nepal took part in the RAMSAR COP 10 Meeting in Changwon, Republic of Korea, as part of the Nepal Government Delegation during October/November 2008. With the aim of highlighting the urgent need for government action on and endorsement of the Himalaya Network Initiative, a side event titled 'Living with Change: Himalayan Waters and Communities' was organized on 1 November 2008.



Field research team in Gokyo

The Annual Knowledge Exchange Workshop was held in Kathmandu in September 2008 by the Regional Himalayan Glaciers, Rivers and High Altitude Wetlands Program during which project progress, future work plans and communications were discussed. In addition, WWF-Nepal and DNPWC conducted a full-day workshop in Kathmandu on 14 March 2009 as an engagement and planning exercise for park wardens from across Nepal. Discussion topics during the workshop included the Guide for Site Managers and Management Effectiveness Tool (METT) which has been published. The Tool was built by WWF and the World Bank to monitor protected areas. It has now been prepared in the context of Nepal together with DNPWC. The Regional SWSH Project Meeting was held in Pokhara, Nepal during April 2009 and included discussions on regional project progress and planning as well as knowledge exchange.

The Management Effectiveness Tracking Tool (METT) was finalized and published based on the outcomes of the Wetlands Managers Workshop in 2009. The Tool will help wetland managers assess and report progress on the RAMSAR sites and other HAWs. Good practices in tourism and related activities in the Gosaikunda area, based on a study conducted in 2009, were also documented and disseminated as signboards at the start of the popular Dhunche to Chandan Bari Trail frequented by domestic tourists and pilgrims. Signboards in English were also put up for foreign travelers. Four information corners as well as hoarding boards on the significance of Gosaikunda were placed at key tourist points.



A Memorandum of Understanding was signed between WWF-Nepal and the Nepal Tourism Board (NTB) in 2009 following which activities for the Green Hiker Campaign was launch on Everest Day, 29 May 2011 to promote sustainable tourism. The GLMG has effectively undertaken responsibility for implementing strict measures to regulate tourism-related activities along with provisions for waste disposal and pollution during the Janai Purnima Festival in the Gokyo area. Subsequently, hoarding boards have been placed at Community Visitor Centers, the Park Headquarters and other places in Namche, Phanga, Gokyo, Ghat and Jorsalle. In addition, 12 zonation maps of Gokyo and the surrounding lakes were set up in Phanga.



Regional workshop in Nepal



Hoarding boards at trekking routes for good practices for tourism



Launching of Green Hiker in Nepal

SECTION IV CONSERVATION AND WISE USE OF WETLANDS

“High altitude wetlands provide important goods and services which help sustain human life, conserve biological diversity, maintain the hydrological regime and combat the impacts of climate change and, thus, are key to water, food and environment security. Often, though, wetland ecosystems are not fully understood and are being destroyed for short-term gains. Communication, participation and information sharing are powerful approaches for placing people’s social, political, economic and cultural realities within the context of the goods and services provided by wetland ecosystems.”

“In general, Nepal has a good institutional and policy base to support wetland conservation. The country became party to the RAMSAR Convention on Wetlands in 1987 and a National Wetland Policy (2003) has been formulated to meet the country’s obligations under the Convention. This Policy outlines the need for a coordinated approach to wetland management and stresses the need to conserve, manage and promote the wise-use of national wetlands. Similarly, the Water Resources Strategy (2002) sets guidelines for the sustainable use of water and is a landmark for Nepal - the first water resource-oriented policy to acknowledge environmental conservation and ecosystem maintenance as a water resource planning priority.” One of the Strategy’s main aims is to manage watershed and aquatic ecosystems.

PROJECT RESULTS, SUCCESSES AND BEST PRACTICES

Climate Change Impacts on Freshwater Ecosystems in the Himalayas (CCIFEH): 2007 – 2010

Since its inception and through its ongoing strategic work, the CCIFEH Project has functioned as a complement to new and existing WWF projects and programs as well as a fundamental conservation and climate change initiative. Freshwater ecosystems are directly and indirectly affected by climate change which has brought in its wake ecological contamination, depletion, degradation and irreversible socio-ecological damage. Freshwater ecosystems also connect and support many social, economic and environmental spheres making them crucially important both as a source and resource.

In 1998, the International Union for the Conservation of Nature (IUCN) - Nepal conducted a study and inventory of 163 wetlands in the Terai Region and 78 wetlands in the Mid-hills and High Mountains of Nepal. The Mountain Institute’s Asia Regional Office has also initiated a HAWs conservation program for three sacred lakes in Solukhumbu District in Nepal. WWF- Nepal is committed to the conservation and management of HAWs and, thus, to promote sustainable tourism and livelihood opportunities for local communities. Since 2007, the CCIFEH Project has achieved significant milestones through its tactical focus on research, documentation, pilot studies, awareness raising and community-based adaptation mechanisms.

A Vulnerability Assessment was conducted in Sagarmatha National Park and Buffer Zone with a focus on Gokyo in April 2007. Subsequently, the GLMG was formed with the aim of overseeing the sustainable management of the lake including pollution control and tourism management issues. The 12th Wildlife Week was celebrated with awareness programs for over 5000 local stakeholders and visitors at the SNPBZ, with the topical theme: 'Climate Change, Our Concern; Freshwater, the Basis of Life'.

A study was undertaken by a team of experts to appraise the status of Gokyo Lake and the Ngozumpa Glacier. Consultation meetings, interactions and focus group discussions, held by the team with local users, included awareness raising and education on the implications and significance of climate change on the Himalayas. Some of the concerns raised by the participants were the irregular rain and snow patterns in the SNPBZ; depleting snowline along Himalayan ranges with observable glacial retreat; shifting agricultural seasons; and the formation of lakes in the glaciers.



Drawing from the research and consultations, appropriate and site-specific adaptation strategies were developed with the active participation of Eco-club teachers, students, lodge owners and local security personnel. Community sensitization and orientation programs on climate change and freshwater issues were also held for local stakeholders. With an overwhelming response from the participants, the 12th Wildlife Week celebrations have been instrumental in highlighting the risks and threats posed by climate change to Himalayan glaciers and high altitude lakes. The twin ideals of environmental conservation and heritage preservation were brought into focus via a heritage walk and related interactions. Local advocacy for biodiversity conservation culminated in a biodiversity conservation rally which helped to spread and ground diverse conservation messages.

The formation of the Gokyo Lake Management Group (GLMG) symbolically marked World Environment Day with the objective of sustainable lake management which inculcates both ecological and tourism perspectives. Envisioning proper waste management, conservation and tourism management, the Environment Day Theme – ‘Melting Ice: A Hot Topic’ – was also extended to different stakeholder groups by the GLMG in partnership with the BZUC and SNP.



Consultation meeting with local stakeholders in Namche, Sagarmatha

Science-based research and monitoring, conducted with Aquatic Ecology Centre (AEC) of Kathmandu University, has yielded vital information on the hydrological systems in Gokyo Lake (such as receding moraine walls, supra-glacial lakes and underground flow) as key early warning signs for the local communities. Moreover, compositional studies of indicator species for an analysis of climate change impact and water quality studies incorporating both physico-chemical parameters (and impact on human health) and biological parameters (such as macroinvertebrates to determine climate driven temperature change) are central elements of the CCIFEH Project. Long-term adaptive strategies and mechanisms will be derived from and based on the above-mentioned research findings and analyses. Natural and anthropogenic activities account for many disturbances in these freshwater ecosystems – part of the research undertakings include studies of permafrost formation and persistence or disappearance as key to understanding the impact of climate change on glaciers.

Lack of proper sanitation facilities and waste disposal mechanisms have led to a significant rise in pollution levels in the Gokyo area. In response, the GLMG constructed and maintained septic tanks in eight lodges around the Gokyo Lake starting in May 2008. The global threats of climate change to local livelihoods, freshwater supplies and biodiversity in the Khumbu Region figured prominently during orientation programs for local communities, schools and teachers in the area. Similarly, a climate change lecture was organized in 12 schools along with a participatory campaign on the value of the RAMSAR designation of Gokyo Lake for local students and teachers. In May 2008, the SNP BZMC organized a two-day workshop entitled 'Leadership Development and Management' for local Gokyo residents and Buffer Zone institutions.



Automatic Weather Station (AWS) at Gokyo

On the research and documentation fronts, temperature loggers for the bottom temperature of snow cover – BTS Measurements – were installed and deployed in the Gokyo Catchment Area. In addition, WWF-Nepal and AEC conducted a meeting on 5 September 2009 with the SNP, SNPBTZ and GLMG to share progress on their research.

The Environment and Public Health Organization (ENPHO), a leading water and sanitation organization, conducted a Feasibility Study on Waste Management in Gokyo. Based on the recommendations of this study, waste management technologies and pollution control mechanisms were demonstrated by the CCIFEH Project. The demonstration, itself, was the first of its kind in a high altitude setting in Nepal and was completed in December 2009. WWF-Nepal together with the DNPWC, AEC and DHM attended an Adaptation Workshop in Delhi, India in November 2009.

Freshwater Ecosystems and Climate Change Impacts in Gokyo - A Scientific Research

The Aquatic Ecology Centre (AEC) at Kathmandu University, with support from WWF-Nepal, conducted a detailed scientific research study on the impact of climate change in the freshwater ecosystem in Gokyo. The main objectives of the research were to monitor the hydrological systems; study the impact of climate change on indicator species (diatoms and macroinvertebrates); study the water quality (physical, chemical and biological) and study the permafrost (at micro-scale level). Highlights of the research results are summarized below.



Measurement of the stream between the 2nd and 3rd Lakes in the Gokyo wetlands



Sediment from the bottom of lake

The Tracer technique (fluorescent or salt tracer) was used to monitor the hydrological connectivity between the lakes in the Gokyo wetlands. The surface inflow to the Second Lake was estimated at about 400 liters per second whereas the discharge from the Third Lake was estimated at 300 liters per second. This is an indication that there is additional subsurface flow either from the Third Lake or through the lateral moraine of the Ngozumpa Glacier. Based on an isotopic analysis of the water samples, there are two key water systems - the glacial system and the Gokyo wetlands system. The Gokyo wetlands system is not a closed system although it is blocked by a 40 m high lateral moraine dam from the glacier. It receives water from the glacier. Furthermore, the sedimentation rates measured by ^{210}Pb dating during this study in the Second, Third and Fourth Lakes were 0.089, 0.069 and 0.083 cm per annum, respectively.

A biological analysis of the lake sediments indicated effects of disturbances on Gokyo lake which was probably caused due to hydrological modifications, sedimentation and rise in local temperature as studied in the area. Species richness, sub-fossil head capsule count and the size of non-biting midges (chironomidae: diptera) were considered as indicators of the disturbances. Species richness of sub-fossil non-biting midges indicated a slight shift from coldwater to warm water taxa. The sub-fossil head capsules count was less than 50 in 1 cm sliced sediment sample indicating poor abundances and the specimens retrieved were also smaller in size (with lower instar larva). Lower abundances further indicated disturbed habitat conditions. However, further sediment sample analysis is necessary to reveal the cause of the findings.

The taxonomic investigations using the Scanning Electron Microscope (SEM) revealed taxa of diatoms which are new to science. New species documented from the Gokyo wetlands during this study are *Cymbella himalaspera* Jüttner & Van de Vijver, *sp. nov.*, *Cymbella subhimalaspera* Jüttner & Van de Vijver, *sp. nov.*, *Cymbella yakii* Jüttner & Van de Vijver, *sp. nov.*; and a new variety of *Cymbella neocistula* var. *nepalensis* Jüttner & Van de Vijver, var. nov. was also recorded in the sample. A manual for the identification of diatoms in the Himalayan Range, based on the species recorded in the Gokyo wetlands, will be developed as a result of this finding. This will make diatom taxonomy in the Himalayan region easier for the coming generations of researchers.

The metal concentrations in the Gokyo wetlands were well below the limits recommended by the World Health Organization (WHO) for drinking water with some limitations. Bathymetric Maps of the Second, Third and Fourth Lakes were also produced for the first time. The Fourth Lake was the largest and deepest (with a maximum depth of 62.4m) among all the lakes studied.

A 200-year history of mercury pollution was reconstructed using lake sediments from Gokyo Lake. The pollution trend has followed the world scenario for the last 200 years. However, mercury pollution in this area has increased in the last decade. This is an indication of the anthropogenic impact on the Gokyo wetlands. Minimizing the impact of human influence on these pristine freshwater resources is crucial for conserving them in their natural states.

A PROJECT STRATEGY AND ACHIEVEMENTS REVIEW

The Saving Wetlands Sky High (SWSH) Project was designed as a considered and tactical response to the environmental challenges facing HAWs and wetland communities in the Himalayas. The project design was modeled with sound performance and fundamental conservation and sustainable development targets in mind. Project performance is then assessed and reviewed periodically on essential benchmarks which include conservation achievements, design and implementation performance and project support performance. On these three elements, the SWSH Project has achieved a high degree of outcome and impact. With well-developed and adaptive Conservation Management and Implementation Plans, high stakeholder and expert engagement as well as sound project operations, the project is also well aligned with WWF-Nepal's overall strategic plan.

The next set of benchmarks, within the Key Performance Indicators, includes government and public institution performance along with NGO and community partner performance. On this level too, the project was assessed to have fared well – the DNPWC, Park Authorities and BZMC are key project and site partners with the required capacities for project work and counterpart management support. Crucially, ownership of project programs and objectives among the local NGOs and community-based partners, such as the GLMG, SPCC and LACCOS, has been high. Built in as a protection measure, the Indigenous Peoples' Safeguards – such as the Indigenous People's Customary Rights – were also upheld through consultations and close cooperation. Risks to the sustainability of project results were appraised as minimal despite the ongoing political and economic changes in the country. Among the important lessons learned was the evidence that effective mobilization of local communities and their ownership are critical for the success of the project. Regular coordination among diverse project elements was also seen to be vital.

EXTENDING THE EVALUATION AND SOCIAL MONITORING DYNAMIC

In October 2010, WWF-Netherlands conducted an evaluation of the SWSH Project with the aims of assessing project progress over 2008-2010; distilling lessons learned from diverse aspects of the project's functioning; and proposing strategic directions for further programming. Preparatory work for the next phase of the project was also based on the evaluation and its conclusions. The SWSH Project was built and implemented so as to 'replicate and take to scale' lessons learned and experiences in HAW conservation and management by earlier WWF Projects in India, Nepal, Pakistan and China.

Results from this important evaluation were structured and reported around three key issues, namely: the quality and relevance of program design, the effectiveness of the program and the potential for sustainability. The evaluation methodology was planned as a four-phase initiative which comprised a study of existing self-evaluation documentation; telephone interviews with all program managers and partners in the region; presentation of lessons learned and suggestions for the next phase; and a final report of the conclusions and recommendations.

In general, the determining conclusions of the WWF-Netherlands Evaluation were positive with the focus areas primarily related to regional coordination; support from WWF- Netherlands; program design adjustments; successful project continuation based on a collaborative vision, targets and goal setting; and scaling up of project activities and experiences.

Recommendations, too, are reflective of the project's initiatives till date with sustainability and a long –term program vision and legacy as key project benchmarks. The recommendations, themselves, are, firstly, improved regional cooperation by integrating scattered projects into one program and goal complemented by a clear monitoring mechanism. The second recommendation approaches better profiling to enhance partnerships, marketing and education along with an updated communications strategy. Thirdly, the evaluators recommend that the project 'seek more upstream-downstream integration within projects' by 'creating linkages with other WWF activities downstream'; develop WWF-Nepal's advisory role and functions; and use the Payment of Environmental Services (PES) Tool within the project design. In addition, the evaluators recommended better technical knowledge to enhance program effectiveness. The fifth recommendation concerns sustainability of the projects and programs – definitions of sustainability; improved cooperation with strategic partners such as ICIMOD; a strong regional SWSH forum; and a strong policy component for institutionalizing the work of the project are key suggestions in this regard. The SWSH Project is, essentially, grounded in local projects and this is viewed as a good approach in the evaluation's lessons learned. Clear definition of roles and responsibilities alongside a strong communications mandate are also seen to be beneficial for future program and project successes.

CHALLENGES FOR THE FUTURE

Bhai Pasang Sherpa, a restaurant owner in Namche Bazaar in Solukhumbu, has witnessed retreating glaciers and the formation of new and enlarging glacial lakes for 20 years. "Some of the lakes may burst at any moment putting many lives downstream at risk." He says. "This is because the temperature of the region is increasing and the glaciers are shrinking rapidly."

Nepal has been witness to many signs of climate change. The rainfall pattern is becoming erratic and resulting in changes in the hydrological regime. These changes have impacts on ecosystems, biodiversity and livelihoods of people. Human activities are also producing large amounts of greenhouse gases with more heat trapped in the

atmosphere thereby increasing the earth's average temperature. The Fourth Assessment Report (2007) published by the Intergovernmental Panel on Climate Change (IPCC) shows average global concentrations of three Greenhouse gases, CO₂, CH₄ and N₂O, are rising continuously.

In terms of the Ecological Footprint, which measures the amount of land and water required to sustain an individual's consumption of food, services, housing and energy and to absorb their waste, the earth has only 15.71 global hectares per person on a renewable basis. Nepal is particularly vulnerable to climate change because of its unstable and fragile geology, direct dependence on natural resources, diverse and sensitive ecosystems, monsoon-dependent agriculture, glaciers and snow-fed rivers, low levels of education and awareness as well as poverty and inadequate technology and infrastructure. However, Nepal ranks as the 25th richest in biodiversity in Asia and its diverse climate supports 35 forest types.

The livelihoods of more than half the population of Nepal depend on agriculture which is based on rainfall distribution throughout the year. About 65 per cent of agricultural land in Nepal is completely dependent on rainfall. Decrease in agricultural production has led to food insufficiency and a lack of food security. In Pokhara valley, 17 out of the 64 traditional varieties of rice have already been lost and 47 are under the threat of extinction.

The Himalayas provide water to 1.3 billion people living downstream. The continuously warming trend is predicted to lead major changes in the freshwater system thus resulting in massive decreases in freshwater availability in the future. Perennial rivers could change into seasonal streams causing water scarcity in dry months. This changing river flow affects the irrigation systems, water-powered grain mills, hydropower plants and drinking water supplies. Climate variability could also affect Nepal's electricity supplies considerably.

Significantly, Nepal is also prone to natural disasters. The geology of the Himalayas is young and fragile. There have been many weather, water and climate-induced disasters such as floods, avalanches, landslides, hailstorms and droughts in recent years. Nepal's rich biodiversity claims 9.3 per cent of bird species, 4.5 per cent of mammals, 2 per cent of reptiles and 2 per cent of the flowering plants in the world. Forests cover 30 per cent of the land area of Nepal. Suitable habitats for these flora and fauna are increasingly at risk due to climate change. For example, the Apolo Butterfly and Pika in the Langtang area have migrated to the upper reaches.

The increasing temperatures bring with them increased health problems and the risk of expansion of infectious diseases such as malaria and Japanese encephalitis. Water-borne diseases during natural disasters and heat waves are also more likely along with increased instances of vector-borne diseases. Negative impacts of climate change on health are likely to double by 2020

because of increased rates of diarrheal disease and malnutrition in low-income countries such as Nepal. With more than 30 per cent of people in Nepal living below the poverty line, climate change is likely to affect the poorest at first and the most.

In light of the dangers and risks posed by climate change and other environmental threats, Nepal has signed many international treaties and conventions to reduce the global impact of climate change. Awareness raising initiatives at the local level are helping people bring about positive actions and changes. Many I/NGOs are also key catalysts of this positive change dynamic. Identifying and prioritizing coping mechanisms, reform measures and actions while using win-win approaches such as understanding vulnerability, establishing policy and developing a national climate change strategy could significantly contribute towards the process of disaster reduction, biodiversity conservation and poverty alleviation.

The High Himalayan Region is more sensitive to climate change than other mountainous regions. Rapid glacier retreat and snow melt will have a drastic impact on the hydrological regime of the region as well as downstream, which will, in turn, have significant impacts on the ecosystems, biodiversity and people. Conservation and wise use of Himalayan wetlands are, thus, crucial given their importance for the region as a whole as well as their fragility and sensitivity to climate change.



Locals managing waste in Gosaikunda

Brochures

- Conservation and Management of the first ever Ramsar Site in Khumbu-Gokyo Lake

Documentaries

- Wetlands for Life (English and Nepali)
- Prakritiko Manoram Upahar : Gokyo Simsar (Nepali)
- Combating Climate Change in Gokyo
- Gosaikunda: A Destination (English and Nepali)

Posters

- Gokyo
- Gosaikunda
- Rara
- Phoksundo

Book/Booklets

- Wetlands-Role of Ramsar Convention on Wetlands Conservation and Management
- Sacred Waters: Cultural Values of Himalayan Wetlands
- Melting Water Towers: Sagarmatha National Park and Buffer Zone
- Melting Water Towers: Langtang National Park and Buffer Zone
- Importance of Religion, Culture and Tradition on Conservation (Nepali)
 - Bahula Pokhari
 - Dudhkunda
 - Gosaikunda
 - Mai Pokhari
 - Panch Pokhari (Ramechhap, Solukhumbu, Sindhupalchok)
 - Parbatikunda
 - Phoksundo
 - Salpa Pokhari
 - Timbung Pokhari
 - Sundaha
 - Gokyo

Factsheets

- Gokyo Wetland Series
- Gosaikunda Wetland Series
- Phoksundo Wetland Series
- Singjema Wetland Series
- Kyangjing Wetlands
- Panch Pokhari (Langtang National Park)
- Rara Lake
- Khaptad Daha and Tribeni Wetland System
- Thulo Pokhari and Associated Wetlands
- Warmi Lake System

- Panch Pokhari and Associated Lakes (Makalu Barun National Park)
- Parbatikunda
- Timbung and Associated Lakes
- Sundaha
- Panch Pokhari
- Dudhkunda

Book Series

- The Journey of Pani Prasad (English and Nepali)
- Pani Prasad and Friends: Off to the High Altitude Wetlands (English and Nepali)
- Pani Prasad Ventures to Raise Climate Change Awareness (English and Nepali)

Reports

- Vulnerability Assessment and Formulation of Climate Change Adaptation Strategies for Langtang National Park and Buffer Zone
- Vulnerability Assessment of Sagarmatha National Park and Buffer Zone, Everest Region
- Inventory of Three Priority High Altitude Wetlands outside Protected Areas in Nepal: Timbung Pokhari, Parbatikunda and Panch Pokhari/Jata Pokhari
- Inventory of Three High Altitude Wetlands: Sundaha in Dhorpatan Hunting Reserve, Panch Pokhari in Makalu Barun National Park and Dudhkunda in Langtang National Park
- Inventory of High Altitude Wetlands of Kanchenjunga Conservation Area, Sagarmatha National Park, Langtang National Park and Shey Phoksundo National Park, Nepal
- Inventory of Three High Altitude Wetlands of Rara National Park and Langtang National Park, Nepal
- Thulo Pokhari and Barun Pokhari Wetlands of Makalu Barun National Park
- Feasibility Study on Waste Management in Gokyo
- Display and Document Good Practices of Tourism in Key Tourist and Pilgrim Sites/ Trails in Gosaikunda
- Final Report by AEC, Kathmandu University

Others

- Reporting Progress of Ramsar Sites and other Wetlands: Management Effectiveness Tracking Tool
- Site Management Plan for Gosaikunda (Nepali)

The projects “Saving Wetlands Sky High (SWSH) and “Climate Change Impacts on Freshwater Ecosystems in the Himalayas (CCIFEH)” was funded by WWF Netherlands.

WWF in Numbers

+ 100

WWF is in over 100 countries,
on 5 continents

1961

WWF was founded in 1961

+ 5M

WWF has over 5 million
supporters

+ 5,000

WWF has over 5,000 staff worldwide



Why we are here

To stop the degradation of the planet's natural environment and
to build a future in which humans live in harmony with nature.

www.wwfnepal.org

© 1980 Panda Symbol WWF - World Wide Fund For Nature
(also known as World Wide Fund)

® "WWF" is a WWF Registered Trademark

WWF Nepal, P.O.Box 7660, Baluwatar, Kathmandu, Nepal

Tel: 977 1 4434820, Fax: 977 1 4438458, Email: info@wwfnepal.org, www.wwfnepal.org