

Workshop on Integrated Studies of Environmental Changes and Climate Adaptation Responses in the Tibet-Himalayan Region

Soaltee Crowne Plaza

Kathmandu, Nepal

13th – 15th September 2010

Report of proceedings



Executive Summary

With generous support from the Australian Agency for International Development (AusAID) International Seminar Support Scheme (ISSS), the Monsoon Asia Integrated Regional Study (MAIRS) and the Australian National University, a three-day workshop (13-15th September 2010) consisting of delegates from over 20 organisations from the region was held in Kathmandu, Nepal. The primary aim of the workshop was to bring together regional knowledge and research findings under the auspices of a truly multinational, interdisciplinary research framework programme for the Himalaya-Tibetan Plateau (HTP) region. Specific workshop objectives included:

1. Assess and document the current research status and projects from each country/region.
2. Identify knowledge gaps.
3. Establish a set of research priorities for the region.
4. Determine an effective mechanism to enhance knowledge sharing in the region

During the three day workshop, delegates provided an overview of their research. Scientific data collected from across the region over a long time period has shown (unequivocally) that temperatures are warming in the Himalayas, with acceleration in the warming trend in recent years. Along with warming, changes in precipitation across the region have also been observed with a notable difference in rainfall between arid and non-arid regions. Changes in the Asia Monsoon System have also been observed, but the reasons for these observed changes are not clear. Without doubt, water security (supply, storage and access) was identified as a major issue facing the region.

In terms of land use change, land use activities such as rapid urbanization, increased resource utilization, large-scale infrastructure development, the overgrazing by livestock, as well as climate change have led to rapid change on a large scale. Research has shown that higher temperatures are contributing to ice, snow and permafrost melt resulting in landslides as well as the rapid retreat of small glaciers especially at lower elevations. With further increases in global emissions, temperatures will continue to rise in the future leading to further social disruption for many vulnerable communities. Forced migration and increased population growth and urbanization will ensue and the region's unique biodiversity will face an ever greater threat of extinction from climate change and anthropogenic influences.

Delegates identified areas where further research is urgently required and ways knowledge sharing and collaboration could be further strengthened and enhanced for the benefit of all. In summary the workshop proceedings identified the following needs:

- Environmental monitoring in the region must be scaled-up and refined to improve or enhance predictive capabilities and decision making processes.
- There is a need to improve adaptive response strategies through better integration of knowledge and experiences amongst stakeholders. However, lack of monitoring, data availability and accessibility remains a major problem for researchers working in the region. It was agreed that a knowledge management system for researchers be developed with the capacity to provide, in the first instance, basic metadata on research activities and data/results (who is doing what and why) in the region.
- The quantification of social hardship originating from extreme events such as landslides, floods, long-term drought and desertification is lacking. Natural risk assessments and early warning systems should be adopted where possible. However, the capacity for disaster handling is limited in almost all the countries in the region and there is a need to enhance the capacities of the national and local disaster management authorities.
- There is a strong demand in the region for hydrological models that adequately incorporate social- economic parameters (integrative models).
- It was agreed that a steering committee be established to encourage cross-cutting collaborative research opportunities.

Introduction

Organising committee, sponsorship and hosting

An organizing committee was established to convene a three day workshop on the “Integrated Studies of Environmental Changes and Climate Adaptation Responses in the Tibet-Himalayan Region”. The organising committee members were Dr Ailikun from Monsoon Asia Integrated Regional Study (MAIRS) IPO, Dr Katherine Morton from The Australia National University (ANU), Dr Lance Heath from the ANU Climate Change Institute and Dr Kedar Shrestha from the Institute of Development and Innovation, Nepal (IDI). Sponsors and hosts of the workshop were:

- Monsoon Asia Integrated Regional Study (MAIRS)
- Australian Government Overseas Aid Program (AusAID)
- The Australia National University (ANU)
- Institute of Development and Innovation, Nepal (IDI)
- Asia Pacific Network for Global Change Research (APN)

Aims and Objectives

The primary aim of the workshop was to bring together a group of key researchers from seven different countries to develop a truly multinational, interdisciplinary research framework programme that will address crucial climate change adaptation issues facing the Third Pole over the next century.

The nominated participants are experts in a range of disciplines including glaciology, sociology, hydrology and ecosystem functioning as well as food security and governance. They also represent the region’s key research institutions and have a good understanding of their own region and the potential impacts environmental change will have on their jurisdiction. However, at present there is no process in place that would allow the various research agencies and their experts to come together to work collectively to solve some of the most challenging environmental issues facing the region.

The participants at this workshop worked towards the following objectives and outcomes:

1. Develop an integrated research programme (and a steering committee) aimed at bringing together regional knowledge and research findings under the auspices of a single framework programme with the capabilities of ensuring that research projects lead to tangible outcomes across regions and which avoid duplication of research efforts.
2. Assess and document the current research status and projects from each country/region.
3. Identify knowledge gaps.
4. Establish a set of research priorities for the region.
5. Determine an effective mechanism to enhance knowledge sharing in the region (e.g is there is a need for a Knowledge Management System (web-based GIS Decision Support System) for the region).

Participating Institutions

In total there were 35 participants who attended the workshop of which ten participants were fully funded by AusAID’s International Seminar Support Scheme (ISSS). A list of participants and their institutional affiliation and country of origin can be found at the end of this report. There were 22 organizations which were represented at this workshop – these included:

- The Australian National University (ANU)
- Monsoon Asia Integrated Regional Study (MAIRS)
- Chinese Academy of Sciences (CAS)

- Institute for Development and Innovation (IDI)
- International Centre for Integrated Mountain Development (ICIMOD)
- Asia-Pacific network for Global Change Research (APN)
- Nepal Academy of Science & Technology
- Bangladesh Rural Advancement Committee (BRAC)
- Institute of Engineering, Nepal
- China Dialogue
- Wageningen University
- Global Change Impact Studies Centre GCISC
- Nagoya University
- Prescott College
- University of Nebraska
- Water Resources Research Institute
- Nong Lam University
- G. P. Pant Institute of Himalayan Environment & Development
- Kumaon University
- Nanjing University
- Tribhuvan University

Content

A critical first step is to develop a more comprehensive understanding of the climate related risks involved which, in turn, can help decision makers identify appropriate adaptation strategies. A comprehensive understanding of local vulnerabilities across the region will help to inform decision-making about the kinds of development assistance projects and programs that are most likely to enhance resilience. Key scientific topics of this workshop covered:

1. Panel I: Changes of water resources in the Tibet-Himalaya Region
2. Panel II: Land and ecosystem changes in the Tibet-Himalaya region
3. Panel III: Climate governance and water/land management in Tibet-Himalaya region
4. Panel IV: Regional collaboration framework

Panel I: Changes of water resources in the Tibet-Himalaya Region

The Himalaya-Tibetan Plateau (HTP) region is home to around 1.3 billion people and is of great importance to the global climate system as well as a source of water for more than 20% of the world's population. This session examined the nexus between climate and water resources in the region.

Speakers and Topics

- Recent changes in Himalayan glaciers and glacial lakes: **Koji FUJITA (Nagoya University)**
- Changes of water resources due to climate change in the eastern Nepal Himalaya: **Narendra Shakya (IDI/IOE, Tribhuvan University)**
- Climate change in recent 50 years in eastern Tibetan Plateau: **Anmin DUAN (Institute of atmospheric physics, Chinese academy of sciences)**
- Effect of climate change on water resources in typical drainage basins of Qinghai-Tibet Plateau: **Heqing HUANG, Zhijun YAO (Institute of Geographic and Natural Resources Research, Chinese Academy of Sciences)**
- Consequent implications of climate change impacts on freshwater resources of Pakistan: **Ghazanfar Ali (GCISC, National Centre for Physics, Pakistan)**

Panel II: Land and ecosystem changes in the Tibet-Himalaya region

The high mountains of the Himalayas are tectonically unstable, ecologically sensitive, and economically under-developed. They also represent the most densely populated mountain ecosystems on the planet. Economic development, such as rapid urbanization and increased energy utilization, is leading to widespread and long-term environmental change.

Speakers and Topics

- Change dynamics: Three-river headwaters region of Qinghai-Tibet Plateau in recent three decades: **Jiangwen FAN (Institute of Geographic and Natural Resources Research, Chinese Academy of Sciences)**
- Disasters within disasters- GLOFs and en-glacier floods: **Roohi Rakhshan (Water Resources Research Institute, Pakistan)**
- Landslide dams hazards in glacier valleys in Hindukush and Himalaya: **John Shroder (University of Nebraska at Omaha)**
- Landslides of Sikkimi and mitigation for selected slides: **Varn Joshi (G. P. Pant Institute of Himalayan Environment & Development, India)**

Panel III: Climate governance and water/land management in Tibet-Himalaya region

A second objective for developing countries is to consider the broader regional governance mechanisms that need to be put in place to ensure effective transboundary cooperation, especially in relation to hydropower development, disaster relief, and watershed management.

- Adaptation to changing water resources availability in Northern India with Himalayan glacier retreat and changing monsoon (HIGHNOON): **Eddy Moors (Wageningen University)**
- Adaptation of traditional nomadism to modern climate change---a case study of Darlag county in source region of the Yellow River: **Wanqi BAI, Yili ZHANG (Institute of Geographic and Natural Resources Research, Chinese Academy of Sciences)**
- Managing saline and acid water quality in canal network in the coastal plain with acid sulphate soils using existing water and infrastructure resources- a modeling approach: **Dr Ngo Dang Phong (Nong Lam University, Vietnam)**
- Institutional adaptation strategies to climate risks: Lessons from the Mekong River basin: **Ram Chandra Bastakoti (AIT, Thailand)**
- Barriers and bridges to climate change adaptation in the greater Himalaya: a review from northern America: **Dr Ed Grumbine (Prescott College, USA)**

Panel IV: Regional collaboration framework

- APN introduction: **Yukihiro Imanari (APN)**
- Environmental changes in Tibet-Himalayan region: **Madhav Karki (ICIMOD)**
- Regional collaboration on water and hazards **Hua Ouyang (ICIMOD)**
- BRAC and climate change-challenges and opportunities: **Babar Kabir (Disaster, Environment, and Climate Change Programme, Bangladesh)**

Summary of proceedings and main findings

Changes in climate in the Tibet-Himalaya Region

Temperature and precipitation Trends

Regional temperature and precipitation trends have shown an increase in temperature and a change in precipitation across the region. When it comes to temperature, there has been an increase in temperature across the HTP region. Some jurisdictions have observed a more significant increase than others (i.e., Nepal vs. TB Plateau, North versus South, Pakistan) with some areas recording temperatures above the global average. Precipitation on the other hand has been more variable with a notable difference in rainfall between arid and non-arid areas. Changes in the Asia Monsoon System have also been observed, but the reason for these observed changes is still unclear and is an area of on-going investigation.

With global emissions on the rise, temperatures will also continue to rise into the future leading to further glacial retreat, permafrost melting and landslides, long-term drought, changes in the Monsoon System and more frequent extreme weather events. Unlike temperature, there is a great deal of uncertainty with respect to projecting future precipitation changes in response to a changing climate.

Changes of water resources in the Tibet-Himalaya Region

Regional water security is without doubt the most contentious issue facing the region and is expected to worsen with climate change. Since climate is the primary driver of the hydrological cycle, further changes in the hydrological balance should therefore be expected. The consequences of climate change on freshwater supplies must be taken seriously if major conflict is to be diverted. Climate change will continue to have major implications for river flows, the pattern of seasonal flows, discharge to the ocean and associated impacts (e.g. salt water intrusion) and water storage capacity. At present, the demand for clean water across the region is increasing and there is little capacity for some countries to secure enough water for the future. Clearly, this will have flow on effects for food production and human health, thus leading to further social disruption for many vulnerable communities. Furthermore, the need for more hydro energy, driven by increased population growth in urban regions and improvements in the standard of living, will also place a greater demand on water resources.

Glacial Retreat

There is overwhelming scientific evidence that glacial retreat in the HTP region is occurring faster than in any other region of the world and is likely to be the consequence of global warming. Based on the latest scientific literature and long term mass-balance calculations (which is still a reliable determinate of glacial retreat) smaller glaciers are retreating at a greater rate than larger glaciers. Estimates of glacial retreat suggest that small glaciers in some locations are likely to disappear within the next couple of decades¹, whereas larger glaciers (above 6000 meters) are likely to remain over the next century. Apart from higher temperatures, accelerated shrinkage of glaciers is also dependent on a number of factors such as changes in precipitation, aspect, slope, elevation and the extent of glacial debris, which acts as an insulator and in turn affects the rate of shrinkage. Monitoring of glacial melt is regarded as fundamentally important given that it is an excellent indicator of environmental change. However, the contribution of glacial melt to river flow is poorly understood and therefore there is a need to quantify the contribution of snow/ice melt to total stream flow.

¹ Note: This is likely to be the case for some small glaciers in some locations. Besides temperature, the rate of shrinkage is also dependent on a number of factors such as aspect, slope and elevation.

Glacial lakes

Studies have shown that in the western part of the Himalayas at lower elevations not only has the size of the glacial lakes increased but new lakes have also formed due to glacial retreat. Continued warming is likely to pose a greater threat to downstream communities from glacial-lake outburst floods (GLOF).

Land and ecosystem changes in the Tibet-Himalaya region

Observed changes in temperature and precipitation across the region have also led to considerable spatial differences with respect to biodiversity, grassland and food production. Such bio-geological differences have created different dependencies with respect to food security and ultimately people's livelihoods.

Mass movements in the land are also common in the HTP region and occur when the ground is preconditioned by a number of factors such as steep slopes, prior tectonic and structural weaknesses, high seismicity, strong freeze and thaw, abundant precipitation and prior mass movements. Many landslides in the HTP region are associated with faulting, seismicity and uplift and most fail with outburst floods when overtopped. There have been many attempts to monitor and predict outbreak floods and there have also been attempts to prevent such events from occurring through engineering solutions, which have resulted in some degree of success.

Along with changes in the landscape, ecosystem changes have also occurred resulting in habitat loss, forest degradation and a decline in the region's unique biodiversity. Grassland degradation has been influenced primarily from anthropogenic activities. Ecosystem construction projects in the Three Rivers Headwaters Region (TRHR) Qinghai-Tibet Plateau, China have resulted in significant improvements in grassland and forest regeneration. Grassland production has benefited from a combination of climate change and a reduction in livestock. However, the benefits derived from a warmer climate must be balanced against the negative effects that the climate has had on the region (i.e., glacial retreat and changes in species distribution and ecosystems dynamics through increased warming in the mountain environment as well as on the downstream ecosystems). Finally, it is worth noting that these rehabilitation projects also have the potential to help in the global effort to reduce atmospheric carbon dioxide through the sequestration of carbon from the atmosphere.

Climate governance and water/land management in Tibet-Himalaya region

The studies presented at this workshop have also revealed the effectiveness in the up-take of adaptive response strategies put in place by the government. For example, Darlag County in Qinghai province China, has experienced extensive grassland degradation over the last decade. The up-take of a number of adaptive response strategies (fencing, supplementing fodder, regulating pastures during winter-summer transitional time, reducing livestock number, diet etc.) by traditional nomads has led to an improvement in their lifestyle and a significant improvement in grasslands regeneration.

When it comes to water, which is a common commodity shared by all nations in the region, cross border cooperation in the area of water governance, management and long term security is paramount. Countries need to adapt to a fast and constantly changing environment where the consequences of no adaptation or a lack of preparedness planning will lead to further human suffering and conflict. To support adaptation, the establishment of a cross border governance framework (i.e Multi-national Water Commission) to allow for greater cooperation and knowledge sharing should be considered. Furthermore, the ability to accurately forecast change before it happens through improvements in climate forecast techniques and skills (e.g. RCM) will ultimately

reduce the adverse consequences associated with extreme events. Finally, the ability to accurately quantify the social-economic drivers of change and interaction between these drivers and the other drivers of change—including climate change—requires further investigations. There is a need to develop Decision Support Systems (software package) that couple Hydrological/Hydraulic models with Bayesian Network Models² (BNM) for land-use options and livelihood analysis.

Regional collaboration framework

IPCC has defined the HTP region as a ‘data deficit’ region which requires a long term strategy to improve long-term data acquisition to address the large knowledge gaps that currently exist. Without adequate monitoring of environmental change, the ability of downstream communities to effectively respond to natural disasters at short notice is dramatically reduced. Technologies such as Satellite Rainfall Estimation (SRE) will help address the meteorological data gaps that exist amongst the trans-boundary countries, particularly in large areas of unpopulated complex terrain with limited distribution of meteorological observation stations. It is anticipated that the application of SRE will provide more precise and accurate flood warning system for many communities. Apart from the acquisition of data, data and information sharing was also identified as a major issue for researchers.

This workshop also highlighted the need for a greater understanding of the nexus between the drivers of change and their impact on human livelihoods from a social and economic perspective. Workshop participants identified the importance of developing an integrated approach to sustainable development for the Hindu-Kush Himalayan Mountain region to enhance community resilience to natural disasters and environmental change. However, such an approach requires a sound collaborative framework programme that draws on experts from a range of disciplines to work together on problems in an integrative way.

Identification of Knowledge Gaps

The following is a summary of the knowledge gaps and action items that were identified at this workshop.

Social and human dimensions

1. The quantification of social hardship originating from extreme events such as landslides, floods, long-term drought and desertification is lacking.
2. More generally, the human and social consequences resulting from environmental change require further assessment and quantification, especially in the context as it relates to human health, gender issues, water security, sustainable agricultural practices, migration and population growth, increasing urbanization and food security.
3. Case studies of successful adaptive strategies in response to climate and environmental change should be documented and shared throughout the region. Lessons learnt from past events should also be documented and form the basis for the development of future disaster response strategies. An effective mechanism for knowledge and technology transfer should also be adopted.

² A fundamental modelling tool for decision making-decision making and management where uncertainty is a key consideration.

Natural dimensions

1. There is a strong demand in the region for an integrated approach for assessing potential impacts and decision support systems that adequately consider the social-economic parameters coupled with hydrological models.
2. There is a need to improve (where practical) climate predictability at the local and region scale. There is also a need to create greater awareness of the changing state of snow, ice and water in all basins through the application of advanced technologies such as SRE and GIS using SRS data.
3. Natural risk assessments should be implemented where possible. However, in doing so, there is a need to identify regions of extreme vulnerability and develop risk maps for local authorities.
4. Currently, monitoring glacial retreat is confined to a few well know glaciers and glacial lakes. Monitoring of glacial melt, changes in glacial lakes and permafrost melt should be expanded and refined to include more on-site measurements; remote sensing per se is useful but not that effective and should be used to complement ground based measurements where possible. However, there is also a need to build capacity of relevant key institutions that rely on using remote sensing and field based techniques to monitor environmental change.
5. Changes in the monsoonal rainfall require further investigation to answer key questions as to why the Eastern Asian Monsoon has declined over the years?

Future directions

At the conclusion of the workshop, a steering committee was formed and a meeting was convened to discuss the results of the workshop. In developing a road map for future collaboration the committee agreed upon a more focused research agenda addressing the dynamic relationship between climate change and water resources and its impacts on food security, livelihoods, and hazards. In addressing these cross-cutting issues, attention would be placed on water governance and disaster mitigation.

Based on the outcomes of the workshops, five “action” items were identified:

1. Identify and invite other groups who were not represented at this workshop to join the program.
2. A database on current projects in the region should be established as soon as possible.
3. To enhance information sharing and data exchange within the region, participating institutions will be asked if they are prepared to provide basic information relating to their work (i.e., Meta data)
4. Explore opportunities for developing new research projects based on the knowledge gaps identified at this workshop.
5. Identify potential sources of funding

It was agreed that efforts should be made to develop a large proposal or several small proposals that will address some of the issues identified at this workshop. In order to undertake these initiatives, suitable funding will need to be sought.

Follow-up activities undertaken

Since the conclusion of the workshop in September, two concept notes have been prepared and submitted to the relevant agencies for funding consideration:

- i) International Development Research Centre's Adapting to Climate Change in Vulnerable Coastal Communities program.
- ii) UK Department for International Development's program on Ecosystem Services for Poverty Alleviation (ESPA).

Workshop Program

Date	Session	Activities & Outcomes
Mon 13th		
All day	<p>Session 1: State of current Knowledge and Research</p> <p>Four panels: <i>Panel I: Changes of water resources in the Tibet-Himalaya Region</i> <i>Panel II: Land and ecosystem changes in the Tibet-Himalaya region</i> <i>Panel III: Climate governance and water/land management in Tibet-Himalaya region</i> <i>Panel IV: Regional collaboration framework</i></p>	<p>Assess and document the current research status and projects from each country/region. Speakers from various institutions will provide a 15 minute overview of their research and knowledge gaps followed by 5-min question time. Develop questions and points for further discussion in sessions 2 & 3).</p> <p>Speakers listed section on "Content"</p>
13th evening	Reception hosted by MAIRS	Solatee Crown Plaza
		A small group meeting to prepare the discussion next day
Tues 14th		
AM (each talk 10-15 minutes)	<p>Talk 1: Tibet-Himalaya Ecosystem: A Generic View and Sustainable Governance of Its Resources and Services by Kedar Shrestha</p> <p>Talk 2: MAIRS mountain research by Ailikun</p> <p>Talk 3: MRI mountain activities by Katherine Morton</p>	
AM	<p>Session 2: Overview of Current Research (4 reports by each panel rapporteur)</p> <p>Summary</p>	<p>1) Summarise the current research from session 1. 2) Identify synergies.</p>
	<p>Session 3: Identify Research Gaps</p> <p>(Chair: Heqing HUANG, topic provider: P. C. Tiwari)</p>	<p>1) Identify research gaps from session 1 2) Establish a set of research priorities for the region</p>

PM	Session 4: Opportunities for Collaboration and develop research frameworks programme (Chair: Madhav Karki, Topic provider: Isabel Hilton)	<ul style="list-style-type: none"> 1) Identify potential partnerships and collaboration on specific research topics. 2) Explore the option of establishing a research coordination committee to coordinate research activities. 3) Develop a strategic framework, or road map, to guide a clear research agenda with shared visions, goals, strategic objectives and projects for the Tibet-Himalayan region.
	Session 5: Knowledge & Information Sharing (Chair: M. Manton; topic provider: Lance Heath)	1) Discussion session – Determine an effective mechanism to enhance knowledge sharing in the region (e.g. there is a need for a Knowledge Management System (web-based GIS Decision Support System) for the region). Role of the Media and civil society organizations.
	Wrap-up	1) Next Steps
14th evening	Reception	Solatee Crown Plaza
15th		
AM	Discussion continuing if needed	Steering Committee meeting
PM	Field Trip	to a WMO reference site in Kathmandu

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