



**Water-induced Disasters
in the Hindu Kush-Himalayan
Region**

A Regional Workshop
December 2001

about ICIMOD

The International Centre for Integrated Mountain Development (ICIMOD) is an international organisation devoted to development of the Hindu Kush-Himalayan region covering all or parts of eight sovereign states. Afghanistan , Bangladesh , Bhutan , China , India , Myanmar , Nepal , and Pakistan . The Centre is located in Kathmandu, Nepal. The primary objective of the Centre is to promote the development of an economically and environmentally sound mountain ecosystem and to improve the living standards of mountain populations.

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Water-induced Disasters in the Hindu Kush-Himalayan Region

A Regional Workshop held in Kathmandu, December 11-14, 2001



Li Tianchi
Sumitra Manandhar Gurung

Organised by
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Author's Preface

Disasters are having an ever-increasing impact on the lives and assets of people all over the world, and this is particularly evident in the Himalayas where the unstable geology and natural phenomena make the mountain system one of the most hazard prone areas in the world. The Hindu Kush-Himalayan Region continues to suffer from a variety of water-induced disasters that have a direct bearing on the sustainable development of the region and on the 500 million people who live there.

ICIMOD has addressed the issues of land and water-related disasters from its inception. In January 2001 a new collaborative project, the 'Participatory Disaster Management Programme' (PDMP), started between His Majesty's Government of Nepal and ICIMOD, with the financial and technical assistance of the United Nations Development Programme (UNDP) and Japan Women in Development Fund (JWIDF). The objective of the programme is to improve Nepal's capacity at local and national levels in the areas of disaster preparedness and management, and to mainstream disaster management into regular development activities at both levels. ICIMOD's main responsibility is to conduct community hazard mapping and vulnerability assessments and to organise regional exchange of information on project experiences.

After almost a year of activity, a regional workshop on 'Water-induced Disasters in the Hindu Kush-Himalayan Region' was organised jointly by ICIMOD and UNDP/Nepal, with the aim of sharing information gathered so far and exchanging other important knowledge and experiences from the region. The aim of the workshop was to help those in the region develop a shared vision of regional cooperation and lay the basis for creating an information and knowledge-sharing network. It is hoped that such a network will ensure a two-way flow of knowledge, information, and expertise from the community to the national and regional levels and vice versa.

We believe that a workshop of this type is the ideal forum for sharing information on disaster preparedness and management and developing a better understanding of the implementation of disaster mitigation activities, especially those using a community disaster management approach. Thus we were very pleased to be able to organise this meeting, and now to share the highlights of the proceedings with a wider audience. The expert participants who came together for this workshop brought with them some 300 years of acquired knowledge on disaster management from the HKH region and from as far away as Japan.

The workshop was another milestone in developing a shared vision of regional cooperation for disaster mitigation. We hope that this brief account of the results will be of interest to all those concerned with disaster mitigation in the region, and will help take forward the process of developing regional information systems and regional response mechanisms, with a view to reducing the impact of and misery caused by water-induced disasters.

Li Tianchi

Executive Summary

The regional workshop on 'Water-Induced Disasters in the Hindu-Kush Himalayan Region' was organised jointly by ICIMOD and the Participatory Disaster Management Programme (PDMP) in December 2001 with the aim of sharing and disseminating the knowledge and information generated during the first year of the programme together with other important experience, information, and knowledge from the region. The PDMP is a collaborative project between His Majesty's Government of Nepal and ICIMOD, with the financial and technical assistance of the United Nations Development Programme (UNDP) and Japan Women in Development Fund (JWIDF).

Thirty-nine participants attended from Bangladesh, Bhutan, China, India, Myanmar, Nepal, Pakistan, Japan, the Philippines, and Thailand. They included government officers, academics, and representatives from international development organisations and universities.

The aim was to achieve a shared vision of regional cooperation and to create the basis for an information and knowledge-sharing network for disaster mitigation in the HKH region.

Twenty-four presentations were given on the themes of risk and vulnerability analysis and hazard mapping; flash flooding, flood forecasting, and landslide hazard assessment; community awareness and disaster response preparedness; natural hazard, poverty, and development; disaster management information systems; and gender aspects of disaster management.

Intensive discussions led to the development of a set of conclusions and recommendations related to effective disaster management in the region. These were summarised in the 'Kathmandu Recommendations' as follows.

- Prepare comprehensive disaster management programmes and integrate them with national development plans
- Promote and support community-based disaster management programmes ensuring self-reliance, poverty alleviation, and women's participation in all processes
- Generate a standardised database on water-induced disasters
- Enhance regional cooperation and timely exchange of information regarding local and transboundary water-induced disasters
- Educate the public and ensure active involvement of the media in information dissemination on disaster management
- Promote basic and applied research on water-induced disasters in the region
- Support regional institutions like ICIMOD and national organisations involved in disaster management
- Continue and expand the PDMP project in the countries of the HKH region

Acronyms and Abbreviations

ADPC	Asian Disaster Preparedness Centre
ADRC	Asian Disaster Reduction Centre
CBO	community-based organisation
DMSP	Disaster Mitigation Support Programme
DWIDP	Department of Water-induced Disaster Prevention
EU	European Union
GDP	gross domestic product
GIS	geographical information system
GLOF	glacial lake outburst flood
GNP	gross national product
GPS	geographical positioning system
HKH	Hindu Kush-Himalayas
HMG	His Majesty's Government (of Nepal)
ICIMOD	International Centre for Integrated Mountain Development
IDNDR	International Decade for Natural Disaster Reduction
IUCN	International Union for Conservation of Nature and Natural Resources
IUGS	International Union of Geological Sciences
JICA	Japan International Cooperation Agency
JWIDF	Japan Women in Development Fund
NGO	non-government organisation
NWG	national working group
PAGASA	Philippine Atmospheric Geophysical & Astronomical Services Administration
PDMP	Participatory Disaster Management Programme
RS	remote sensing
TU	Tribhuvan University
SNV	Netherlands' Development Organization
UNDP	United Nations Development Programme
USEDf	United States Environmental Diplomacy Fund
VDC	village development committee

Group Photo: Participants in the Regional Workshop on Water-induced Disaster Management, Hindu Kush-Himalayan Region, 11—14 December, 2001.



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introduction

Background

The unstable nature of the Himalayas is well recognised worldwide. The topography and fragile geology combined with intense monsoon rains, makes the young mountain system one of the most hazard-prone areas in the world. In particular, the Himalayan region suffers from a range of water-induced disasters including debris flows, landslides, glacial lake outbursts, erosion, and sedimentation. These hazards create severe problems for water resources and other development projects and directly impact on people by destroying their environment for living and production, thereby seriously affecting social and economic development.

In order to promote mitigation of these hazards, ICIMOD over the years has developed and implemented a number of programmes related to mountain risk engineering, and landslide and instability management. The United Nations Development Programme (UNDP/Nepal) and other national institutions in China, India, Nepal and Pakistan have also acquired substantial expertise in dealing with these problems. In January 2001 a new collaborative programme, the Participatory Disaster Management Programme (PDMP), was started by His Majesty's Government of Nepal (HMGN) supported by UNDP, with contributions from the Japan Women in Development Fund (JWIDF), with ICIMOD as a collaborating partner. The objective of the programme is to improve Nepal's capacity at local and national levels in the areas of disaster preparedness and management, and to mainstream disaster management into regular development activities at both levels. ICIMOD's main responsibility is to conduct community hazard mapping and vulnerability assessments and to organise regional exchange of information on project experiences.

Towards the end of the first year of the programme, ICIMOD and PDMP organised a regional workshop on 'Water-Induced Disasters in the Hindu-Kush Himalayan Region' with support from JWIDF with the aim of sharing and disseminating the knowledge and information generated during the first year of the project and of gathering together other important experience, information, and knowledge from the region. It was hoped that the workshop would provide a basis for developing an information and knowledge-sharing network.

Thirty-nine participants attended the workshop. They included senior government officials engaged in disaster management and academic experts from ICIMOD's member countries (Bangladesh, Bhutan, China, India, Myanmar, Nepal, and

Pakistan); resource persons from Japan, the Philippines, and Thailand; and representatives of international development organisations and universities including IUCN, ADRC, ADPC, JICA, and the US Embassy.

Objectives and Outcomes

The specific objectives of the workshop were

- to share information on disaster preparedness management, and
- to facilitate understanding and implementation of disaster mitigation activities based on a community disaster management approach, including the integration of gender into disaster mitigation.

The aim was to achieve a shared vision of regional cooperation and to create the basis for an information and knowledge-sharing network for disaster mitigation in the HKH region.

The themes of the workshop were

- risk and vulnerability analysis and hazard mapping;
- flash flooding, flood forecasting, and landslide hazard assessment;
- community awareness and disaster response preparedness;
- natural hazard, poverty, and development;
- disaster management information systems; and
- gender aspects of disaster management.

Twenty-four presentations were given at the workshop. Intensive discussions were then held on types of regional level hazards, national and community approaches to mitigate disasters, replication of new techniques, exchange of information at national and regional level, and regional/international cooperation.

The workshop arrived at a number of conclusions and made some detailed recommendations related to effective disaster management in the region. These were summarised in the 'Kathmandu Recommendations' given at the end of this report.

the opening session

The Workshop Speeches

Dr. Binayak Bhadra, Director of Programmes and Acting Director General of ICIMOD, opened the workshop by highlighting the magnitude of water-induced disaster in the region and how it affects sustainable development. Implementation of disaster reduction measures constitutes a central aspect of any sustainable development policy. ICIMOD has been addressing the issues of land and water-related disasters for nearly two decades. He emphasised the need to develop synergy to better cope with the disasters at regional level, for which purpose the workshop was being organised.

In the inaugural speech, the Hon'ble Khum Bahadur Khadka, Minister for Home Affairs and Local Development, spoke about the increasing incidence of disasters in the region coupled by widespread poverty, illiteracy, and socio-economic inequities, which have been impediments to development in Nepal. The Government of Nepal has accorded high priority to integrating environmental development programmes by empowering people through decentralisation and participatory approaches to disaster management. The minister called for all stakeholders to develop the capacity of all concerned to reduce the risk as government efforts alone are insufficient to deal with the intensity of damage caused by land and water-related disasters. He also emphasised the need to integrate disaster management programmes with the regular development activities of the government by sharing responsibilities on mitigation, preparedness, and rehabilitation activities, and recognised that workshops of this kind are essential to refine policies and upgrade expertise in the region through mutual sharing of knowledge.

Minister Takemichi Okabe of the Embassy of Japan expressed happiness in taking part in the workshop and noted the variety of water-induced disasters in the lives of Nepalese people, which causes the loss of many lives and seriously damages property every year. Mitigation of disasters is an important issue for Nepal, which is located in a tectonically active and fragile geological region. The Government of Japan has supported the Participatory Disaster Management Programme (PDMP) in Nepal under Japan's special trust fund for women. The trust fund supports the empowerment of women and their families. He highlighted how government organisations, local government, CBOs, and NGOs have worked together to enhance the capacity of women and communities to manage water-induced disasters under the PDMP project. The Minister also emphasised the need for mutual cooperation and coordination in the field of disaster mitigation to strengthen understanding

among the experts in the region. This is essential to enable countermeasures to be taken to minimise the effects of disasters. He also hoped that the opportunities provided by this workshop for mutual cooperation would lead to a long-term positive effect in the region.

Approach

The workshop was designed to allow the participating countries to present outputs of various project activities related to landslide, debris-flow, floods, glacial lake outburst flooding, and forecasting and warning systems, as well as ongoing mitigation efforts. Resource persons from within and outside the region were invited to share experiences on new technologies to deal with such disasters. The workshop adopted a participatory approach for discussions in plenary and small groups to allow and encourage everybody to contribute and enrich knowledge. The initial programme of a day's field excursion to study water-induced disaster had to be cancelled due to the emerging security situation in Nepal. Although disappointing, this did provide the group with more time for interaction and learning.



the workshop sessions

Twenty-four presentations were given in eight sessions.

Session One

Binayak Bhadra, Director of Programmes and Deputy Director General of ICIMOD chaired the first session.

1. *How floods in Bangladesh have affected land, lives, livelihoods, and the economy since times past*

As a country of rivers, floods that affect up to 68% of the land area are common in Bangladesh. Since 1954, some 7,700 people have died as a result of flooding and the country has suffered economic losses of US\$ 14,250 million. Bangladesh has developed an institutional set up for coordination between all ministries involved to manage disasters. Based on past experiences, strategies have been developed to control floods, on encroachment, for information on warning systems, on advanced technology for sedimentation, and for developing a clear policy for infrastructure development. Since the cause of floods is not contained within the country, the importance of cooperation with India and Nepal is well recognised. *(Mohsina Yasmin)*

2. *Flood and disaster reduction in China*

An example was given of the 'Big Flood' in Yangtze in 1998 that killed 5,511 people and damaged property worth 300 billion Yuan (US\$ 36.6 billion). Between 1989 and 1999, floods in China have caused damage annually equivalent to 3.8% of GNP. China has since developed advanced technologies to monitor and give early warnings to prevent and reduce damage with the aim of reducing losses from 4% GNP this year to 0.5 % GNP in 100 years time. *(Wang Angsheng)*

3. *Newly emerging flash flood disasters in Thailand*

A case study was highlighted of a flash flood in Phetchabun Province on 11 August, 2001. A flash flood lasting only one hour killed 131 people, affected 1,749 families, and damaged 13,171 ha of land. The flash flood resulted from landslides that occurred 20 km away. This situation is uncommon in Thailand and caught out the communities who were unprepared to cope with the disaster. The Asian Disaster Preparedness Centre (ADPC), established to assess causes of landslides and floods and devise rescue operation plans, was called in to provide advice and collect information. Lessons learned from this disaster include the needs for flood forecasting and early warning systems, for multi-agency cooperation, and for integrated watershed management concepts along with land use planning. The focus should be on preparedness and mitigation rather than search and rescue. *(Apichai Thirathon)*

Summary

The Chair noted three important aspects that emerged from the presentations and discussion:

- a) Disaster forecasting and mitigation help people to cope better with floods.
- b) Building infrastructures can backfire if standards for infrastructures are not reviewed to control damage.
- c) Irrespective of preparation, disasters take place. Generalised systems do not help for heterogeneous mountain regions. Intense precipitations are very new and not well understood by science. These are key areas for research in the future.

Session Two

Wang Angsheng, Director of the Center for Disaster Reduction, Chinese Academy of Sciences, China, chaired the second session.

4. *Flood risk assessment and flash floods in Yunnan Province, China*

A detailed account was given of the methodology used for flood hazard and risk mapping using GIS to integrate and analyse large amounts of disparate information and provide an output map that delineates flood risks. In this way potentially vulnerable areas can be identified that should be avoided for habitation and risks can be taken into account during construction planning. This method of flood risk assessment is a valuable tool for planners and engineers involved in regional planning and construction. (*Zhu Jing*)

5. *Causes, consequences, and management of flash floods in the Indian Himalayas with special reference to Uttarakhand*

In almost every monsoon season, there are incidents of flash floods in the Indian Himalayas resulting from blockage of river channels by debris flows or landslides, creation of a landslide dammed lake, and subsequent breaching of the unstable natural dam and outburst of the trapped water. Glacial lake outburst floods, which have a similar etiology, are also more likely to occur during the monsoon season. Dams often breach as a result of a sudden massive increase in water following a cloudburst, and a heavy cloudburst can result in sudden flooding of vulnerable areas even without the added affect of a dam burst. Increasing population has led to an increase of settlement and agriculture in previously avoided flash flood and cloudburst flood prone areas. It is necessary both to increase understanding of the triggering factors and potential for landslides and floods, to use techniques of mountain risk engineering to reduce the hazards, to enforce restrictions on settlement in such areas to reduce risks, and to develop early warning systems, with a particular focus on the transboundary situation. (*Varun Joshi*)

6. *Flood hazard and risk mapping in selected VDCs in the Terai region of Nepal*

To some extent, this presentation paralleled that of Zhu Jing on China. Floods, riverbank cutting, river shifting, and siltation are common natural hazards in the low-lying Terai region of Nepal. Losses and damage are increasing as a result of rapid population growth with resultant encroachment into hazard prone areas, rapid growth in infrastructures, and the increasing sediment load resulting from increased erosion in the hills. A GIS approach was used to organise data and create flood (and

flood-related) hazard and risk maps. The maps prepared using the GIS approach fitted well with the social hazard maps prepared by local people. This method can be used to identify hazard prone areas and to quantify the elements at risk to different magnitudes of hazard in the Terai region. (*Moti Lal Ghimire*)

Summary

All three speakers emphasised the need for database awareness, bioengineering, and warning and zoning systems. GIS was an appropriate tool for developing flood hazard and risk maps. Risk is essentially the hazard (likelihood of an event occurring) multiplied by the amount of damage that the event would do (to people, utilities, farms, and so on). Even where hazards cannot be reduced, the risks can be considerably reduced by ensuring that people, buildings, and utilities are not located in vulnerable areas. The papers indicated that GIS are increasingly used as tools to organise databases and predict risks in the region.

Session Three

The third session was chaired by Meen B.P. Chhetri, Director of Narcotics Control and Disaster Management, Ministry of Home Affairs, Nepal.

7. Flood forecasting and warning system in the Philippines

Flood and its attendant hazards is one of the most severe, widespread, and destructive hydrological hazards in the Philippines. Floods, which in earlier days were part of a natural adjustment of the river system, are now major disasters because of increased settlement and activities in the floodplain. The presentation gave insights into the reorientation in approach of the Philippine Atmospheric Geophysical and Astronomical Services Administration (PAGASA). This has involved a move away from the structural approach used prior to 1990, to the non-structural awareness-oriented community-based flood forecasting and warning system employed since 1997. Through various training programmes for different people, including children through school curricula, and developing coordination among all agencies of the government and media, PAGASA has managed to prepare communities to deal with floods cost effectively. The importance in working with rivers rather than controlling rivers, to use a quote from Water Resources International, was emphasised. One way forward is to reduce damage by using non-structural approaches to keep people away from water rather than a structural approach to keep water away from people. (*Susan Ramos Espinueva*)

8. Developing a framework for regional cooperation in flood forecasting

An update was presented on the magnitude of flood damage and its impact in the HKH region, and the efforts being made towards regional cooperation in flood forecasting and information sharing. An action plan was developed at a high level meeting in May 2001 organised by ICIMOD and the World Meteorological Organization (WMO) and cohosted by the Department of Hydrology and Meteorology, HMG. Several international agencies will support the efforts to ensure continuous dialogue among the countries of the HKH to build trust. The aim is to be able to access updated information and real time hydrological and meteorological data on floods and for flood forecasting from a regional website. (*Mandira Shrestha*)

9. Failures of natural dams in Pakistan

The presentation summarised the historical records of natural dams blocking the Indus river, the greatest river of Pakistan, or its tributaries during the last 200 years. In most cases the dams were formed by advancement of glaciers (ice dams) but on a few occasions major landslides or debris flows have also formed large dams across the river. Some dams drained naturally, while others burst abruptly generating catastrophic floods down stream. There have been fewer events since 1935, thought to reflect the general recession of glaciers in the region. There is an urgent need for hazard assessment maps of the northern areas of Pakistan, for a monitoring system for glacier advancement and glacial lakes, and for assessment of the potential impacts of such events if large dams are constructed upstream of the Tarbela dam. (*Basit Masud*)

10. Water-induced disasters and countermeasures in Nepal

Floods, landslides, and avalanches are responsible for most of the property loss and a proportion of the deaths resulting from disasters in Nepal. The Disaster Mitigation Support Programme Project (DMSP) of JICA in Nepal is looking at a variety of countermeasures for water-induced disasters including raising awareness through education, street drama, seminars, and advocacy; mitigating disasters through low-cost technology, plantations, and river training with involvement of communities; preparing for flood disasters through the use of information technology and GIS; and disaster and emergency rehabilitation work. (*Koji Kamee*)

Summary

The Chair noted Nepal's efforts in flood forecasting and mitigation to reduce loss of life and property, which so far had only been possible in the case of Tsho Rolpa. He stressed the need for regional cooperation in flood forecasting to control damage across the region. However, high-level commitment is required at the political level, going beyond the act of seminars.

Session Four

The fourth session was chaired by Apichai Thirathon of the Asian Disaster Preparedness Center (ADPC).

11. International cooperation for disaster reduction: the Asian Disaster Reduction Center

The ADRC was established in 1998 in Japan following the Great Hanshin Awaji Earthquake in Kobe in 1995. There are 23 member countries, all of whom benefit from research and information sharing, capacity building, and cooperation in the field of disaster reduction. Activities have included a training programme in Nepal. ADRC has also established a website designed to serve as a clearing-house for anyone seeking information on disaster reduction. (*Satoru Nishikawa*)

12. Glacial lake outburst floods and infrastructure development in Nepal

The presentation highlighted GLOF events with insights into six well-studied cases in Nepal: Lower Barun, Imja, Thulagi, Tam Pokhari, Dig Tsho, and Tsho Rolpa. These case studies gave a clear idea of the magnitude of damage that GLOFs are likely to create in the HKH region in the future, as their number increases in the wake of global warming. The need for caution with large infrastructure projects in the region was also stressed.

Recently an 'Inventory of Glaciers, Glacial Lakes and Glacial Lake Outburst Floods in Nepal and Bhutan' was prepared and published in two volumes. GIS mapping and analyses were used to identify the potentially dangerous glacial lakes in the two countries. The books describe what needs to be done to minimise risks – for example lowering the lake levels before outbursts occur. (*Pradeep Mool*)

Session Five

The fifth session was chaired by Basit Masud, Principle Geologist of National Engineering Services, Pakistan.

13. Mechanisms of rapid landslide motion

Rapid long run-out landslides can be precipitated by various events including earthquakes and heavy rainfall. Detailed understanding of the mechanisms is still limited. The presentation highlighted results obtained using long-span extensometers and GPS to monitor two potential rapid motion landslides, at Lishan in China and Machupicchu Citadel in Peru. In Lishan electronic extensometer sensors are wired to a PC inside a tunnel at the toe of the slope. Data acquired by the PC is transmitted to the Lishan Landslide Monitoring Station through a telephone line. These sites were studied with UNESCO/IUGS as part of an approach to prevent landslides at cultural heritage sites. The application of realtime kinematic GPS to landslide monitoring, being tested in Japan, was also explained. The proposal is to use quick RTK-GPS surveys for periodic mass monitoring of slope stability at sites at risk. (*Hiroshi Fukuoka*)

14. Natural dam created by a rapid landslide, flash flood from the dam failure, and mitigation of impact in Tibet, China

In spring 2000, due to a rapid melting of snow and ice in upper Zhamulongma watershed, 200 million cubic metres of debris slid a distance of 8 km at high speed, to form a natural dam, and subsequent lake, in the valley of the Yigong river. Upstream and downstream flooding threatened thousands of inhabitants and vast areas of farmland. Six hydrological observation stations were established to monitor discharge of the stream flow into the dam-lake. Information gained enabled the creation of a risk mitigation plan that included evacuation of all residents in the potential flooding areas, hydrological observation, and slope instability analysis downstream. Under great time pressure, a ditch 24m deep was dug through the lowest position of the dam to mitigate flooding. Outflow was still less than inflow, however, and the same month the dam was breached following partial collapse of the ditch, resulting in a high-speed flash flood 50m high which reached Medong 200 km downstream in 3.5 hours, and created new landslides and destroyed many bridges. As a result of the previous mitigation measures, there were no deaths in China. However, In Arunachal Pradesh in India over 50,000 people were rendered homeless by the flash flood, with 30 deaths reported, and a huge economic loss. This event highlights the pressing need for inter-country flooding warning systems and for developing a mechanism for sharing the costs and benefits of mitigation measures. (*Li Tianchi*)

Summary

The discussions highlighted the necessity of using a highland-lowland interactive system approach in the region. Disasters act as eye-openers for decision makers and help them

realise the need for collaborating with other countries in the region. The joining together of UNDP and ICIMOD in disaster mitigation work has been very important and is an example of the recent positive change.

Session Six

The sixth session, on Community Managed Disaster Mitigation, was chaired by Suresh R. Chalise, Senior Advisor of ICIMOD.

15. Hazard and risk mapping

It is estimated that between 1983 and 2000, landslides in Nepal resulted in 5,800 deaths, with an annual loss of property worth 20% of GDP. Two methods for GIS based landslide hazard and risk mapping were tested in the first phase of the PDM programme: a bivariate statistical (landslide index) method and a modified Mountain Risk Engineering (MRE) method (expert-based rating method). Areas in four districts were selected for testing. The bivariate statistical method was found to be more representative than the modified Mountain Risk Engineering (MRE) method in terms of observed landslide distribution, but there were some limitations as there was insufficient information available to include all the parameters recommended in the MREH. The maps can be used to identify areas with a different degree of hazard, at least at the pre feasibility level, and to lay the basis for preparation of disaster preparedness plans. Hazard and risk mapping is necessary so that resources for mitigation can be effectively utilised; they can be used as a guideline for land-use and mitigation measures. *(Rajesh Thapa)*

16. Capacity building of community institutions to prepare for hazard management

One of the major components of the PDMP is to develop the institutional capacity of local communities to incorporate disaster management. The paper highlighted the challenges of capacity building of community institutions to prepare for hazard management. The entry point should be awareness raising and social mobilisation. Under the PDMP, men and women in selected communities are participating in needs assessment, programme design, implementation, and monitoring. Communities are very willing to participate in activities as hazards affect their lives seriously. Local participation contributes more than half of all project costs. The challenge is to convince communities of the need for institutional development, not just infrastructure, and to overcome the fact that in general post disaster activities are more attractive and publicised than pre-disaster mitigation measures. Effective disaster management requires good understanding of local knowledge, institutions, and social dynamics, but activities based on indigenous knowledge, local materials and limited local resources alone are not adequate. *(Man Bahadur Thapa)*

17. Community development and disaster management

The paper gave insights into the institutionalisation of a disaster management system and community development processes in one community in Nepal, with local government, line agencies, NGOs, and JICA contributing their expertise. The purpose was to develop a model village community-based disaster management system that would ensure safer livelihoods and reduce poverty in the village. Disaster management is combined with natural resource management, community development, infrastructure for the prevention of landslides, and income generation.

(Bishnu D. Shrestha)

Summary

The papers clearly showed that in Nepal disaster management could be very successful when the principles of community-led development, transparency, empowerment, gender sensitivity, coordination with all stakeholders, sustainability, and socioeconomic self-reliance are adopted. This approach should be replicated elsewhere in the region.

Session Seven

The seventh session was chaired by Satoru Nishikawa, Deputy Executive Director, Asian Disaster Reduction Centre (ADRC), Japan.

18. Indigenous knowledge of disaster management

There is a rich pool of indigenous knowledge on landslides and flooding and measures for mitigation among communities in Nepal. However the pool of knowledge is eroding and is being replaced with borrowed outside knowledge and expertise that is imposed on communities. Indigenous knowledge on mitigating landslides includes early warning signs, agro-forestry, fencing, terracing, and mixed and intercropping methods. Indigenous measures to mitigate flooding include housing location and construction measures, river bank strengthening, afforestation, and construction of ponds to collect water during the rainy season. Indigenous knowledge needs to be re-evaluated for and incorporated into disaster management and mitigation. It should be combined with rather than replaced by modern scientific knowledge and hi-tech solutions. *(Yuba Raj Luintel)*

19. Disaster and development: a gender perspective

The paper highlighted the efforts of the PDMP in addressing issues related to gender in disaster management, and the role of women in coping with disasters. A study in four districts showed that women bear a larger amount of pain and suffering during and after any disaster. In the project areas women contribute significantly to the mitigation measures, often contributing more than men, and in some cases have assumed a leadership role and coordinated community mobilisation. Many women were very aware of the overall development needs of their communities and pointed out the need to integrate community development with disaster mitigation, but overall they had a greater need for input as a result of their lower literacy and awareness levels. The positive impacts shown by raising the awareness of women as well as men through training and exposure, and involving women in decision-making, clearly indicate that there is a great need to focus support on women as well as men. Women's active and full participation in disaster management in Nepal will be crucial for its success. *(Man B. Thapa)*

20. Disaster management strategies of the Government of Nepal

A detailed presentation was given of the Government of Nepal's institutional set up, and its role and the problems it faces in coping with disasters and rehabilitation work in Nepal. Policies and programmes related to natural disaster relief work are formulated and implemented through the Central Disaster Relief Committee, its sub-committees, and its District and Local Committees. The problem is a complex one

and requires a concrete, effective, practicable, and proactive policy. During crisis periods, local people help themselves before government can respond, thus the most pressing need is for political commitment, and effective and efficient policy implementation. Enhancing public awareness for disaster reduction and people's response capacity is of vital importance to achieve goals. *(Meen B. P. Chhetri)*

21. Causes, impacts and mitigation measures for floods

Every year Nepal experiences floods of varying magnitude during the monsoon season. This is a natural phenomenon, but increasingly the situation is exacerbated by development activities, changing land use, improper land use practices, and ad hoc river control works that fail to look at the larger picture. At the same time, the risk to lives and property is increasing as more people and structures are located in vulnerable areas. Socio-economic factors contribute in a variety of ways to flood vulnerability. HMGN has prepared an 'Action Plan on Disaster Management' that specifies the priority activities to be undertaken in the field of disaster management, including mitigation. This paper highlighted the causes of floods, their impacts, the mitigation measures being practiced, and the assigned roles of the various government and non-government agencies. A range of recommendations was shared which would help Nepal to respond to floods better. Planning and activities must focus on the management and enhancement of the whole riverine environment using a watershed approach, and not just the exploitation of river resources, for flood control measures to be effective. Flood disaster prevention should be seen as development work in its own right. *(Damodar Bhattarai)*

Session Eight

The last paper presentation session was chaired by Mohsina Yasmin, Senior Assistant Secretary of the Ministry of Chittagong Hill Tracts Affairs in Bangladesh.

22. Women amidst disasters

The paper gave insights into the gender perspectives of disasters and how women bear the higher costs of disaster. This is mainly the result of the discrimination that exists in societies; disasters are also deeply intertwined and cross-cut by gender concerns. Natural disasters frequently cause women and men to lose their capacity to sustain their families' livelihoods through loss of homes, seeds, livestock, and tools. Men often leave their families behind in search of employment. Women are left to carry the burden of the family alone. Highlights were shared from the Expert Group Meeting on 'Environmental Management and the Mitigation of Natural Disasters: a Gender Perspective', held in Ankara one month previously. 'Gender myths', like the common perception of women as passive victims of disaster, undermine recognition of the actual and potential role that women play. There is a need to see natural disasters in a much wider socio-economic context. Disasters only make more visible the underlying vulnerabilities and inequities that already exist. *(Sumitra M. Gurung)*

23. The complex of risks and vulnerabilities in mountain areas

Mountain areas have specific attributes like accessibility, fragility, marginality, diversity, and niche advantages. Using these as a base, the paper discussed how the risks and

vulnerabilities in mountain areas are mounting in the context of a globalised economy, and that mountain areas are on the losing side in global advance. The unequal terms for integration and mainstreaming of mountains have had a negative impact on many vulnerable mountain communities. There is a need for a regionally differentiated integrated coping strategy for mountain areas to enable wise and effective adaptation to globalisation. Such a strategy should include recognition of, and dissemination of knowledge about, the options and opportunities created by globalisation. (*Narpat Jodha*)

24. Community risk and vulnerability analysis

The extent of vulnerability and loss of communities' livelihood, property, and resources were highlighted using a case study on community risk and vulnerability in eight pilot village development committee areas in Nepal, two in each of the four PDMP pilot districts. Between 85 and 99% of total loss was from water-induced disasters; common events had recurred at intervals of 5 to 13 years, major events at intervals between 12 and 26 years. Between 25 and 92% of households were exposed to disasters, with a higher percentage in Terai areas. The average annual loss was equivalent to between 1 and 6% of total household income. The major threat was to land, followed by buildings and other infrastructure. The great majority of exposed value was private, but rural communities lack insurance schemes. Low literacy, low off-farm income, poor housing, poor service facilities, and poor accessibility all contributed to a low capacity for response and recovery. Communities should be involved in all aspects of mitigation and development processes. There is a need for appropriate local institutions with a provision for training and an operational fund, for a flood warning network with highland lowland links, and to emphasise maintenance of existing control structures as well as new measures. (*Narendra Khanal*)





ICIMOD programmes on mountain disaster management

Mountain disasters and their management have been a core concern of ICIMOD since its inception. Li Tianchi gave a brief overview of the past activities and achievements of ICIMOD in this field followed by a synthesis of the recommendations made by various participants from different countries in past workshops.

Past Activities (1995-2000)

1. Mountain risk engineering programme, supported by the EU (1995-1998)
 - On-the-job training for junior engineers (1996, 1997)
 - Hands-on training for local farmers in China (1996, 1997)
 - Study tours
 - study tour in European countries for project officers (1996)
 - study tour in China for regional government officers (1996, 1997)
 - study tour in Nepal for China and India project staff (1998)
 - Six workshops for government officers and academics (China, India, and Nepal, 1996-1998)
 - Demonstration sites in China and Nepal (1996-1998)
2. Landslide hazard mitigation and control, supported by the Government of Japan (1995-1999)
 - Regional workshop in Kathmandu (1995)
 - Regional pilot training on landslide hazard mitigation (1996)
 - Regional training workshop for decision-makers on landslide and debris flow hazard mitigation in Kunming and Chengdu, China (1997)
 - Regional training on landslide and debris flow control (1999)
 - Hands-on-training for local farmers in Nepal (1997,1999)
 - Research activities, case study in China, India, Nepal and Pakistan
3. Application of remote sensing and GIS in hazard mapping and slope stability analysis, supported by the Netherlands Government (1996, 1997, 1998, 1999)
4. Geo-technical training for irrigation engineers in Bhutan, supported by SNV (2000)

5. Monitoring and early warning system in the Hindu Kush-Himalayan region, supported by USEDF (2001)
6. Research activities on large disaster events, in collaboration with national institutions (1996-2001).

Outputs and Publications

1. Development of a human resource base in the region.
More than 600 government officers and academics trained. This human resource base provided the foundation for training, disseminating information on hazards, developing programmes, and research activities to mitigate hazards/risks.
2. Documentation of landslide hazard management and control in China, India, Nepal, and Pakistan.
3. Establishment of a Mountain Risk Engineering Unit at Tribhuvan University in Nepal, with post-graduate courses for engineers, scientists, foresters and so on.
4. Establishment of a training team for Mountain Risk Engineering at Chengdu Institute of Mountain Hazard and Environment, China.
5. Training Manuals include
 - Training Manual for Mountain Risk Engineering in China.
 - Geo-technical Training Manual for Irrigation Engineers, Bhutan.
6. Selected recent publications include
 - Landslide Hazard Mitigation in the HKH Region
 - Inventory of Glaciers, Glacial Lakes and Glacial Lake Outburst Floods, Nepal
 - Inventory of Glaciers, Glacial Lakes and Glacial Lake Outburst Floods, Bhutan
 - Climatic Atlas of Nepal

Summary of Past Recommendations

Over the years, participants in various workshops organised by ICIMOD have made recommendations on different points associated with mountain disasters and their management. These are summarised below.

In each member country:

1. Awareness raising at all levels for Landslide and Debris Flow
2. Zonation of landslide and debris flow prone areas
3. Build an information database related to landslide and debris flow
4. Formulate a national programme on landslide and debris flow including poverty alleviation and development activities
5. Design and implement appropriate training courses at various levels

ICIMOD – national support

1. Conduct training courses at the following levels: a) policy and decision-makers; b) middle-level professionals; c) technicians and scientists; d) local communities/farmers
2. Identify and/or provide model landslide and debris flow training areas, experts, and institutions at both national and regional levels
3. Interact more with national institutions related to landslide and debris-flow
4. Support national training programmes

5. Provide guidance to formulate national training programmes
6. Conduct post training tracer studies
7. Identify national focal points for landslide and debris flow, help establish national working groups, and help evolve national action plans

ICIMOD – regional cooperation

1. Document and disseminate success cases and lessons learned from failures
2. Identify and develop early warning and forecasting systems
3. Act as a resource centre to compile and disseminate information on all aspects of landslide and debris flow using all media
4. Follow up on past recommendations
5. Establish a Regional Working Group on landslides and debris flows





group work and presentations

Group work was intended to enable discussion among participants and help them develop a shared understanding on water-induced disasters and a consensus on regional cooperation. The forum also helped in sharing information about the technologies applied by different countries in dealing with disasters. Since many disasters prevailing in the HKH region are transboundary in nature, joint responses will be more effective. To help ensure continuity in the process of disaster management in the region, Li Tianchi first provided the synopsis given in the preceding section of past achievements and outputs of ICIMOD and the recommendations made at various workshops by participants from HKH countries. Man Bahadur Thapa, of the Participatory Disaster Management Programme of UNDP Nepal, also shared information on the ongoing activities of UNDP and Unicef.

Guidelines for Group Discussion

Participants were divided randomly into three groups for the discussions, but they all worked on the same themes. The results from all three groups have been summarised together in the following under the major thematic headings.

Question 1

The first task was to identify the types of regional level (water-induced) hazards and their potential effects/impacts in the Hindu Kush Himalayan region and list them in order of intensity of damage, and suggest methods to cooperate at a regional level.

Types of regional level water-induced disasters

The types of water-induced/related disasters identified that can have a regional or transboundary impact are:

- Floods
- Flash floods, including GLOFs and breaching of landslide dams
- Landslides/debris flows
- Changes in river course
- Soil erosion
- Avalanches (snow)

and the types of damage:

- Loss of life
- Loss of livelihoods
- Loss of property (agriculture/infrastructure)
- Environmental degradation
- Long term negative impact on overall development of the countries

Methods for regional level cooperation.

The main needs and methods suggested for regional level cooperation were

- Both bilateral and regional cooperation
- Data sharing (real time hydro-meteorological data)
- Early warning systems
- Highland/lowland interactions
- Research and information dissemination
- Regular interaction among regional countries, with technical support and direct financial support from countries like Japan and China to countries which need to come ahead
- Better information sharing
- Monitoring
- Working groups at the regional level for coping with each type of hazard

Question 2

The second question was: How did your country and communities deal with the hazards in the past? What new techniques emerged in the presentations that could be replicated in other situations/sites.

Country response: local level management system

Generally both the forecasting and disaster management systems were thought to be poor in all the countries represented at the meeting except Japan and to some extent in China. It was felt that post disaster management was improving in Nepal, Pakistan, Bangladesh, China, and Thailand. The main responses were classed as being mostly

- Reactive – crisis management
- Rescue and relief
- Top down activities
- Isolated efforts

Techniques which could be replicated

A number of the techniques and approaches described in the presentations were potentially useful for replication elsewhere. They included

- Community-based awareness approach: community-based warning systems (the Philippines approach) and community-based disaster management systems; methods should promote self reliance (affordable, sustainable, & poverty alleviation)
- Well coordinated multi-sectoral approaches to reduce impacts of disasters
- Hazard/risk mapping (GIS, RS); the accuracy and resolution of each layer in GIS systems should be examined
- Regional hydro-meteorological real-time data sharing
- Disaster forecasting; dissemination of early warning information through the media
- Cost-benefit sharing mechanisms
- Technology transfer

- Inventory of success cases
- Integration with development programmes
- Gender sensitive database
- Monitoring and evaluation (models & indigenous mitigation activities)
- Efficient information flow in every direction
- Equal opportunities to women in planning, design and implementation, training, skills development, and so on; actively include women in local level disaster management as they are repositories of much valuable information
- Blending of new techniques with indigenous knowledge
- Developing social maps/resource maps through local participation before taking up high cost and sophisticated techniques like GIS
- Analysis of technical reports for all major events, and sharing with the community and stakeholders working on the same issues
- Develop a database on trans-boundary disasters and share through a website as well as at institutional level, possibly coordinated by the hazard working groups mentioned above
- Enhance fundamental research and establish domestic academic interdisciplinary societies for water-induced disasters
- Involve different agencies in assessments and studies of the effects of disasters

Question 3

Participants were asked for ideas that would promote working together, and for establishing a network to exchange information at the local and regional levels. What factors will contribute to keeping the networks alive? What I will do on my return? Most of the ideas for working together were already covered under the preceding heading, and the need for a network was taken as given, so participants focused on the second parts of the question.

Factors that could contribute to keeping the network alive

- Equal participation of senior and younger professionals in the networking group
- Aim for equal participation of both genders
- Performance award for active participation
- Establish an email mailing list about HKH water-induced disasters to facilitate information sharing

What I will do on my return?

- Share and disseminate the knowledge acquired with concerned stakeholders

Question 4

Participants were asked to make recommendations to ICIMOD and the PDM programme (and the region) on disaster management, including coordination and collaboration at the national and regional levels, with specific recommendations for action by ICIMOD.

Recommendations for ICIMOD, PDMP/UNDP and the region

- Projects should be extended for at least the next five years; there should be continuation in the same area, extension in other areas, and expansion in the regional countries of the HKH; basin-wise selection of areas
- Formulate a regional working group for each hazard under the MNR Division of ICIMOD. Each group should have a national working group from each country with participation on a voluntary basis by both administrators and scientists/engineers. The national working groups (NWG) should be responsible for sharing the database and providing feedback. Programmes for ICIMOD should be developed in consultation with these NWGs. The Board Member of the respective countries should coordinate the activities of the national groups.
- Contact between ICIMOD Board Members and the personnel associated with ICIMOD should be enhanced.
- Interact and coordinate with similar agencies
- Exchange information with international professional organisations
- Ensure that the data that is collected is standardised for effective use in the region
- Establish a satellite for collecting data about disasters in the HKH region
- Strengthen VDCs in their disaster management activities
- Establish a national group of senior citizens (men and women) to act as a resource body to advise government bodies

Specifically ICIMOD should

- Prepare an inventory of success stories
- Assess past disasters and vulnerability
- Promote coordination among regional countries
- Organise regular training/workshops/conferences, these should include training of people at risk through sharing experiences of those who have coped successfully
- Strengthen the capability of regional countries
- Prepare an inventory of experts in the region
- Pilot a community-based early warning system
- Pilot a hydrological (raingauge and discharge instruments) system

One group stated that ICIMOD would take an active role in fund-raising activities to realise or implement recommendations.

kathmandu recommendations

The Process

The group made recommendations from the workshop with the purpose of sharing them widely among concerned agencies that were working on water-induced disasters in the region. Participants selected representatives from each country present, to consolidate the conclusions and recommendations that had been made into a document titled **‘Kathmandu Recommendations’**. This declaration would be circulated among the ICIMOD Board Members and institutions affiliated with ICIMOD, including those that dealt with water-related disasters.

The final text was as follows.

The Kathmandu Recommendations

In the “Regional Workshop on Water-Induced Disasters in the Hindu Kush-Himalayan Region” held at the Hotel Himalaya in Kathmandu from December 11-14, 2001, thirty-nine participants from the countries of Bangladesh, Bhutan, China, India, Myanmar, Nepal, and Pakistan of the Hindu Kush-Himalayas and from Thailand and Japan met to discuss:

- Risk and vulnerability analysis and hazard mapping
- Flash flooding, flood forecasting and landslide hazard assessment
- Community awareness and disaster response preparedness
- Natural hazards, poverty and development
- Disaster management information systems
- Gender aspects of disaster management

The unstable nature of the Himalayas is well recognised worldwide. The topography and fragile geology combined with intense monsoon rains, make the young mountain system one of the most hazard-prone areas in the world. The Himalayan region hence suffers from water-induced disasters including debris flows, landslides, glacial lake outbursts, erosion, and sedimentation. These hazards create severe problems for water resources and other development projects, and directly impact on people by destroying their environment for living and production, thereby seriously affecting social and economic development. These disasters are hampering sustainable development of the region as a whole. To find answers and to collectively mitigate the recurrent damage, experts from the region met in Kathmandu. They jointly recommend all concerned authorities and stakeholders of the Hindu Kush Himalayan region to focus on the following.

1. Prepare comprehensive disaster management programmes and integrate them

with national development plans

2. **Promote and support community-based disaster management programmes ensuring self-reliance, poverty alleviation and women's participation in all processes**
3. **Generate a standardised database on water-induced disasters**
4. **Enhance regional cooperation and timely exchange of information regarding local as well as transboundary water-induced disasters**
5. **Educate the public and ensure active involvement of the media in information dissemination on disaster management**
6. **Promote basic and applied research on water-induced disasters in the region**
7. **Support regional institutions like ICIMOD and other national organisations involved in disaster management**
8. **Continue and expand the PDMP project by UNDP in the countries of the HKH region**



Opening Speech by the Honourable Minister Khum Bahadur Khadka, Minister for Home Affairs and Local Development of HMGN

Mr. Chairman,
Distinguished Guests,
Ladies and Gentlemen,

I would like to thank the organisers for their invitation to inaugurate the ‘Regional Workshop on Water-induced Disasters in the Hindu Kush-Himalayan Region’ organised by the International Centre for Integrated Mountain Development (ICIMOD) in conjunction with the Participatory Disaster Management Programme/UNDP with support from the Japan Women in Development Fund/UNDP.

All of us are aware that the Hindu Kush-Himalaya is one of the most fragile regions and prone to natural hazards due to its steep slopes, unstable geology, and highly concentrated monsoon precipitation. Various forms of water-induced natural hazards such as landslides, debris flows, glacial lake outburst floods (GLOF), floods, river bank cutting, erosion, siltation, and shifting of river channels commonly occur. Such natural hazards cause loss of life and property in all countries in the region.

Nepal has been experiencing a high rate of land use and land cover change as a result of the high population growth rate and rapid development in physical infrastructures, such as settlements, roads, dams, and irrigation canals. As a result, life and property is increasingly at risk from natural disasters. At the same time widespread poverty, illiteracy, inaccessibility, and economic and social inequality have resulted in a weak response and recovery capacity to natural disasters. Loss and damage have caused increasing disruption to the socioeconomic development of countries. There is a need for further development of infrastructure – irrigation canals, rural agricultural roads, and rural electrification, in order to improve the living standard of the people. But it is likely that loss and damage will increase in the future if effective mitigation measures are not implemented.

His Majesty’s Government of Nepal has given high priority to poverty alleviation and empowerment of local people through decentralisation. More recently, environment has been integrated with development, and a participatory approach for protection, conservation, and management of the environment has been introduced. Environmental Impact Assessments have become an inseparable part of the development programme. The government has endorsed the National Action Plan prepared by the Nepal National Committee on IDNDR. This comprehensive plan has identified the main actions necessary for reducing the risk from disaster. Efforts have also been made to improve the national capability in disaster management including the provision of rescue and relief services to disaster victims.

Water-induced disasters in Nepal are so frequent and widespread that government efforts alone are not sufficient in reducing risks. Efforts from all sections of society are equally

important. It is necessary to raise awareness among people in communities so that investment in hazard prone areas can be minimised and the response and recovery capacity of the people improved.

A consolidated and integrated approach for disaster management and control, which includes a myriad of tasks and responsibilities such as mitigation, preparedness, reconstruction, and rehabilitation, is relatively new. There is a need to upgrade the hazard management capability so that disaster management and control becomes an integral part of the regular development activities of the government.

Dissemination and transfer of information and technology are crucial in planning, design, and implementation of disaster mitigation and control measures. Often individuals or groups or institutions do not take mitigating action because they do not know what to do or how to do it. Well-tested effective mitigation programmes and technologies developed in some areas in the region can be transferred to other areas. The challenge is how to transfer the expertise and technologies to the users and implementing agencies.

It is in this context that such a regional workshop is necessary to share experiences and knowledge about the issues related to disasters. I am confident that the deliberations in the workshop will come up with valuable recommendations for policy guidelines and measures, which will help to reduce the risk of water-induced disasters.

Speech by Minister Takemichi OKABE Embassy of Japan, Kathmandu, Nepal

Honorable Minister of Home, Mr. Khum Bahadur Khadka, Distinguished Delegates, Ladies and Gentlemen.

It is indeed my great pleasure to take part in this opening ceremony of the Regional Workshop on Water-induced Disasters in the Hindu Kush-Himalayan Region.

Ladies and gentlemen, as is well known, the Himalayan range was only recently formed by tectonic activity, resulting in many geological folds and fractures on both sides of Himalayas. Being one of the youngest mountain ranges in the world, it has a fragile geological composition. In addition, each summer, monsoon clouds bring torrential rains to the southern slopes of the Himalayas during a short span of time.

Because of this combination of weak geology and heavy rainfall, as well as some unfavourable human activities, the people living in Nepal have frequently faced water-induced disasters, including flash floods, landslides, and debris flows, causing each year a heavy loss of life and great damage to property and national infrastructure. Consequently, the mitigation and management of water-induced disaster is one of the most important issues for the Kingdom of Nepal.

In light of this, the Government of Japan has supported the Participatory Disaster Management Programme (PDMP) in Nepal under the Japan special trust fund for Woman in Development/UNDP. This unique project, which provides an exceptional opportunity for joint collaboration among ICIMOD, UNDP, and the Government of Japan, supports the empowerment of women and their families for the purpose of mitigating and managing water-induced natural disasters in Nepal. In addition to this project, the Disaster Mitigation Support Programme Project (DMSP) is being implemented under the technical cooperation of JICA, in order to strengthen the capacity of HMG and local communities to cope with water-induced disasters.

In these programmes, government organisations, local governments, NGOs, and CBOs are working together to enhance the capacity of women and communities to mitigate and manage water-induced disasters. I believe that the information provided at this workshop will be helpful for the participants.

Distinguished participants are here today to share their experiences concerning this important issue. I believe this workshop will provide a good opportunity for discussing ideas and coming to mutual conclusions concerning water-induced disasters and their countermeasures, and I believe it will also greatly contribute to strengthening mutual cooperation and understanding between the participating countries.

In conclusion, I would like to express my sincere belief that the outcomes of this workshop will be very practical and useful. I am certain that it will provide valuable input to all participating nations which will help them conduct proper planning for water-induced disaster mitigation and management in the future.

I would like to express my hope that the activities today will enhance mutual cooperation and coordination in the field of water-induced disaster mitigation and management for years to come.

Thank you.

Workshop Schedule

DAY 1: Tuesday, 11 December 2001

- Welcome address – Dr. Binayak Bhadra, Acting Director General, ICIMOD
 Inauguration of the Workshop – Hon'ble Minister Khum Bahadur Khadka, Minister for Home Affairs and Local Development
 Speech – Minister Takemichi Okabe, Embassy of Japan
 Inaugural address – Hon'able Minister Khum Bahadur Khadka
 Vote of thanks – Mr. Man B. Thapa, National Manager, PDMP

Session 1: Chair Binayak Bhadra

- Flood Disaster Mitigation in Bangladesh
 – Mohsina Yasmin and Rownag Jahan, Ministry of Chittagong Hill Tracts Affairs, Dhaka, Bangladesh
 Flood and Disaster Reduction in China
 – Wang Angsheng, Director of the Centre for Disaster Reduction, Chinese Academy of Sciences
 Flash Flood Disaster in Phetchabun Province, Thailand: What are the lessons learned?
 – Apichai Thirathon, ADPC, Bangkok, Thailand

Session 2: Chair Wang Angsheng

- Flood Risk Assessment for Yunnan Province, China
 – Zhu Jing, Geographical Institute of Yunnan Province, Kunming, China
 Flash Floods: Causes, Consequences and Management in the Indian Himalaya
 – Varun Joshi, G.B. Pant Institute of Himalayan Environment and Development, Garhwal Unit, Srinagar-Garhwal, India
 Flood Hazard and Risk Mapping in Selected VDCs of Two Districts
 – Moti Lal Ghimire, Narendra Khanal, TU, Kathmandu; Rajesh Thapa, Li Tianchi, ICIMOD

Session 3: Chair Meen B.P. Chhetri

- Flood Forecasting and Warning System in the Philippines
 – Susan S. Ramos-Espinueva, Philippine Atmospheric, Geophysical and Astronomical Services Administration, Diliman, Q.C. Philippines
 Regional Cooperation in Flood Forecasting and Information Sharing
 – Mandira Shrestha, ICIMOD
 Failures of Natural Dams in Pakistan
 – Basit Masud, National Engineering Services of Pakistan; Lahore, Pakistan
 Flood: Causes, Impacts and Countermeasures in Nepal
 – Koji Kamee, Chief Advisor, DMSP/JICA
 – Damodar Bhattarai, Department of Water-induced Disaster Prevention (DWIDP), Kathmandu, Nepal

DAY 2: Wednesday, 12 December 2001

Session 4: Chair Apichai Thirathon

- Activities of the Asia Disaster Reduction Centre
 – Satoru Nishikawa, Deputy Executive Director, ADRC, Kobe, Japan
 Glacier Lake Outburst Floods and Infrastructure Development in the Nepal Himalayas
 – Pradeep Mool, ICIMOD

Session 5: Chair Basit Masud

Mechanism of Rapid Landslide Motion

- Hiroshi Fukuoka, Disaster Prevention Research Institute, Kyoto University, Japan

Natural Dam Created by a Rapid Landslide and Flash Flood from the Dam Failure in Tibet, China

- Li Tianchi, ICIMOD, Kathmandu, Nepal

Session 6: Chair Suresh R. Chalise

Landslide Hazard Mapping for Community Disaster Management

- Rajesh Thapa, Li Tianchi, ICIMOD
- Moti Lal Ghimire, Narendra Khanal, TU, Kathmandu

Mobilising Communities for Sustainable Development: The Case of Community Led Disaster Management in Nepal

- Man B. Thapa, National Manager, PDMP, UNDP/Nepal

Chisapani Community Development and Disaster Management

- Bishnu Das Shrestha, Department of Soil Conservation and Watershed Management

Session 7: Chair Satoru Nishikawa

Indigenous Knowledge on Disaster Mitigation in Nepal

- Youba Raj Luintel, Kiran K. Amatya and Bhupendra Gauchan, PDMP, UNDP/Nepal.

Disaster and Development: A Gender Perspective

- Man B. Thapa, National Manager, PDMP, UNEP/Nepal

Disaster Management Strategies of the Government of Nepal

- Meen B. P. Chhetri, Director of Department of Narcotics Control and Disaster Management, Ministry of Home Affairs

Floods, Causes, Impacts & Counter Measures, Mitigations

- Damodar Bhattarai, Department of Water-induced Disaster Prevention (DWIDP)

DAY 3: Thursday, 13 December 2001

Session 8: Chair Mohsina Yasmin

Women Amidst Disasters

- Sumitra Manandhar Gurung, Consultant for Environmental Management and Watershed Management

The Complex of Risks and Vulnerabilities in Mountain Areas

- Narpat S. Jodha, ICIMOD

Community Risk and Vulnerability Analysis: Examples of Eight Pilot Target Communities of Nepal

- Narendra Khanal, Department of Geography, Tribhuvan University
- Li Tianchi, ICIMOD

DAY 4: Friday, 14 December 2001

Group discussions and presentations

Drafting recommendations

Presentation and finalisation of recommendations

Closing Ceremony

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