

Managing Flood Risks in the Hindu Kush Himalayas



The Hindu Kush Himalayan (HKH) region is one of the most disaster-prone areas in the world. Here, floods account for more than a third of the total natural disasters in the region and affect millions of people. The impact of climate change is expected to be more significant in the HKH region, which will only increase the frequency and magnitude of flood events in the coming years.

Statistics show that the number of people killed per flood event is significantly higher in Asia, and floods have a greater effect on poor and marginalized communities in the mountains of the HKH region. The recent deadly floods in Bangladesh, India, Nepal, and Pakistan are a testimony to the region's vulnerability to the unprecedented wrath of both riverine and flash floods.

Lessons learnt from past floods in the region

- Huge data gaps persist in the region
- There is a need to develop accurate and reliable end-to-end information systems
- Infrastructure planning should take flood risks into consideration
- Effectively addressing floods requires transboundary cooperation

While riverine floods are a regular occurrence in the plains of Bangladesh and India, the physical environment of the Hindu Kush Himalayas makes flash floods a more common phenomenon. Intense rains, cloudbursts, glacial lake outbursts, and landslide outbursts can trigger devastating flash floods in the middle mountains.

Widespread deglaciation in the region has led to the formation and rapid growth of many glacial lakes. These lakes can burst their boundaries as a result of internal instabilities or external triggers in a process known as a glacial lake outburst flood (GLOF), which can cause immense flooding downstream. Similar to this, landslides resulting from intense rainfall in combination with geological instabilities can cause the ephemeral damming of rivers. The outbreak of lakes created by such damming is another type of flash flood common in the region.

Each year, hundreds of lives and billions of dollars worth of property and high-cost infrastructure are lost and much-scarce agricultural land is destroyed in the region. Many of the floods in the region cross borders, and transboundary floods are known to lead to greater loss of lives and properties. To minimize the devastating effects of floods, new technologies and approaches, as well as greater transboundary cooperation, are required.

ICIMOD's Role in Disaster Risk Reduction

As a regional knowledge and learning centre serving the eight countries of the HKH region, ICIMOD is uniquely placed to address issues that are transboundary in nature. ICIMOD focuses on improving the understanding of the complex hydrological processes of the HKH region and promoting data and information sharing. It seeks to facilitate cooperation on policies, timely sharing of information, and the proper management of water resources.

ICIMOD has chosen to focus on hazards and disasters related to adverse weather and climate conditions, such as high intensity rainfall, GLOFs, riverine floods, and flash floods. In addition to working with governments to promote regional cooperation on floods, ICIMOD also assists mountain people in implementing improved disaster risk reduction at national and regional levels addressing upstream-downstream linkages for saving lives and livelihoods.

Approaches and solutions

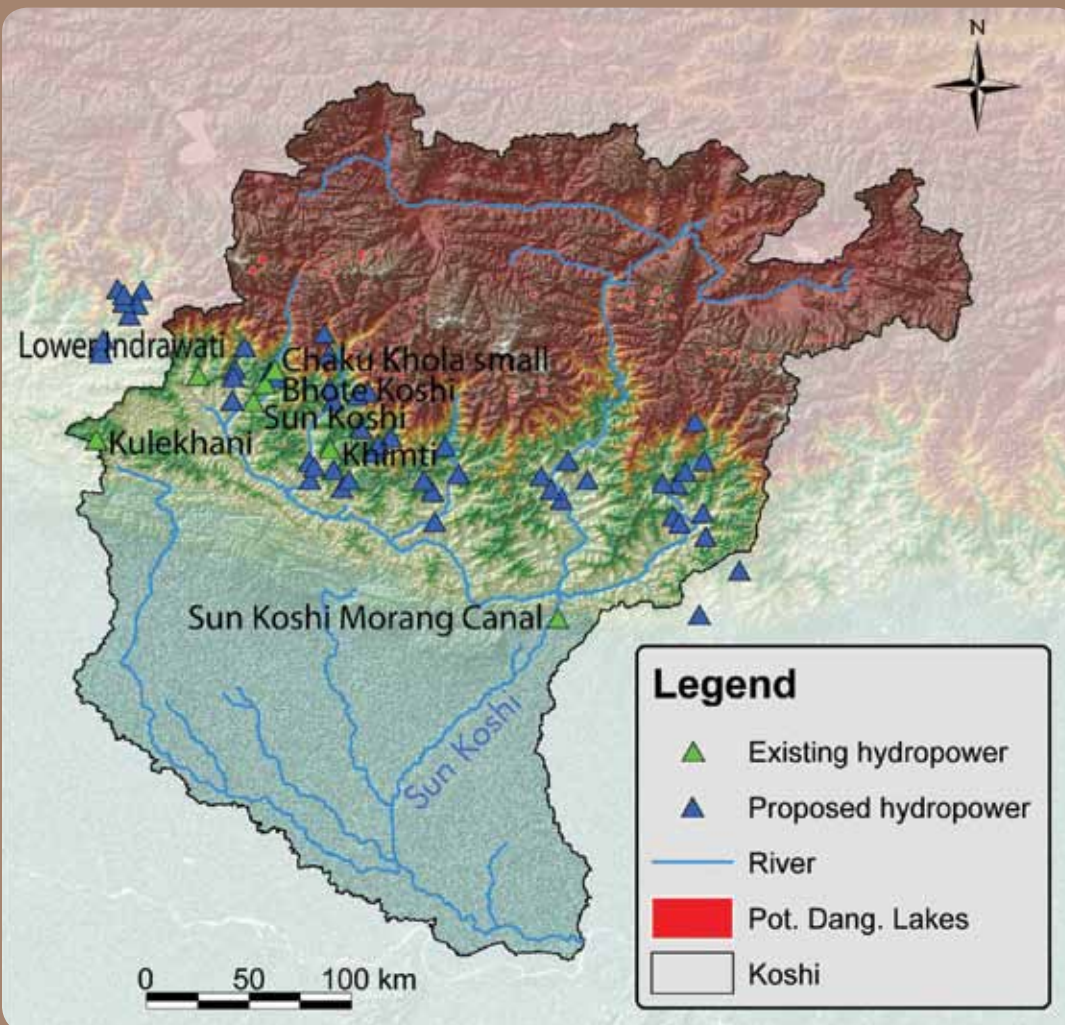
Climate change and the steady increase in the number and magnitude of floods in the region have amplified the need for a regional flood information system for sharing

real-time data and information across borders. In the absence of such a system, the loss of human lives and properties will only escalate. Therefore, the countries in the region must come together to work out collaborative approaches to these common challenges.

ICIMOD has always emphasized the need for end-to-end information system for flood risk reduction. This includes acquiring satellite data, flood forecasting models, and community based early warning systems. ICIMOD has already piloted these simple but effective flood early warning systems in Assam and Bangladesh.

Regional cooperation for data sharing

To promote the timely exchange of flood data and information through an accessible and user-friendly platform, ICIMOD is implementing the Regional Flood Information System in the Hindu Kush Himalayan region (HKH-HYCOS) project in partnership with the World Meteorological Organization and partner countries. The project seeks to enhance regional cooperation and strengthen the capacity of hydrometeorological agencies in flood forecasting by establishing a regional flood information system for sharing real-time hydrometeorological data and information.



A map of the Koshi River basin in China, India, and Nepal shows potentially dangerous lakes and planned hydropower infrastructure downstream

Within the scope of the project, some of the activities being implemented are:

- Strengthening the framework for cooperation for sharing regional flood data and information among participating member countries;
- Establishing a flood observation network in selected river basins in the participating countries;
- Establishing regional and national flood information systems to share real-time data and information and increase lead time, and;
- Enhancing the technical capacity of partners on flood forecasting and public awareness.

(For more info see: www.icimod.org/?q=9472)

Flood forecasting and satellite estimates

On the basis of the deep interest expressed by the partners to strengthen rainfall monitoring and its applications, a project on application of satellite rainfall estimates has been developed and implemented. The project is part of the long-term initiative on regional cooperation in flood forecasting and information exchange. Under this, trainings on satellite rainfall estimation and associated technologies were conducted for ICIMOD's partners. Currently an integrated hydrological model is being developed together with NASA to improve the understanding of snow and glacier melt into the flow of the rivers of HKH region. The project aims to minimize the loss of lives and properties through reduction in natural vulnerability to floods and droughts in the HKH region, in particular the Indus, Ganges, Brahmaputra, and Meghna Basins. Specifically, the project aims to validate the satellite rainfall estimation by various methods and explore its applications in flood forecasting.

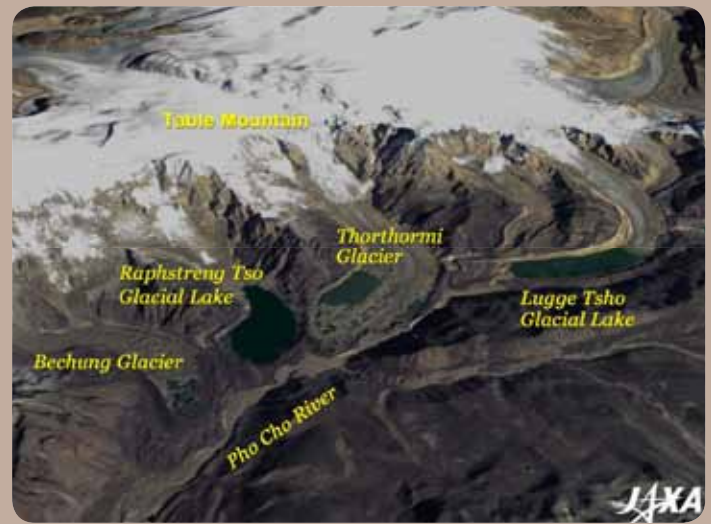
(For more info see: www.icimod.org/?q=254)

Timely data for rapid response

The state-of-the-art MODIS satellite receiving facility at ICIMOD provides timely data for research and various applications, including early flood and forest fire detection. MODIS images are moderate-resolution and have been used for national and regional level mapping, including rapid response mapping after flood events.

ICIMOD receives two images of the HKH region daily, one in the morning half and other in the afternoon. MODIS images are available for visualization almost real-time through ICIMOD's Mountain GeoPortal, and are good for monitoring geophysical parameters at national and regional scale.

A MODIS-based forest fire detection and monitoring system has been developed by ICIMOD in close collaboration with Department of Forests, Nepal. The



An image of potentially dangerous glacial lakes in Bhutan

application, launched in March 2012 with SMS and email fire alert features, sends timely notifications to relevant government officials and community forest users.

(For more info see: www.icimod.org/?q=9278)

GLOFs and infrastructure planning

The HKH region has seen about 56 GLOFs so far, and there are several potentially dangerous lakes located in the upstream of settlements and major infrastructures. Thus, one of ICIMOD's major tasks has focused around the regional mapping of glacial lakes and assessment of the increasing risk from GLOFs. This task builds upon ICIMOD's past experience in the technical and physical aspects of mapping of glaciers and glacial lakes in the HKH countries since 1999. Around 200 glacial lakes have been identified as priority lakes in the region, but the real risk of these lakes bursting their dams remains largely unknown and needs to be researched.

Of late, discussions have focused around the potential severity of GLOFs on the massive infrastructures downstream, including large hydropower projects already built or being planned for development in the near future. ICIMOD advocates that the severity and adverse impacts of potential GLOFs could be mitigated with a proper infrastructure planning.

What can be done to reduce the severity of and better manage disasters in the future?

- Work towards a better end-to-end information system
- Put in place institutional mechanisms that can use technological advances in forecasting
- Strengthen disaster management and preparedness mechanisms
- Set up more hydrometeorological stations on/along transboundary rivers
- Carefully plan infrastructure in the mountains
- Promote timely sharing of transboundary data and information



About ICIMOD

Founded in 1983, ICIMOD is a regional intergovernmental learning and knowledge sharing centre serving the eight regional member countries of the Hindu Kush Himalayan (HKH) region – Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal, and Pakistan – and the global mountain community. For 30 years, ICIMOD has acted as a knowledge development and learning centre to build awareness and take action to preserve the unique role that the Hindu Kush Himalayan mountain system plays. ICIMOD's history of working in the region and its core competencies put it in a unique position to contribute to helping the region take on new challenges. ICIMOD delivers impact through its six Regional Programmes of Adaptation to Change, Transboundary Landscapes, River Basins, Cryosphere and Atmosphere, Mountain Environment Regional Information System, and Himalayan University Consortium. These Regional Programmes are supported by the four Thematic Areas of Livelihoods, Ecosystem Services, Water and Air, and Geospatial Solutions and underpinned by Knowledge Management and Communication. ICIMOD is working to develop an economically and environmentally sound mountain ecosystem to improve the lives and livelihoods of mountain people – now, and for the future.

Governance and Funding

ICIMOD is governed by a Board with members representing each of the eight regional member countries as well as seven independent board members selected based on their technical merit. The Board is supported by a donor coordinating group (the ICIMOD Support Group), a Programme Advisory Committee of the seven independent board members, and a Finance Committee including representative board members.

Regional member countries and non-regional financial partners who support ICIMOD's objectives fund ICIMOD through both core and programme funding. Scaling up activities, which take the form of well-defined projects in the member countries, are largely financed through the regional member countries themselves.

Our Partners

Strengthening partnerships at all levels is crucial to realizing ICIMOD's vision and mission. ICIMOD's partners are the different agencies and organizations in its regional member countries that interact with development practitioners, policy makers, and advocates. ICIMOD also encourages long-term partnerships with international centres of excellence from outside the region as a means of acquiring the specific expertise it needs in technical areas.



For further information contact

Arun Bhakta Shrestha abshrestha@icimod.org

Photos: Alex Treadway; Mahmood Akhtar - Pakistan

ICIMOD gratefully acknowledges the support of its core donors: the Governments of Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal, Pakistan, Switzerland, and the United Kingdom.

© ICIMOD 2013

International Centre for Integrated Mountain Development
GPO Box 3226, Kathmandu, Nepal

Tel +977-1-5003222 **Email** info@icimod.org **Web** www.icimod.org

Prepared by ICIMOD Publications Unit, August 2013