



HYCOS User Phase: Flood Early Warning for “Last Mile” Connectivity

ICIMOD

FOR MOUNTAINS AND PEOPLE

Background

The Hindu Kush Himalaya (HKH) is one of the most complex, dynamic, and fragile mountain systems in the world, and is extremely sensitive to the effects of climate change. The frequency and magnitude of extreme weather events are likely to keep increasing, putting people in flood-prone areas at risk with shared vulnerabilities across national boundaries. For example, the 2010 floods in northern Pakistan affected an estimated 20.2 million people; the 2017 floods in Bangladesh, India, and Nepal killed over 1,000 people, and caused economic losses estimated at millions of dollars. Women, children, and physically-challenged people are typically more vulnerable to the effects of floods.

To prevent the loss of lives, livelihoods, and property due to floods, the International Centre for Integrated Mountain Development (ICIMOD) implemented the Hindu Kush Himalaya Hydrological Cycle Observing System (HKH-HYCOS¹) initiative from 2010 to 2016, in partnership with the national hydromet agencies of Bangladesh, Bhutan, Nepal, and Pakistan; with China and India as observers; and the World Meteorological Organization (WMO) as a technical partner.

¹ HKH-HYCOS is one component of the World Hydrological Cycle Observing System (WHYCOS) of the WMO.

The initiative had several major achievements:

- Countries shared real-time hydro meteorological data through a regional flood information system (RFIS).
- Upgraded 38 hydro-met stations – nine each in Bangladesh and Bhutan, 12 in Nepal, and eight in Pakistan – with modernized automatic telemetric systems to generate near real-time data.
- Developed a regional flood outlook for the Ganges Brahmaputra basin, which was used by the Department of Hydrology and Meteorology (DHM) in Nepal during the 2017 floods.
- Enhanced the capacity of partners to install, operate, and maintain hydro-met stations and their capacity in flood forecasting, attracting larger investments for the modernization of their hydromet networks.
- Developed and agreed on a project document for the user phase.

Rationale for the HYCOS User Phase (2017–2019)

Early warning systems (EWS) have protected lives and livelihoods, but to be effective, these systems must be technically sound and people-centric. Due to socioeconomic differences and inequalities in access

to information and lack of social measures and proper institutional mechanisms for communicating early warnings, these systems have trouble reaching the “last mile,” the most vulnerable and exposed populations, who often lack skills and face social barriers. Attention to gender and social measures is often weak in early warning systems. In the 2017 floods, over 160 people perished across Nepal even though warnings were issued on time. The National Planning Commission of Nepal, in its *Post Flood Recovery Needs Assessment Report*, identified communication as the weakest link in the 2017 floods.

It is imperative that EWS be designed with proper communication mechanisms to reach vulnerable populations with timely, understandable, and actionable flood early warnings, so that they are able to respond appropriately. The HYCOS user phase, which is part of the Hi-RISK initiative of ICIMOD, looking at minimizing the adverse impacts of water-induced disasters, contributes to the seventh target of the Sendai Framework for Disaster Risk Reduction 2015–2030.

HYCOS User Phase Objective and Activities (2017–2019)

The overall objective of the HYCOS User Phase is to contribute to reduced physical and social vulnerabilities in the HKH region for improved protection of lives, livelihoods, and property. The project seeks

- i) To assess communication and dissemination gaps in Flood Early Warning Systems (FEWS) in HKH countries.
- ii) To develop a communication strategy and knowledge products to address end-user needs.
- iii) To build the capacity of end users, particularly women, children, the physically challenged, and the poor to process, understand, and respond to flood early warnings.

The HYCOS User Phase has three major action areas:

1. **Assess approaches and pathways related to flood information management to improve end user connectivity.**
 - Identify gaps in all four pillars of FEWS in Nepal, with a focus on dissemination and communication through desk research, key informant interviews, surveys, and stakeholder consultations.
 - Conduct case studies of good practices on communicating flood early warnings in Bhutan, Bangladesh, and Pakistan as well as capturing indigenous knowledge use in FEWS.



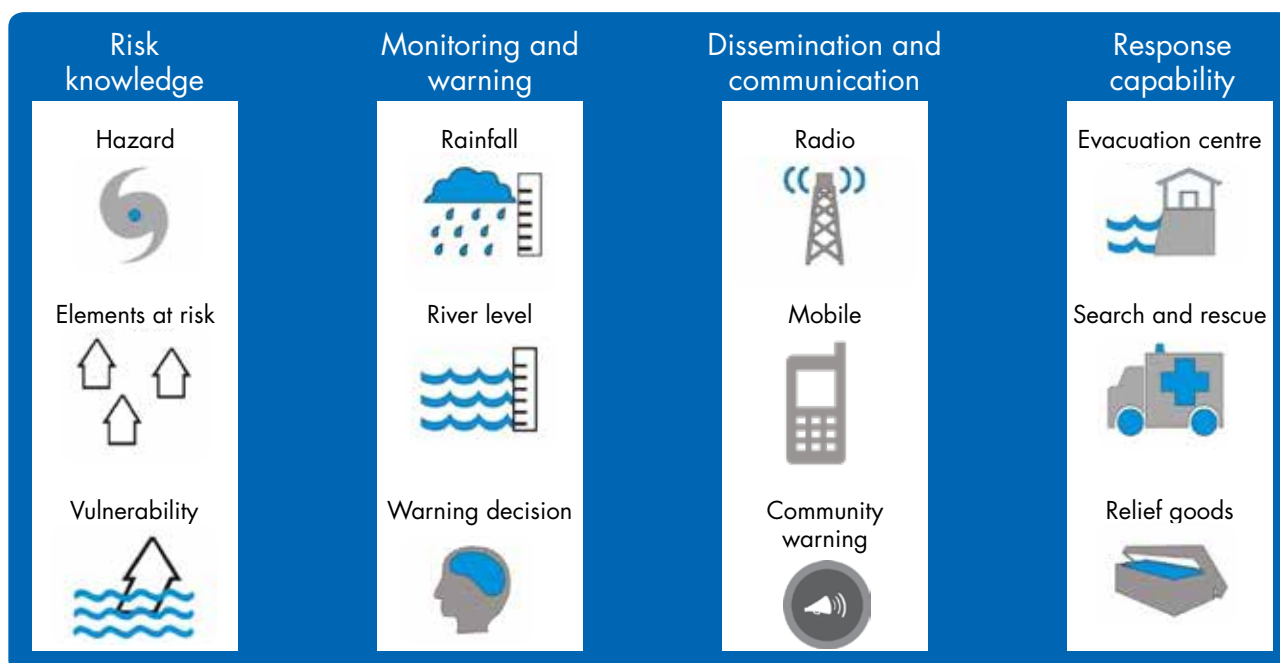
2. Develop communication strategies at all levels.
Ensure that flood early warnings reach those who need it most, taking into account gender equity and social inclusion (GESI).
 - Understand the institutional mechanisms for communicating and disseminating flood early warnings from the national to the local level.
 - Co-create knowledge products such as training manuals and short instructional videos that target end users.
 - Organize awareness raising and sensitization activities.
3. Strengthen institutions at regional, national, and local levels in terms of end-user connectivity.
Streamline dissemination and communication of flood early warnings across multiple channels to end users.
 - Improve the regional flood outlook and continue to promote regional cooperation in sharing data and information for timely warning.
 - Organize a regional knowledge-sharing workshop in collaboration with regional partners and WMO for outscaling and upscaling good practices on FEWS and lessons learned.



Organizations responsible for weather, climate services and early warning

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| Partner countries | Bangladesh: Bangladesh Meteorological Department (BMD); Bangladesh Water Development Board (BWDB) |
| | Bhutan: National Centre for Hydrology and Meteorology (NCHM) |
| | China: China Meteorological Administration (CMA); Bureau of Hydrology (BoH) |
| | Nepal: Department of Hydrology and Meteorology (DHM) |
| | India: Central Water Commission (CWC); Indian Meteorological Department (IMD) |
| | Pakistan: Pakistan Meteorological Department (PMD); Water and Power Development Authority (WAPDA) |
| Disaster management authorities (national, provincial, local) in all the partner countries | |

Four pillars of FEWS



Source: adapted from Neussner (2009)

Flood Early Warning Dissemination from Central to Community Level in Nepal

The flowchart illustrates the process of flood early warning dissemination from the central level to the community level in Nepal. The process begins with the **Technical** level, which includes the **Department of Hydrology and Meteorology (DHM)** and **Flood Forecast Analysis & Evaluation**. The DHM issues a **FLOOD ADVISORY**, which is then disseminated through various channels.

Dissemination Channels:

- Text for SMS Message:** The flood advisory is converted into text for SMS messages, which are then sent via **Nepal Telecom Ncell** to **COMMUNITIES (individuals, households)**.
- FLOOD BULLETIN:** The flood advisory is also converted into a flood bulletin, which is disseminated via **Email** and **Phone** to **TARGETED RECIPIENTS** (Ministries, Organizations, Individuals, Media) and the **DHM website (www.dhm.gov.np)**.
- Social Media:** The flood bulletin is also disseminated via **Social Media (Facebook, Twitter)** to **COMMUNITIES (individuals, households)**.

Community Level:

The **COMMUNITIES (individuals, households)** receive the flood advisory through the above channels. They then take **ACTION** based on the received information. The **COMMUNITIES (individuals, households)** also provide feedback to the **Technical** level via **Toll free 1155**.

Early Warning Task Force:

The **Early Warning Task Force** is responsible for disseminating the flood advisory to the **COMMUNITIES (individuals, households)** via **Siren, Phone, Email, SMS, Flags, Miking**. The task force is supported by the **INSTITUTIONAL** level, which includes the **NEOC** (National Emergency Operation Centre), **PEOC** (Province Emergency Operation Centre), **DEOC** (District Emergency Operation Centre), **LDMC** (Local Disaster Management Committee), and **CDMC** (Community Disaster Management Committee).

Legend:

- NEOC: National Emergency Operation Centre
- PEOC: Province Emergency Operation Centre
- DEOC: District Emergency Operation Centre
- LDMC: Local Disaster Management Committee
- CDMC: Community Disaster Management Committee



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