



# Community-based Flood Early Warning System: The Story from Then to Now

ICIMOD

FOR MOUNTAINS AND PEOPLE

## Background

The Hindu Kush Himalaya (HKH) is one of the most dynamic and complex mountain systems in the world. The region is prone to natural hazards, which are exacerbated by climate change. Floods and flash floods are the major climate-induced natural hazards that threaten the lives and livelihoods of downstream communities, particularly in monsoon season. Because governments tend to monitor floods on larger rivers and develop early warnings at the global, regional, or national level, floods in small rivers and tributaries strike with little or no warning and are often more disastrous. The Hyogo Protocol and the United Nations Framework Convention on Climate Change (UNFCCC) Special Report on Extreme Events and Disasters (SREX 2012), note that information does not reach the most vulnerable communities.

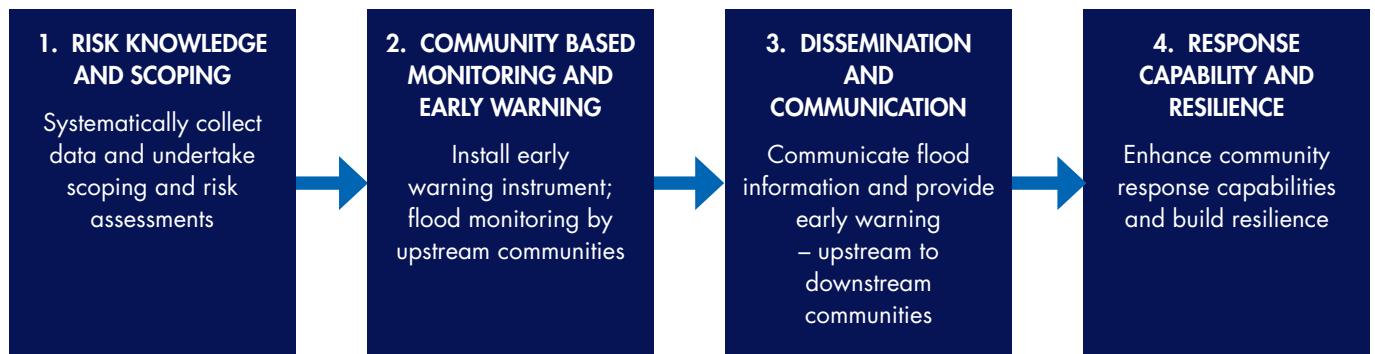
## What is CBFWS

A community based flood early warning system (CBFEWS) is an integrated system of tools and plans to detect and respond to flood emergencies that is managed by communities. The people-centric CBFWS developed by the International Centre for Integrated Mountain Development (ICIMOD) emphasizes the four essential elements of early warning systems (EWS). Although the detection of a flood risk and its communication to vulnerable communities is driven by technology, the success of CBFWS depends on a community's preparedness to respond to floods.



## Key elements of CBEWS implementation

The United Nations International Strategy for Disaster Reduction (UNISDR) Platform for the Promotion of Early Warning has identified four inter-related key elements for a complete and effective EWS. CBEWS is based on these four key elements; failure in one element can result in failure of the system.



Source: Based on UNISDR, 2006, <http://www.unisdr.org/2006/ppew/whats-ew/basics-ew.htm>

## Why CBEWS?

1. Low cost technology and tools
2. People centered
3. Upstream/downstream linkage
4. Close to real time information
5. Provide guidance on how to respond to warnings

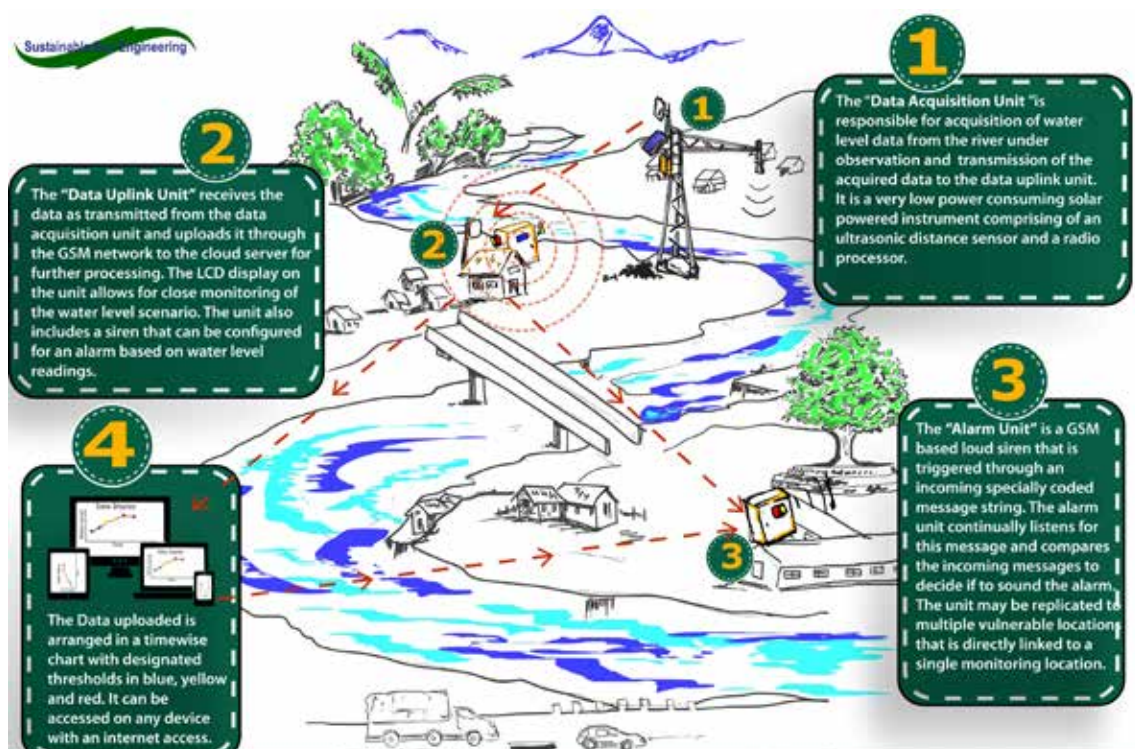
## How does CBEWS work?

CBEWS is based on a set of simple instruments installed upstream to detect floods. It generates flood signals that are communicated to downstream communities.

The system consists of two units: a transmitter unit at the riverbank and a receiver unit at a caretaker's house, at a safe distance from the river.

A sensor in the transmitter senses water level rise and transmits this data to the receiver. The receiver unit generates audible and visible signals. Telemetry based versions of CBEWS instruments also upload data to the cloud server. The trained caretaker interprets the alerts and relays the early warning information to downstream communities through pre-established channels to enable flood vulnerable individuals, communities, and organizations to prepare and take action to reduce harm or loss of lives and property.

Telemetry allows for water levels to be viewed in a time series chart directly through the internet.





## CBFEWS in the HKH established by ICIMOD

CBFEWS was implemented in 2010 in pilot projects along the Jiadhal and Singora rivers in Assam. The piloted system was based on a simple open wire based immersion instrument to detect water level and generate warnings for dissemination downstream; it was named the water level monitoring system (WLMS). Based on community feedback, two versions of wireless WLMS (WWLMS) were developed with local manufacturer Sustainable Eco Engineering (SEE). These versions allowed wireless transmission of water level data to a receiver unit up to 800 m away.

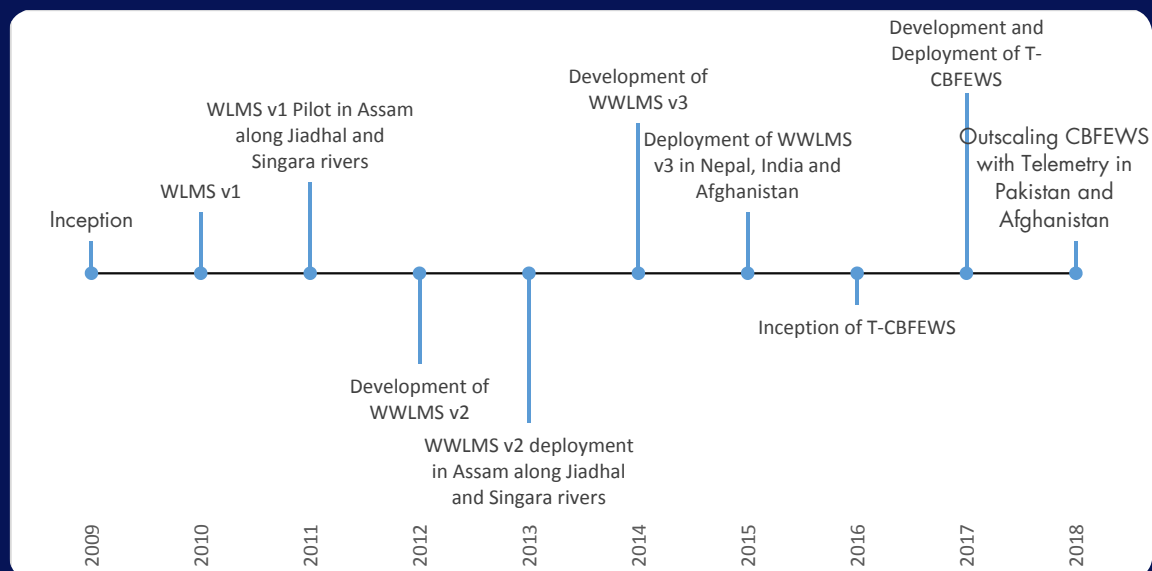
The WWLMS were used in CBFEWS implementations in Assam, India; Mahottari, Nepal; and Baghlan, Afghanistan. CBFEWS was also implemented in Dammas

and Sherquilla in Punnial Valley in Pakistan using radar and wireless technology to monitor the Gilgit River and provide early warning to communities along the river.

In 2016, SEE overhauled the ultrasonic sensing and telemetry instrument into the third version of its WWLMS. The telemetry based WLMS (TWLMS v4) has been deployed along the Ratu River in Bardibas, Nepal and in Bhitthamore, Bihar, India, enabling a transboundary early warning system between Nepal and India. The telemetry based CBFEWS has also been introduced to the Gagan River in Siraha, Nepal. Oxfam has partnered with ICIMOD to install a CBFEWS in Rangoon River, western Nepal.

Timely early warning across borders has saved lives in both countries.

## CBFEWS evolution and implementation





# Stories from the Region

## Saved Livelihoods

On 5 September 2013, the District Disaster Management Authority in Dhemaji, Assam, India, deployed a national disaster response force to affected downstream areas of the Jiadhal River upon receiving early warning. In Dihiri, Assam, communities were able to save assets worth USD 3,300 during the same flood event. ICIMOD had provided seed money for the locally manufactured instrument. The project's impact in the field was acknowledged by the UNFCCC when it presented ICIMOD, Aaranyak, and SEE with the Momentum for Change: 2014 Lighthouse Activity Award in the Information and Communications Technology (ICT) category.



## Empowered and Important

Bhaba Barman feels empowered today in her village in Abhoipur, Assam, India. She is the appointed caretaker of the CBFEWS instrument installed at the Jiadhal River in Abhoipur, responsible for disseminating early warning information to downstream communities and authorities. The village chiefs come to her to know of the flood situation. She is proud of being the voice of safety and preparedness in her village.

Like Barman, Rinku Singh in Sarpallo, a village in Mahottari, Nepal, feels responsible for her village. Following the out-migration of men for work, the responsibility of disaster preparedness has fallen upon women. Rinku Singh is one of the few literate among the adult population in Sarpallo. The early warning system has eased her anxieties as she knows that information about floods will reach her when it matters most.





## Early Warning Early Morning

A CBEWS was established in Sherquilla for the Gilgit River in June 2017. On 3 August 2017, at 4:30 am, the CBEWS generated a siren that woke up 2,800 people in the 350 households of Sherquilla. Within an hour, the community had moved about 2,000 heads of livestock and precious belongings to safety before the floods entered the village.

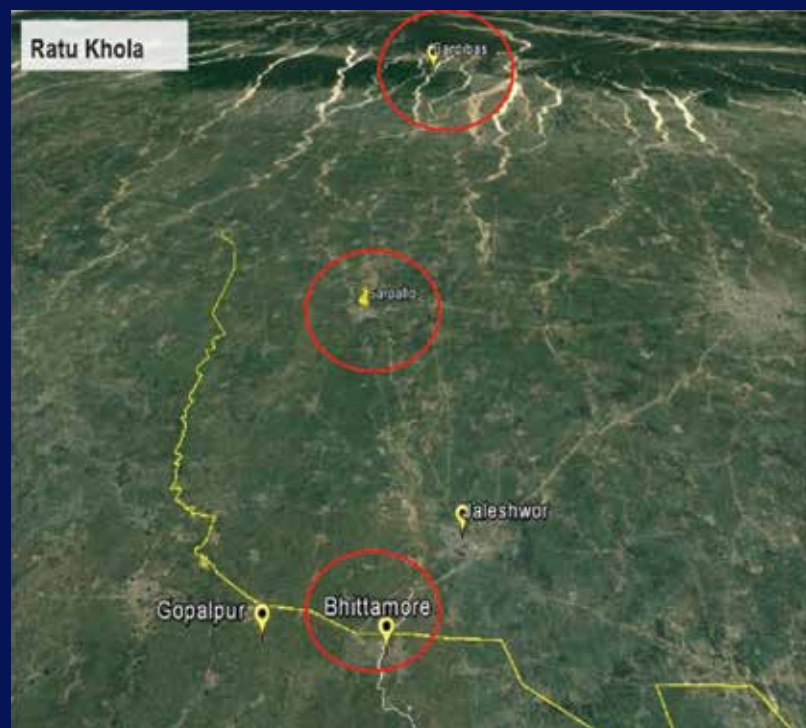
Following the event, Fida Ali, Businessman and Volunteer Area Captain of the Community Emergency Rescue Team said:

"The CBEWS is a miracle for our community. Before it was put in place, we would spend entire nights at the point of origin of flash floods for situation updates to alert others. Now, we can all sleep in peace."



## Reaching the Most Vulnerable Across the Border

The monsoon of 2017 saw many rivers flood across the South Asian region. The Ratu River flowing from Nepal into Bihar was heavily flooded on 12 August 2017. When the CBEWS at Bardibas, Nepal generated the alarm, the caretaker, Mahendra Bikram Karki followed pre-determined protocol and activated the communication channel, disseminating flood early warning information. The communities downstream across the border in Bhitthamore, Bihar, India received this warning four hours before the flood waters reached there. There was ample time to secure lives and livelihoods. People evacuated to the safety of a school building and livestock were moved to higher ground.



## Building Climate Resilience in the HKH through Partnerships

Synergy between communities and local partners, experts, local manufacturers, and government line agencies is crucial to implementing the four fundamental elements of CBFEWS.

- With the successful implementation of CBFEWS in Assam, India, with local partner Aaranyak for communities in the Jiadhal and Singora rivers, the Assam Disaster Management Authority fully funded another CBFEWS implementation at the Ronga River.
- The Department of Hydrology and Meteorology, Nepal, has piloted CBFEWS in the Ratu and Gagan rivers of the Koshi basin in Nepal, and acknowledged the system performed well during the 2017 floods.
- Oxfam implemented a CBFEWS at the Rangoon River in Dadeldhura, Nepal, in 2018 with technical support from ICIMOD and SEE.

- The Government of Bihar's Department of Disaster Management, in collaboration with Yuganter, SEE, and ICIMOD, has piloted CBFEWS at the Ratu River in Bhitthamore, Bihar, India. Following the system's successful performance in 2017, the community has taken ownership, even raising funds to replace parts when necessary.
- Following the flooding in Sherquilla in 2017, Pakistan's National Disaster Management Authority (NDMA) has acknowledged the efficiency of CBFEWS in Gilgit-Baltistan. The NDMA has stated that the system safeguarded Sherquilla's vulnerable community as it battled the elements, and has committed to install more CBFEWS in Gilgit-Baltistan.
- FOCUS/Aga Khan Agency for Habitat (AKAH) in Afghanistan has implemented CBFEWS in the Kunduz River in Baghlan with technical support from SEE and ICIMOD. With learnings from this project, FOCUS/AKAH has expanded its work on EWS in Afghanistan and signed an MoU with the Afghanistan National Disaster Management Authority and the Ministry of Energy and Water, Government of Afghanistan for the inclusion of EWS in its planning.

### ICIMOD-SEE: An Award Winning partnership

Resulting from a long-term partnership that started in 2010, SEE now has sufficient capacity to implement CBFEWS independently with like-minded partners. SEE has developed water-level monitoring instruments used by CBFEWS, and improved and upgraded the instrument. SEE also supports scoping, communication, and capacity building activities pertaining to CBFEWS.

Acknowledging the impact of CBFEWS, the UNFCCC presented Aaranyak, SEE and ICIMOD with the Momentum for Change: 2014 Lighthouse Activity Award in the Information and Communications Technology (ICT) category.'.

SEE worked closely with Oxfam to implement CBFEWS in Rangoon River in the Mahakali basin, Nepal. It has implemented TWLMS in the Karnali and Seti, among other rivers.

### Way Forward

ICIMOD has taken steps to make CBFEWS more inclusive by targeting excluded groups within vulnerable communities in the designed and implementation. ICIMOD has also started to systematically collect baseline data to assess the vulnerability of communities to flood hazards. The data will be used to measure the impacts of CBFEWS in reducing the vulnerabilities of communities at risk of floods.

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