Reaching the Most Vulnerable:
Community-based Flood Early Warning System

Sitamarhi District, Bihar, India

Government of Bihar
Department of Disaster Management

ICIMOD

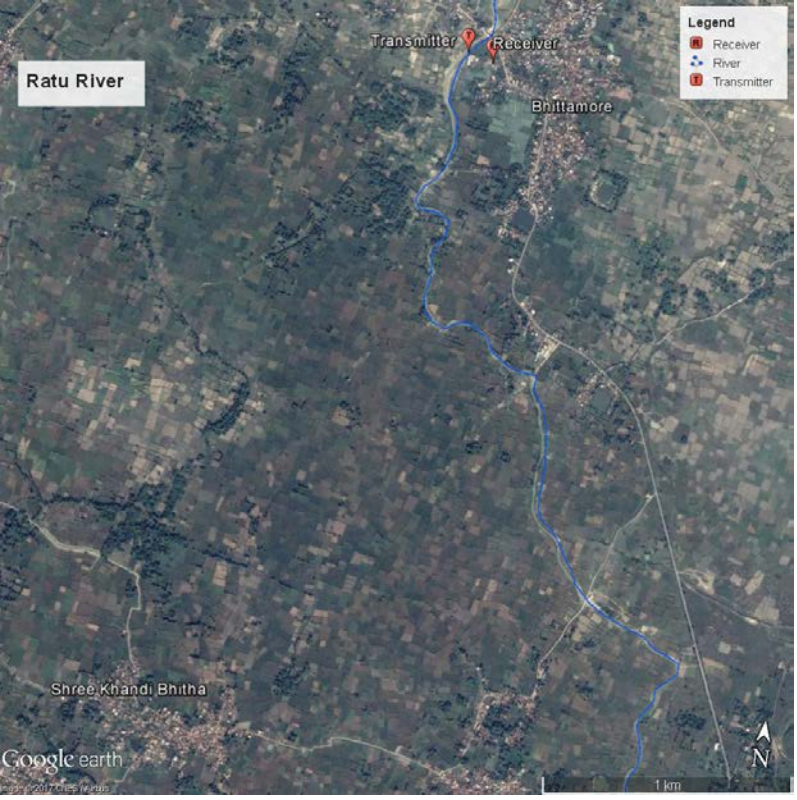
YUGANTER
make a difference

CBFEWS site, Bhittamore, Sitamarhi District , Bihar

The Hindu Kush Himalaya (HKH) contain some of the most dynamic and complex systems in the world. This fragile region is prone to natural hazards that are exacerbated by climate change. Climate change and other drivers of change have been gradually causing extreme weather events and natural hazards to increase in frequency and magnitude thereby increasing risks and uncertainties in the region. Floods and flash floods are major natural hazards in the HKH and are catastrophic to the downstream communities, particularly during the monsoon. Floods can be disastrous in small rivers and tributaries. Though early warning systems have been developed at the global, regional, and national levels to provide flood information, the Hyogo Protocol and the United Nations Forum Convention for Climate Change (UNFCCC) Special Report on Extreme Events and Disasters (SREX 2012) have identified that the gap lies on getting this information to communities that are most vulnerable.

The border between India and Nepal in Sitamarhi District of Bihar is generally characterized as a flat, flood prone, and partially waterlogged area. Light to heavy rainfall in the Churia Hills of Nepal can cause flash floods that affect this zone. Flash floods impact Ratu River in the Sursand Block of Sitamarhi every year. These rapid and intense flash floods cause huge losses of life and livelihood. Local people are aware of traditional early warning and preparedness methods that pertain to recurrent flood risks. However, they are unable to receive appropriate and timely information to minimize casualties and loss.

To address the challenges of flash floods, the International Centre for Integrated Mountain Development (ICIMOD), in partnership with Yuganter, is supporting the implementation of Bihar's Roadmap on Disaster Risk Reduction, led by the Disaster Management Department of the Government of Bihar through a pilot project on community-based flood early warning systems (CBFEWS).



Map of Ratu River in Bihar, India

Community-Based Flood Early Warning Systems

A community-based flood early warning system (CBFEWS) is an integrated system of tools and plans to detect and respond to flood emergencies prepared and managed by communities. The objectives are to manage flood or flash flood risk by providing early warning to downstream communities and to enhance cooperation between upstream and downstream communities in the sharing of flood information. CBFEWS is implemented in communities under flood risk to enhance the capacity of local people to withstand the adverse effects of floods or flash floods. A properly designed and implemented system can save lives and property by providing time for downstream communities to prepare and respond to the threat of floods.

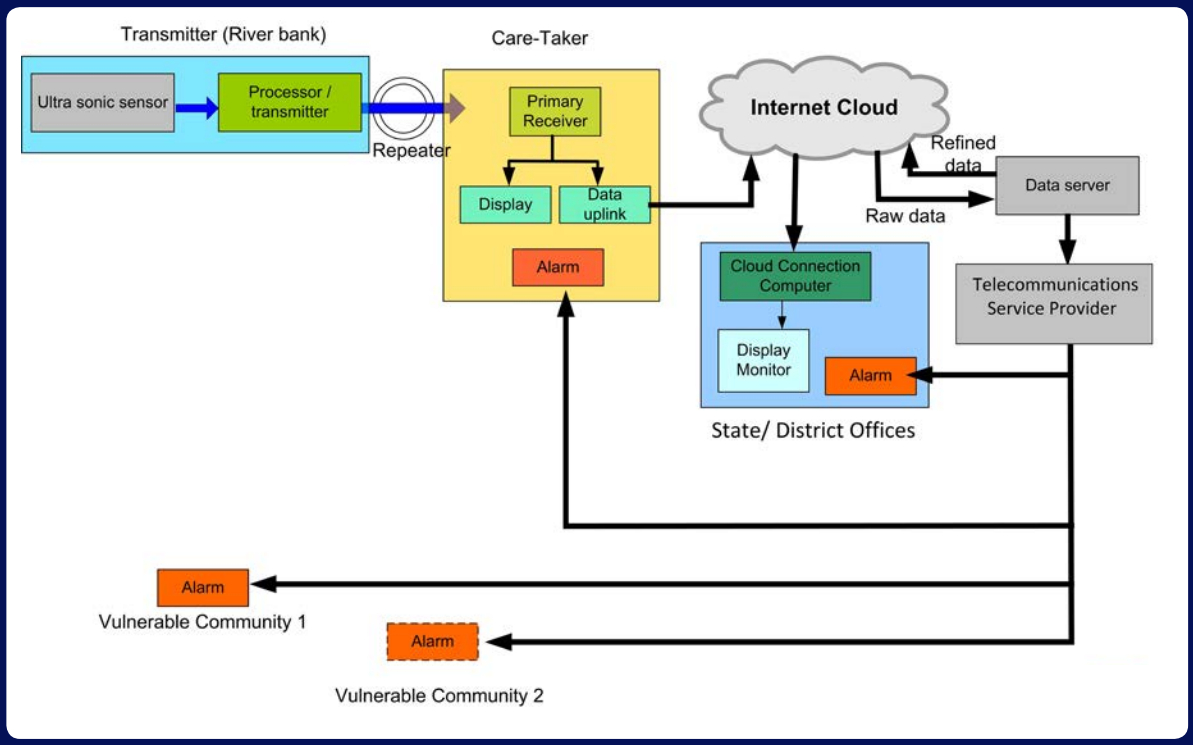
CBFEWS with Telemetry

Telemetry-based CBFEWS is an enhanced technology featuring a major development. It allows for river monitoring data to be accessible worldwide through the internet. The instrument is a low-cost deployment allowing for timewise monitoring of river water level and uploading of level data to the cloud. Further, thresholds are set for each river water level. If the instrument measures the water level to be higher than the set thresholds, then early warning messages can be generated and sent to people in vulnerable communities on their cell phones. The alarm unit can also be triggered to signal necessary action and evacuation in the community.

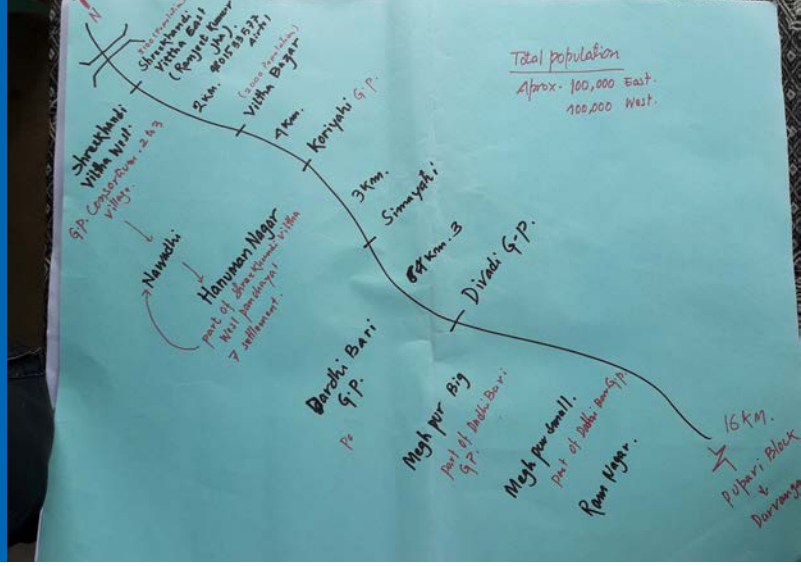
Features of CBFEWS

- Implemented in tributaries and flashy rivers
- Upstream-downstream linkages
- Provides almost real-time information
- People-centered
- Low-cost technology

Telemetry-based community-based flood early warning system



- **Lead Time:** The time between the warning and the actual arrival of the flood needs to be sufficient for preparedness.
- **Shelter Zone and Rescue Routes:** Safe places and rescue routes must be identified in consultation with the local communities prior to the flood event.
- **Condition of the Instrument:** The instrument needs to be tested, updated, and kept fully operational and in reliable condition.
- **Willingness of the Communities:** Community members need to be willing to act upon the early warning signals and made aware of the procedures.



Community risk mapping

Key Elements of CBFEWS

The United Nations International Strategy for Disaster Reduction (UNISDR) Platform for the Promotion of Early Warning has identified four key elements for a complete and effective early warning system. Based on UNISDR's four key elements, CBFEWS has also defined four key elements for its implementation. An isolated approach cannot make CBFEWS successful. It is important to understand that these four elements are interrelated and failure in one element can result in failure of the entire system.

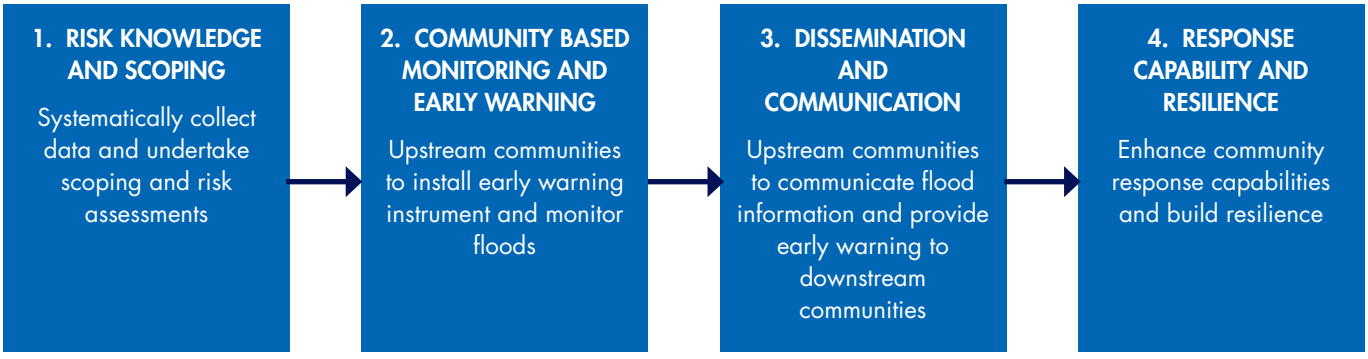
(1) Risk Knowledge and Scoping: Detailed risk assessment was conducted through systematic data collection and analysis of hazards, vulnerabilities, and the existing capacity of the community to understand situations of risk. Downstream and upstream settlement areas, existing infrastructure, and river characteristics were mapped by identifying potential danger posed to populations residing close to the stream, in settlements about 500 metres to 1 kilometre from the stream, and populations residing more than 1 kilometre away from stream.

(2) Establishing Early Warning and Monitoring Systems: The early warning system automatically generates flood signals which are communicated to downstream communities. This system consists of two units–a transmitter unit and a receiver unit. The transmitter unit has been installed on the bank of the Ratu River while the receiver unit has been placed in a caretaker's house.

(3) Dissemination and Communication: Elected Panchayati Raj (India) representatives, women self-help groups (including Jeevika), schoolteachers, and adult literacy volunteers gathered to share information about CBFEWS and flood early warning system sensitization. A task force of Jeevika didis (Jeevika group members) was formed and the group took up the responsibility of disseminating information on flood early warning. The caretaker was trained to formulate and send a clear and standardized warning message so that the intended recipients (the Jeevika didis) might fully understand the message and act accordingly.

(4) Response Capability and Resilience: Communities will be sensitized and made aware of the early warning system in place. They will also be given information on how to act once they receive warning signs. To increase the preparedness of vulnerable communities, mock drills will be carried out and recue routes, shelter zones and task forces identified. First aid and health facilities will also be established.

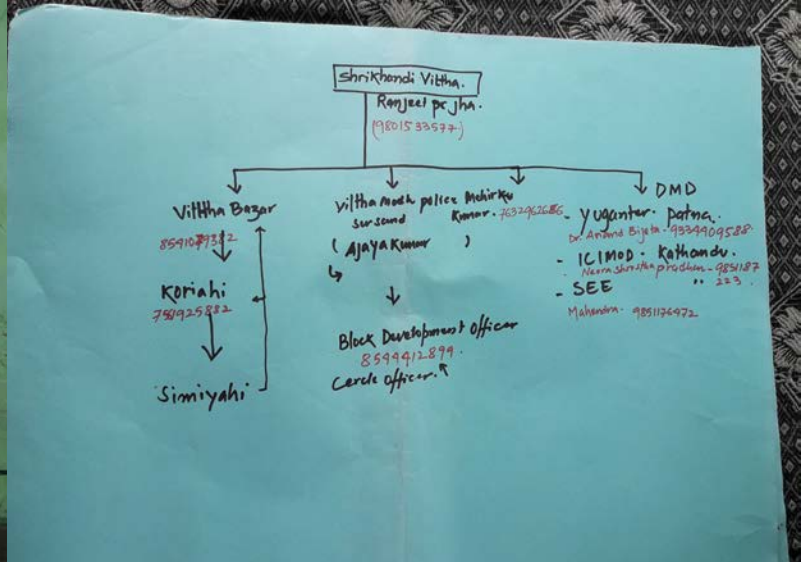
Four elements of CBFEWS



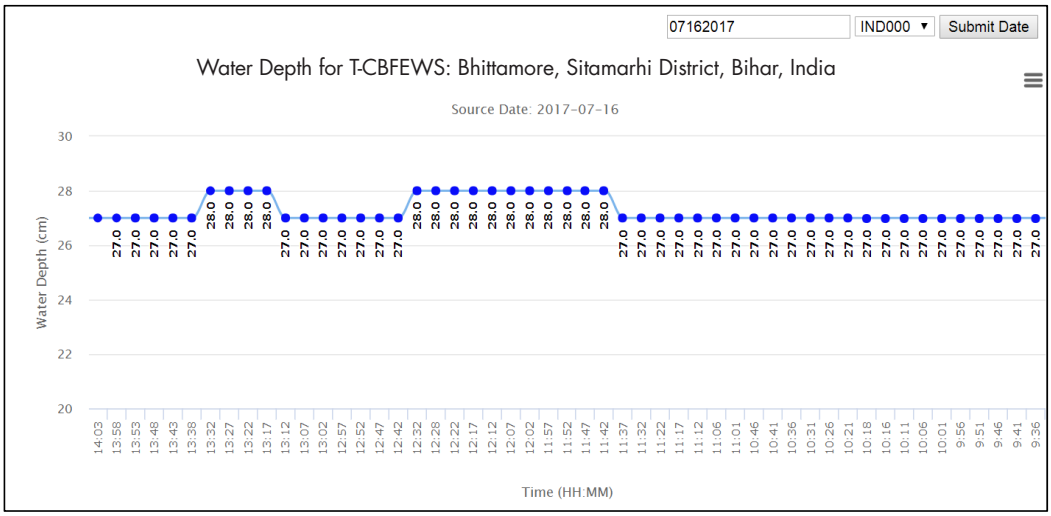
Source: Based on UNISDR, 2006, http://www.unisdr.org/2006/ppew/whats-ew/basics-ew.htm

Transmitter unit

Receiver unit



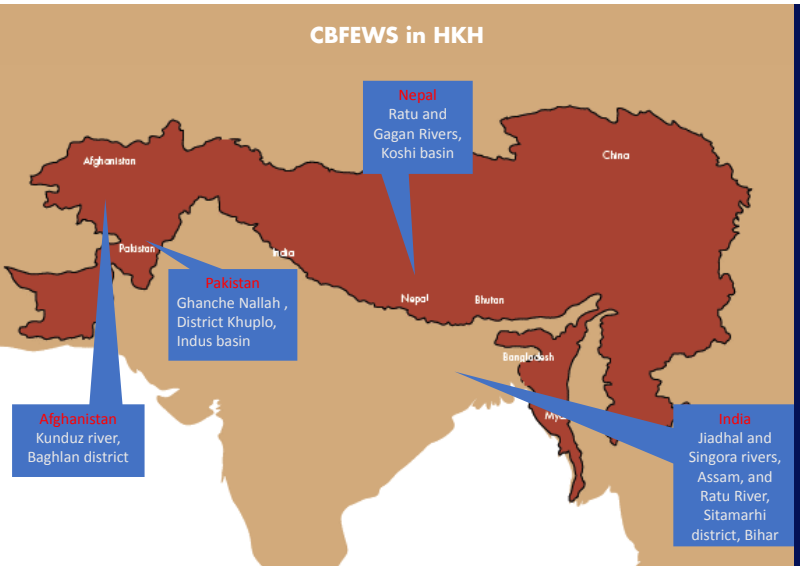
Communication channel



Real time water level data in Bhittamore, Sitamarhi District, Bihar, India

Implementation of Community Based Flood Early Warning System in Bihar

Project/campaign title	Strengthening Community Based Flood Early Warning System in Sitamarhi, Bihar
Project River	Ratu River (Adhwara group of Rivers)
Project District	Sitamarhi
Project Block	Sursand
Project Village (Panchayat)	Shri Khaddi Bhitta
Number of Villages Covered	Six villages in Sursand Block of Sitamarhi District: Shri Khanndi Bhitta (East), Shri Khanndi Bhitta (West), Koryahi, Dadhabari, and Matauna
Number of Population Covered	Households: 12,500; Population: 59,600
Date of Initiation of Project	1 April 2017



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