

# Community- Based Flood Risk Management



The Hindu Kush Himalayan (HKH) region is one of the most dynamic and complex mountain systems in the world. It is also extremely fragile and sensitive to the effects of climate change. It is believed that climate change and other drivers of change are gradually increasing the frequency and magnitude of extreme weather events and natural hazards in the region, which has led to higher levels of risk and uncertainty.

Floods and flash floods are hazards that can cause considerable losses of lives and property in lowland communities, particularly during the monsoon season. Although floods in small rivers and tributaries are often more disastrous, the support provided by the government and other concerned agencies to help communities deal with floods is not sufficient.

To fill this gap and enhance the resilience of vulnerable communities to flood hazards, ICIMOD, the Center for International Climate and Environmental Research-Oslo (CICERO), and Aaranyak, an environmental research and advocacy organization in northeast India, have initiated a project that uses a community-based flood early warning system and flexible flood management planning to help manage flood risk and uncertainty as a part of the Himalayan Climate Change Adaptation Programme (HICAP).

## Community-Based Flood Early Warning Systems

A community-based flood early warning system (FEWS) is an integrated system of tools and plans to detect and respond to flood emergencies that are prepared and managed by the communities. The objectives of community-based FEWS are to manage flood or flash flood risk by providing early warnings to downstream communities and to enhance cooperation between upstream and downstream communities in the sharing of flood information. Community-based FEWS are 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 flood. While implementing the community-based FEWS, four key elements must be considered:

- risk knowledge;
- monitoring and warning service;
- dissemination and communication; and
- response capability.

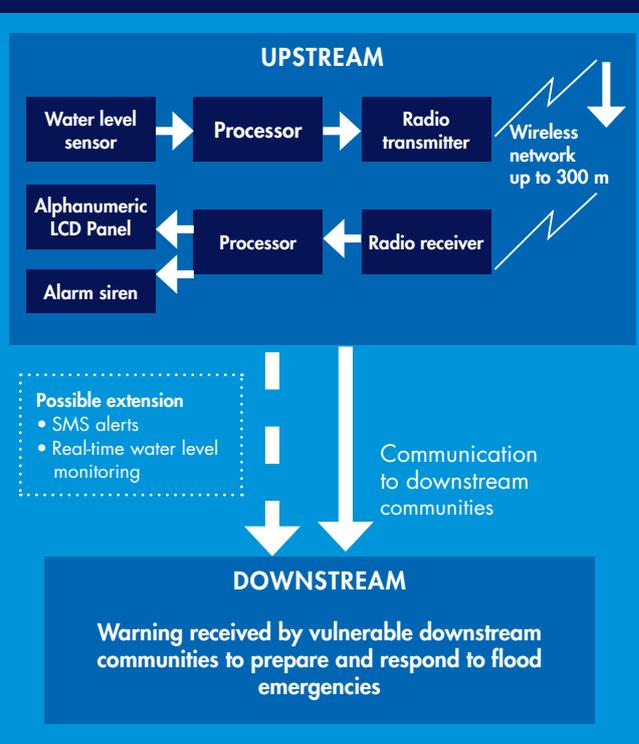
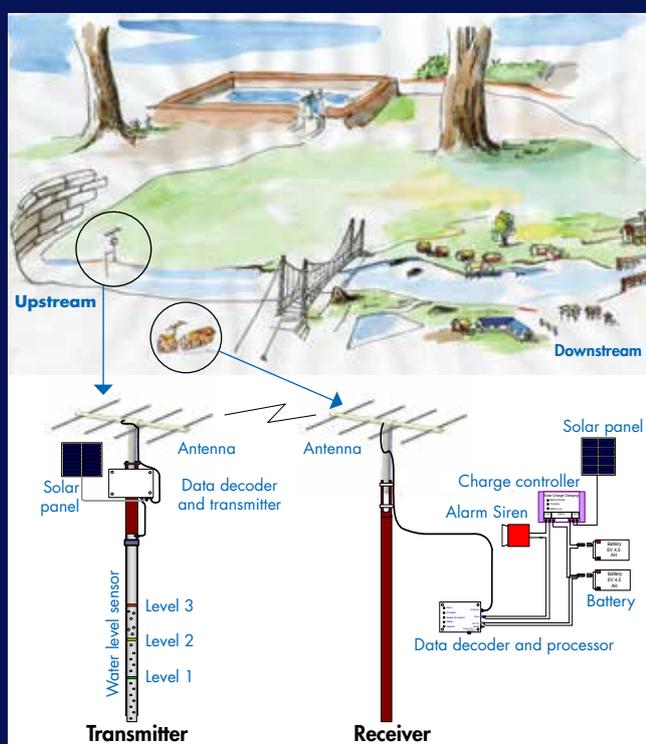
The formation of a local institutional arrangement, like a community flood risk management committee, helps to increase the effectiveness of community-based FEWS.

## Wireless Flood Early Warning System

A wireless flood early warning system is a low-tech, cost-effective, and user-friendly system. It consists of two units – a transmitter and a receiver. The transmitter is installed along the riverbank, and the receiver is installed at a house near the river. A flood sensor attached to the transmitter detects rising water levels. When the water reaches a critical level, a signal is wirelessly transmitted to the receiver. The flood warning is then disseminated via mobile phone to concerned agencies and vulnerable communities downstream. Critical flood levels are set with the help of the local community. Both of the units can be powered by rechargeable lead acid batteries with solar photovoltaic panels. To ensure reliable results,

the system equipment (e.g., sensor, batteries, receiver, wireless transmitter) must be regularly maintained. The cost of the equipment needed for this wireless flood early warning system is approximately USD 800.

The effectiveness of wireless flood early warning systems is dependent on the selection of proper installation sites for both of the units. It is also necessary to provide training to local community members on the installation and operation of the system, as well as troubleshooting. Moreover, it is crucial to institutionalize the roles and responsibilities of different stakeholders and develop an efficient communication and dissemination mechanism.



## Flexible Flood Management Planning

Flexible flood management planning\* (FFMP) is a comprehensive, participatory process used to prepare a flood management plan for vulnerable communities. The major objectives of FFMP are to enhance the adaptive capacities and resilience of flood vulnerable communities and explore uncertainties as a co-learning experience between communities, researchers, policy makers, and institutions on the ground in the context of social and environmental change including climate change.

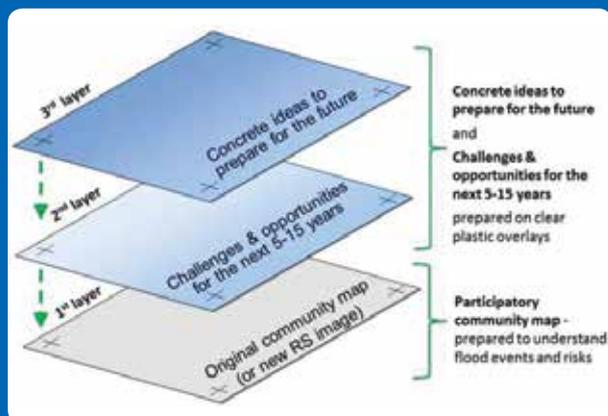
The four main steps in FFMP are:

1. Participatory flood mapping is an activity in which participants prepare a flood hazard map with the help of a trained facilitator.
2. Community-driven monitoring is an activity in which local community members regularly monitor and record flood events and weather conditions, particularly temperature and rainfall, over several months or years. This information can be later used to prepare future climate scenarios. Participants receive training on how to monitor and record flood and weather conditions in advance.

3. Participatory envisioning is an exercise in which local communities anticipate plausible future scenarios for the community, based on their own experiences, foresight, and externally introduced climate information. By identifying three major drivers of change, social or environmental, participants develop three story lines of the future. After this, participants are given future climate projections, which they use to envision how climate change will affect major drivers of change and prepare two future scenarios. Well-trained facilitators, including individuals to take notes, are required to perform this exercise.
4. Flexible flood management planning is an activity that enables local community members to learn how to plan as a key step in building their adaptive capacity. Through this activity, participants gain an understanding of initial steps in the development of comprehensive community plans based on the principles of sustainability, resilience, and justice. A flood management plan is prepared on the basis of data and information obtained from the previous three steps and can be used by authorities while preparing local-level disaster flood action plans and disaster preparedness and response plans.



Envisioning exercise



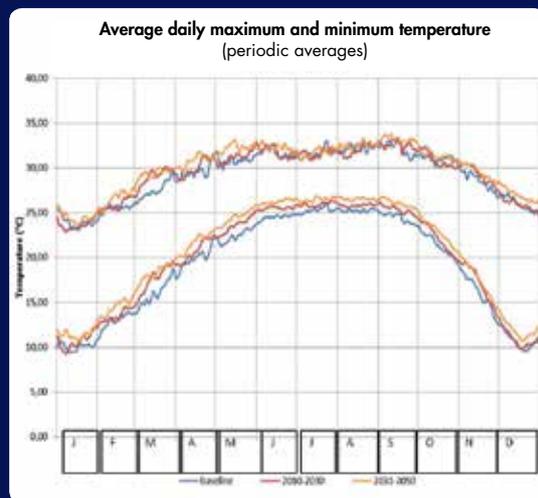
Process of preparing a FFMP

\*This methodology was created under Anticipatory Learning for Climate Change Adaptation and Resilience (ALCCAR) of Pennsylvania State University. The approach was adapted for HICAP and training with HICAP partners in Assam was carried out by Petra Tschakert, CICERO.

## Climate Trends and Scenarios in the Brahmaputra

To envision future scenarios and inform flexible flood management planning, it is essential to consider both historical trends and future climate projections. It is based on this information that storylines are prepared for flexible flood management planning.

Historical climate analysis of the Brahmaputra River basin shows that extreme rainfall frequencies are increasing. Both maximum and minimum temperature is increasing with minimum increasing at higher pace.



In the future, extreme rainfall events are expected with warming of night time temperature. Similarly, climate projections in Lakhimpur indicate that the pre-monsoon will be delayed from 2010 to 2050, while more rain will fall during the high monsoon period. Although the projection predicts that the end date of the monsoon will not change, more rain will be concentrated within fewer days.

## Piloting Community-Based Flood Early Warning System and Flexible Flood Management Planning

Both of these initiatives have been piloted in the Jiadhhal and Singora sub-basins of the eastern Brahmaputra in Assam, India, with involvement from the District Disaster Management Authorities of Lakhimpur District and Dhemaji District.

In 2013, five community-based flood early warning systems were installed in the Singora and Jiadhhal rivers. The system installed in the Singora River sends flood warning signals to 20 flood vulnerable villages downstream; more than 25 villages receive warnings from the system installed in the Jiadhhal River.



## CB-FEWS Supports Improved Flood Response

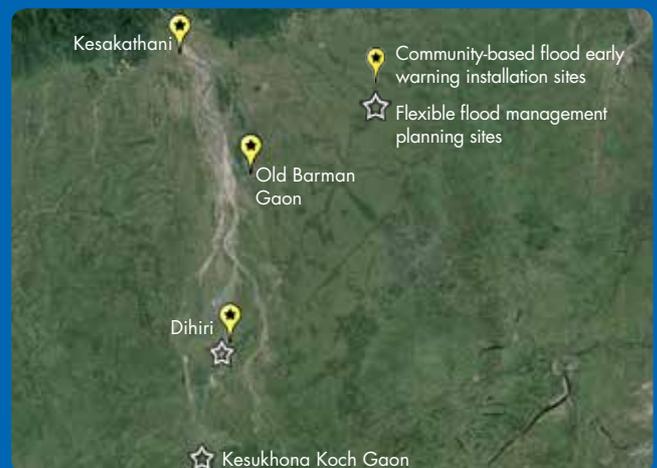
During the flood season of 2013, the flood early warning system installed in the Jiadhhal River successfully informed community members in Dihiri of pending floods, helping them save assets, including cattle and pigs, worth approximately USD 3,300.

A District Disaster Management Authority official from Dhemaji shared that the flood warning information provided by the system helped the district administration many times. He writes, "The information from the community-based early warning system was extremely helpful because it is based on more realistic rises in river water and is more area specific. We deployed our flood rescue team many times based on the system's information. After receiving a warning on 5 September 2013, we deployed a national disaster response force to the affected downstream areas of the Jiadhhal River, which helped the district administration prevent a disaster situation."

Flexible flood management planning (FFMP) was piloted in four villages in the Singora and Jiadhhal river basins (see maps to the right). The first step in executing FFMP included training for field facilitators on participatory flood mapping and flood monitoring. The facilitators worked with communities to prepare a flood map and mobilized them to monitor and record rainfall and temperature data and flood events during the flood season. Following this, envisioning training and field exercises were conducted with local communities and a flexible flood management planning exercise was carried out.



Singora River



Jiadhhal River

Map data: Google, DigitalGlobe 2013



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**Photos:** Sundar Rai, Partha J Das

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