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Acting in anticipation against unseasonal floods in Nepal

A Case Study on anticipatory actions taken against October 2021 floods in Karnali river



QUICK FACTS:

Disaster: Flood in Karnali river resulting due to unseasonal rainfall

Target area: Janaki Rural Municipality (Ward:3,6,9) and Tikapur Municipality (Ward: 5,6,7,8,9), Sudur Pashchim Province

Lead time: 4 hours

Karnali River Trigger under the FbA-SRSP project:

- Readiness trigger: GloFAS Forecasts greater than 50% chance for Karnali river to exceed 5 years return period at Chisapani Station (Red Color) with a lead time of 7 days. Readiness stage (7-4 days)
- Activation trigger: DHM forecast bulletin – red highlights of Bardiya and Kailali (and/or Karnali river basin. DHM – DEC HMS Model or Regional Flood Outlook (MIKE Model) Forecast – Karnali Chisapani river level greater than (Danger level 10.8 + 1m). A lead time of 3 days.

**Note: The trigger has been revised after the October 2021 floods*

Early Actions taken:

- Early warning messages disseminated through radios, NRCS volunteers and *Badhghads* - community leaders, *Chiragis* – village informers.
- Support in early evacuation of at-risk households lying along the Karnali river basin to pre-identified safe sites.
- Pre-positioning of Ready to Eat food items and drinking water

Actors and stakeholders:

- Nepal Red Cross Society HQ, District Chapter, Sub Chapter
- District Emergency Operation Centre (DEOC)
- Municipal Office, Ward Office
- Department of Hydrology and Meteorology (DHM)
- Technical partners: Danish Red Cross, Red Cross Red Crescent Climate Centre, Handicap International (Humanity and Inclusion)



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1. Anticipatory action in Nepal



Nepal Red Cross Society (NRCS) with financial support from the EU Civil Protection and Humanitarian Aid Operations, and technical support from Danish Red Cross, Red Cross Red Crescent Climate Center (RCCC) and Handicap International (HI) started working on Forecast based Action (FbA) and Shock Responsive Social Protection (SRSP) for flood and cold waves in 2020. The FbA mechanism comprises of impact thresholds, vulnerability indicators and Early Action Matrix (EAM) which was jointly developed with the NDRRMA, DHM, and the local government authorities in July 2021. The mechanism was developed for five high-risk municipalities along the Karnali and Babai river basins, in Kailali and Bardiya districts.

In the event of a flood forecast, the EAM guides NRCS and the local authorities to take pre-agreed early actions and defines roles and responsibilities of various line agencies at different levels of governance. These early actions cover areas of:

1. Early warning messaging (EWM)
2. Temporary shelter
3. House strengthening
4. Water, Sanitation and Hygiene (WASH)
5. Livestock and livelihood
6. Ready to eat (RtE) food
7. Critical services
8. Shock responsive social protection

2. Anticipatory actions against Karnali 2021 flood



Flood is a recurring phenomenon in Nepal. Usually occurring in monsoon, floods result in significant loss of lives, assets, livelihoods, and infrastructures. Nepal is considered the second highest country at risk of floods in South Asia (UNDP, 2009). Steep and rugged mountain topography, fragile geology, active tectonics, extreme weather together with unplanned urbanization and infrastructure development has made the country prone to recurring floods. It generally affects people living in lowlands or along the river basins, living under poverty, in fragile housing structures, with one or more vulnerable family members, often lacking coping mechanisms.

The 2021 monsoon in Nepal was heavier and lasted for longer than usual. Monsoon withdrew from Nepal on 11th October, delayed by 9 days. Barely weeks later, Nepal was hit by extreme, unseasonal rainfall, commencing from western part of the country eventually moving to the east, creating a havoc along the way. For an agrarian country, the devastation was amplified by its timing as it occurred during harvesting season. Ready to harvest crops were damaged in large quantities.

Two of the target municipalities in Kailali district, Tikapur and Janaki were impacted by the flood. The following account details the sequence of events and early actions taken during the flood in the two municipalities based on a tentative timeline.

17 October, Sunday:

- Start of heavy, unseasonal rainfall in western part of Nepal. DHM publishes special weather bulletin through their social media page at 3PM, forecasting increase in rainfall activities in western part of the country from 18th – 19th Oct, 2022. At 6 PM, a special alert from DHM forecasting increased likelihood of rise in river levels including Karnali with possibility of flash flood in few small rivers originating from Chure and middle mountains, disseminated through social media page.
- RCCC circulates this information to NRCS requesting to closely monitor the ground situation. Meanwhile, there is no indication of flood forecast from Global Flood Awareness System (GloFAS) in major rivers of Nepal including Karnali. European Centre for Medium-Range Weather Forecasts (ECMWF) also shows less likelihood of widespread, heavy rainfall in western part of the country.
- The weather bulletin and special alert is relayed to the DRR focal persons in Tikapur and Janaki.
- Early warning messages (EWMs) regarding forecast of heavy rainfall for the next three days disseminated through radios, Red Cross volunteers, *Badhgadhs* (community leaders), *Chiragi* (village informer).

18 October, Monday:

- Second day of heavy and continuous rainfall.
- No special weather bulletin or no flood alert published from DHM. Similarly, no indication from GloFAS.
- EWMs continued through multiple communication channels regarding continued heavy rainfall for next few days and requesting communities living along the river basin and lowlands to stay alert.
- NRCS Sub-chapter informs the pre-identified vendors with stand-by agreements about the weather forecast and requests them to have necessary stock of Ready to Eat (RtE) food in stand-by.
- At 9 PM, DEOC receives a call from Chure rainfall station (upstream area) informing a possibility of water level crossing danger level within the next 24 hours.
- At 10 PM, RCCC picks up indication of the river surpassing danger level (11.8 mt.) within the next 24 hours from ICIMOD's HYCOS Flood Model.

19 October:

- 5 AM: the Gauge reader from Chisapani gauge station informs DEOC that the water level is close to crossing the warning level. DEOC informs NRCS District Chapter and project team, District Disaster Management Committee (DDMC) members, District level security forces (Nepal Army and APF), DRR focal person at the municipalities and other relevant agencies.
- 7 AM: Karnali crosses warning level (10.2 mt) at Chisapani gauge station. Information relayed to all stakeholders.
- 7 AM: DDMC meeting is held where it is decided to deploy the Search and Rescue team (SAR team and APF) with necessary equipment. By 9 AM, the team is deployed.
- 8 AM: SMS alert from DHM informing that warning level has been crossed in Karnali and requesting everyone to alert at-risk communities
- 8 AM: RCCC tries to monitor the ground situation remotely through DHM's flood forecasting website, but live updates not available on the site. NRCS contacts the Gauge reader at the Chisapani Gauge Station for information on current situation. Continuous communication established with the gauge reader here onwards. Simultaneously, DEOC also maintains continuous communication with the gauge reader and relays the information to the DDMC, DRR focal person at the municipalities.
- 8 AM: RCCC contacts DHM Kolhapur to cross verify the forecast by HYCOS. DHM confirms that their flood model has also forecasted that the river level will surpass the danger level in Karnali and reach up to 12mt by evening. NRCS are alerted about the situation. 5
- 9 AM: NRCS triggers activation. NRCS and Municipality authorities begin preparations for early action and response.
- 11 AM: NRCS DC has a help desk set up to support in coordination and communication with the sub-chapters and other humanitarian agencies.
- 11.20 AM: Water level crosses activation trigger threshold (11.8 mt)
- 11 AM – 12 PM: EWM disseminated regarding crossing of the danger level and requesting people to pack their belongings and move to safe sites. These safe sites have been pre-identified for each community.
- 1 PM: Karnali river embankment breached at various locations. At Mulpani in Ward 2 and Saahipur in Ward 5, in Tikapur. Rani Jamara Kulariya irrigation canal is destroyed at Kunti Murtiya and Patabhaar in Janaki -9. Ward 8 sends tractors to evacuate people, while most families move to safe sites on their own.
- 2:30 PM: NRCS Sub-chapter contacts vendors and orders drinking water and RtE food items.

- 3:00 PM: Water level crosses 12.60 mt.
- 3:15 PM: Order for evacuation issued by the Tikapur Municipal Office
- NRCS volunteers together with security personnel and ward offices support in evacuation of at-risk communities.
- 8 PM: Water level crosses 13.10 mt

20 October

- 6 AM: NRCS SC and project team contacts safe shelters and affected areas to assess need for drinking water and RtE food.
- 8 AM: NRCS coordinates with Municipal and ward officials to distribute drinking water and RtE food.
- 4 PM: Initial Rapid Assessment (IRA) report submitted to NRCS HQ.
- 5 PM: Municipal Office appeals for relief to various organizations.

**Note: The timings are tentative to present sequence of the events.*

3. Lessons learned

- a) The piloting of pre-identified early actions during the October 2021 floods also created a favorable environment for taking early response such as distribution of ready-to-eat food (RTF) including safe drinking water and multi-purpose cash top-up by leveraging the national social security allowance program. These actions have established a proof of concept based on which advocacy initiatives are planned with a focus on ensuring that the local, provincial and federal government recognize the benefit of anticipatory action in a climate crisis situation, and the use of national social protection program for a time and cost-effective early actions and response. This initiative will eventually support in integrating such ideas into relevant policies, guidelines, and overall preparedness and response mechanisms.

Forecast accuracy:

- b) During the October flood, global forecast systems such as GloFAS underestimated flood forecasts in Karnali. Even local flood models picked up flood signals only within 24 hours such as DHM's flood forecast model and ICIMOD's HYCOS model. Local flood models consider various factors such as rainfall level in upstream area, river water level etc. which possibly resulted in a more accurate forecast. Since many actors working in AA in Nepal rely on global models, we should overlay forecasts from different sources with priority given to the local models. Rainfall scale and intensity was also underestimated by ECMWF.
- c) Few flood models forecasted the flood but only when we were very close to the event, with lead time of less than 24 hours. Based on this experience, we should consider working with a lead time of less than 24 hours in future scenarios. This means skipping the readiness stage and commencing directly from the activation stage. There cannot be linear progress that we assumed in FbA mechanism, it might not be feasible in real time in case of Nepal.
- d) Considering the amount of rainfall, the spatial coverage was much higher, and the response time was much faster than usual for large rivers such as Karnali. This could be because the river basins were already saturated during monsoon and therefore the rainfall quickly translated into river runoff. Therefore, we might need to consider shorter response time for major rivers during post-monsoon rainfall.

Forecast information gap:

- e) DHM released a special weather bulletin on 17th Oct indicating chances of heavy rainfall in few isolated places in western part of Nepal. And special flood alert in smaller rivers possibility of flash flood. But there was no indication of flooding in major rivers such as Karnali. Finally, on 19th Oct, at 8 AM, DHM disseminated mass sms informing about water level cross warning level and requesting to inform at-risk communities. As the authorized government body to issue special bulletins and flood forecasts, DHM needs to ensure continuous and wide dissemination of forecast information. Continuous dissemination of the forecasts could have resulted in a longer lead time. DHM's flood model and special bulletin issued 2 days before also underestimated the intensity and spread of the rainfall and flooding scenario in major rivers.
- f) While the Chisapani Gauge station was fully functional, data from the station was not updated on flood forecasting website on 19th Oct, preventing online monitoring of the Karnali water level. The FbA mechanism – threshold and trigger mechanism, was based on water level of Chisapani water level. Manual monitoring of the river level and regular update of the information by the gauge reader was helpful to understand the situation, but it still created a gap of understanding of the live situation and timely information.

Impact threshold:

- g) For major rivers such as Karnali, threshold should consider both water level and rainfall level forecasts across the river basin to inform readiness trigger. Activation trigger is determined by river level but readiness trigger needs to consider rainfall level too.

Early Warning Messages:

- h) For early warning messaging, many households still do not have access to mass communication mediums such as radio. They rely on community leaders, neighbors, community-based organizations, networks, and groups for information and consider them as a reliable source.
- i) Compared to previous years, the early warning messages were frequently disseminated through multiple channels. Regular weather updates were provided with information regarding embankment status, safe sites, requests for evacuations etc. Detailed information is helpful for communities to take informed decisions.

Community engagement:

- j) Community's understanding of the weather forecasts and early actions plays a huge role in the success of the anticipatory work. Communities did not evacuate until the water started entering their houses, as they did not understand the

importance of early actions. The unseasonal nature of the rainfall led them to believe that there was no risk of flooding. Therefore, community engagement from early on is important.

- k) Immediately after the flood, a consultation and review meeting with the ward chairs, *Badhgadhs* and *Chiragis* was conducted where they shared that they have a better understanding of the early actions and value it more, especially since it proved that past experiences might not be relevant due to the changing climate patterns. There is more trust towards weather forecasts and anticipatory action amongst the stakeholders after this experience.



"We received text messages informing that there is possibility of a flood. The ward chair, ward executive members and Badhgadhs - community leaders held a meeting and decided to send a tractor to evacuate the people. They were taken to the school (pre-identified as a safe space). Due to this, we are safe and alive." Lalta Prasad Tharu, resident of Janaki Municipality



We were constantly providing weather updates to all the departments within the municipal office, as well as all the ward offices. Based on this information, one of the ward offices immediately mobilized tractors for early evacuation. They didn't have to wait for a decision from the municipal office.

Netra Prasad Jaisi, Disaster focal person for Janaki rural municipality

4. Way forward: Plans to scale up

By demonstrating the benefits of acting in anticipation of a disaster, NRCS hopes that the FbA mechanism can be replicated and scaled up in other flood prone municipalities across Nepal. The experiences from Janaki and Tikapur can serve as a lesson for other municipalities, which this case study hopes to deliver. Lessons learned from acting in anticipation against the Karnali 2021 flood will be used as a guidance to further refine the FbA mechanism. Moving forward, NRCS will continue its work with the Municipalities to institutionalize the FbA mechanism by integrating it into the SOPs, and the LDCRPs.



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