

Developing triggers for forecast-based financing: how partnerships can strengthen anticipatory action



An Ecuadorian Red Cross team heads to assist affected communities. © Ecuadorian Red Cross

The forecast-based financing approach is built on partnerships between different actors. One central element that requires such collaboration is developing triggers: the thresholds for a hazard that determine when financing is released for early actions. To identify and develop these, humanitarian actors and hydrometeorological experts need to work together to establish robust, evidence-based and actionable triggers, as well as the enhanced climate services that provide critical information and interpretations to communities and other end users.

In many cases, working in partnership to develop triggers has helped to build deep and active working relationships between hydrometeorological scientists and humanitarian practitioners, forging new levels of collaboration between them. This brings benefits beyond the triggers that are developed: scientists can extend their reach to engage with ‘last mile’ users, while humanitarians have greater access to relevant and actionable information.

“Everything you need to know you can get from Google. What you cannot get is where knowledge ends. We need partnerships.”

– Paul Davies, chief meteorologist, UK Met Office,
in [ARRCC et al. 2020](#) (p.4)

Partnerships support other elements of forecast-based financing, such as impact-based forecasting, which is broadly defined as forecasts that move beyond stating what the weather will be, to what the weather will do; for example, a forecast that states not just that there will be 50mm of rain, but that it will cause flooding in areas x, y and z. As such, partnerships align with the recent World Meteorological Organization (WMO) guidelines, which set out the need to “strengthen the provision of expert Impact-based Forecast and Warning Services oriented towards the protection of life, livelihood and property, focused on those who are most vulnerable in society, and fashioned in a clear and actionable manner” ([WMO 2020](#)).

Drawing on case studies from Ecuador, Kenya, Mongolia and Viet Nam, this briefing explores the mechanisms that set up these science-humanitarian partnerships for success, and some of the shared benefits they deliver. It also highlights some of the challenges that persist, and the best practices identified to date. It draws on interviews with practitioners involved with forecast-based financing, including from hydrometeorological and humanitarian sectors, as well as inputs from the technical guide, [The Future of Forecasts: Impact-based Forecasting for Early Action](#). This was the first publication to be jointly authored by, and thus feature the perspectives from, both the Red Cross Red Crescent Movement and meteorological agencies. As such, it is a good starting point for anyone looking to design and implement forecast-based financing programmes. It is hoped that this brief supports the replication of partnerships and processes by other actors, and further increases cooperation and coordination between the humanitarian and science sectors.

“By putting a great emphasis on scientific research, the [forecast-based financing] approach creates a new and growing demand of climate services from the humanitarian aid sector, fostering collaborations between the humanitarian aid, scientific and governmental institutes to anticipate disasters.”

– [Dinnissen et al. 2020](#) (p.1)



Four case studies of joint trigger development

The following case studies come from countries that have led the way in codeveloping triggers for forecast-based financing. Drawing from a range of hazards and regions, they provide insights into the diverse ways in which triggers can be developed through collaboration, building upon each other's efforts, and partnerships between humanitarian and hydrometeorological organizations.

Mongolia

Hazard	Dzud
Actors	Mongolian Red Cross Society; Red Cross Red Crescent Climate Centre; National Agency for Meteorology and Environmental Monitoring; Information and Research Institute of Meteorology, Hydrology and Environment; Nagoya University; British Red Cross
Lead time	One month
Trigger	At least 20 per cent coverage of the highest-risk level on the <i>dzud</i> risk map predicted for three or more provinces.

The process to develop the trigger for Mongolia's *dzud* (a severe drought followed by severe cold wave) is perceived within the forecast-based financing community as the 'gold standard', due to its use of existing climate and weather services. The Information and Research Institute of Meteorology, Hydrology and Environment, under Mongolia's National Agency for Meteorology and Environmental Monitoring (a government agency), partnered with Nagoya University in Japan to create a *dzud* risk map. This integrates 11 parameters, both socio-economic and natural, including (among others) snow depth, snow cover, precipitation and temperature forecasts, biomass and pasture carrying capacity. Combined, these provide a comprehensive overview of the risk of *dzud*, which is issued annually at the beginning of winter (November). The Red Cross Red Crescent Climate Centre and the Mongolian Red Cross Society used this map to develop a trigger by defining what counts as an 'extreme' event.

Using existing information and services in this way is a 'low-hanging fruit' and should be one of the first options that forecast-based financing practitioners pursue, when possible. In Mongolia, using the *dzud* risk maps as the foundation for trigger development had several advantages. It minimized the resources needed by making use of an existing service. It also increased the project's sustainability, as the team can rely on a service embedded within external institutions, rather than those funded for specific projects or donors, which may be time bound.

In an interview, Munguntuya Sharavnyambu, disaster management programme manager at the Mongolian Red Cross Society, explained that basing the trigger largely on the Mongolian government's *dzud* risk map contributed to widespread trust in it among other humanitarian agencies: "We don't have any formal agreement that other agencies will be using our trigger, but during our preparation meeting, we would always mention that this is our trigger and this is what actions we would take. All of the agencies know what our trigger is. So once informed [that we would activate], they were also ready to respond."

She also highlighted that coordination with other agencies yielded fruitful developments and joint benefits. For example, at the start of the project, they established an early-warning working group. This group now meets each autumn to discuss forecasts for the upcoming winter. In 2019-2020, the group communicated to other humanitarian agencies that their trigger had been met and that the Mongolian Red Cross Society would implement early actions. This spurred the Food and Agriculture Organization of the United Nations to implement its own early assistance, based on the same trigger. Ongoing coordination within the working group also enabled the various members to avoid duplication in terms of target areas and beneficiaries.

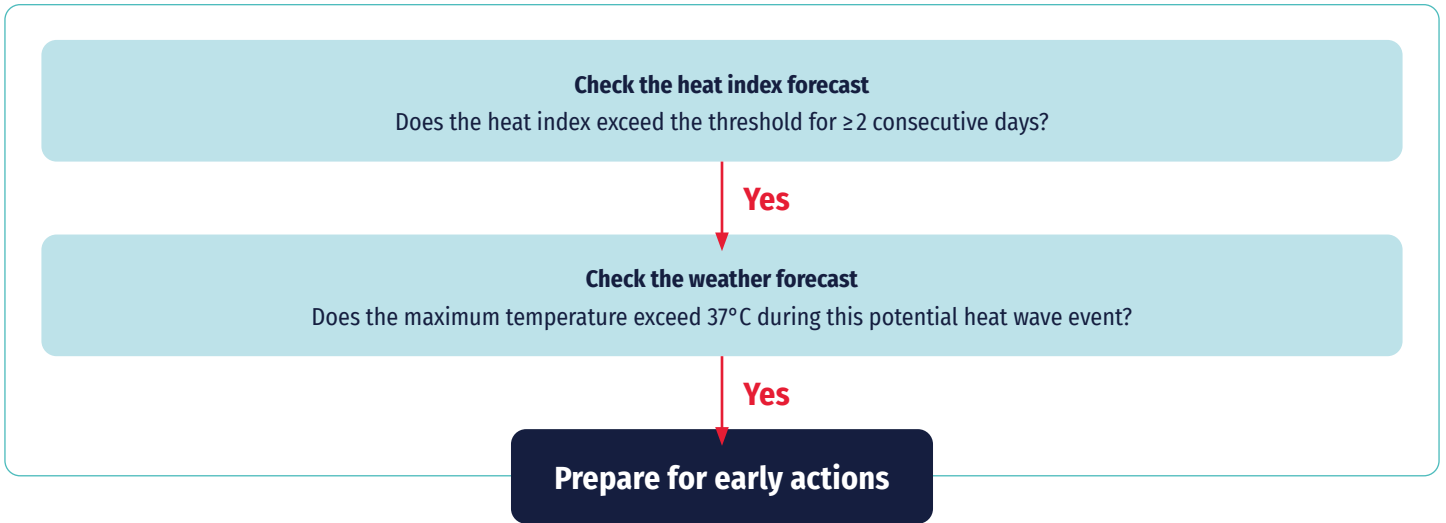
Though this shared use of a trigger is not established in formal agreements, it is a testament to how engaging with other actors in the humanitarian system while developing a trigger generates trust and belief in its robustness.

Viet Nam

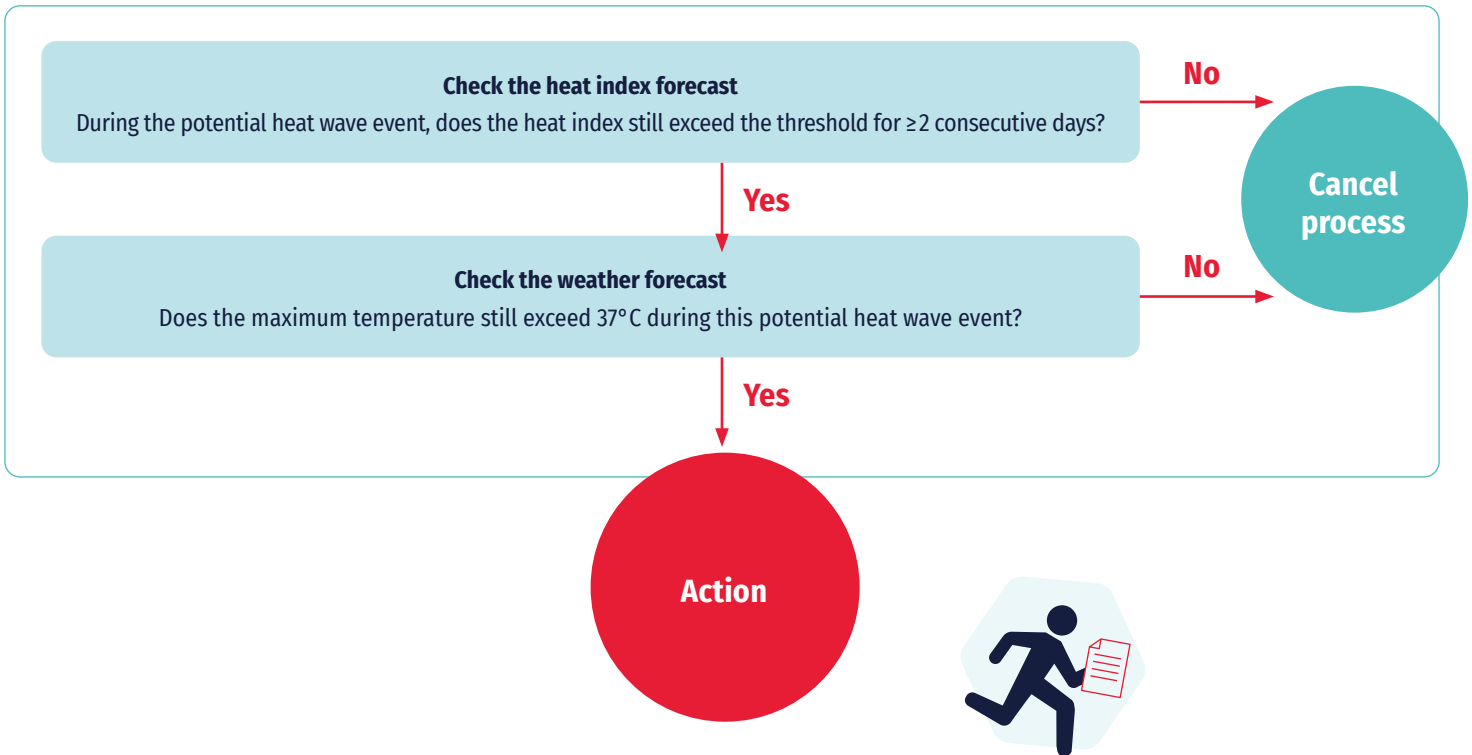
Hazard	Urban heat wave
Actors	Viet Nam Red Cross Society; Vietnam Institute of Meteorology, Hydrology and Climate Change (IMHEN); International Research Institute for Climate and Society, Columbia University; German Red Cross
Lead time	Six days readiness, three days trigger
Trigger	Two or more days of temperatures higher than 37°C; a forecast heat index that exceeds the 99th percentile-based threshold value

Figure 1. How the trigger for early action ahead of heat waves is activated in Viet Nam

Lead time: six days



Lead time: three days



As in Mongolia, the process of trigger development in Viet Nam highlighted the importance of building upon existing work. In this case, the stakeholders took it one step further by establishing a close partnership in which they collaborated to establish a trigger and embed it within the country's hydrometeorological structure. The partnership between the main partners led to the creation of a tailored system for forecasts and early warnings.

“This partnership made the development of an impact-based forecast service possible and inspired other national hydrological and meteorological services to follow suit.”

– [ARRCC et al. 2020 \(p.35\)](#) 

There were several factors behind this successful partnership, and the actors involved identified the following as critical.

Funding personnel helped to foster longevity and promote integration.

The German Red Cross, which is the main donor for the forecast-based financing project in Viet Nam, funded a staff member within IMHEN. This person was also integrated into their project team.

Investing in stakeholder analysis helped the project team to understand different actors' needs and levels of interest – and to tailor messaging accordingly. For example, with local authorities, they highlighted concrete outcomes from the project (e.g., addressing the impacts of heat waves). With international bodies, they emphasized the shift in disaster policy from reaction to anticipation. By using their respective strengths and understandings of different actors, the humanitarian and hydro-meteorological practitioners were able to build upon their existing relationships and target their messaging more effectively to the various actors.

“While the collaboration between scientific and humanitarian organizations has ensured that relevant anticipatory actions for heatwaves were taken on the right moment and at the right place, it also contributed to the improvement of heatwave forecasting in Vietnam.”

– [Dinnissen et al. 2020 \(p.4\)](#) 

Box 1. Benefits from working together to develop triggers

Working together helped create triggers that are more replicable and shareable – and which can be used by other actors and/or in other contexts. For example, IMHEN and the Viet Nam Red Cross Society will replicate the success of the heat wave trigger, which was developed for Hanoi, in other urban areas across the country. The Viet Nam Red Cross Society is also using the trigger to take actions above and beyond those funded through Forecast-based Action by the Disaster Response Emergency Fund (FbA by the DREF)¹ activations. It has decided that, in addition to activating when the one-in-five-year hazard threshold is reached, it will also use the trigger to inform early actions for lower intensity heat waves. This means that it can act ahead of heat waves more frequently, reducing the impacts on vulnerable populations. It will also result in more regular interventions, which will prevent operational capacity being eroded and help to sustain people's skills.

Joint trigger development facilitates collaboration on other hazards. Based on their successful foray into triggers for heat waves together, IMHEN and the Viet Nam Red Cross Society have decided to look for opportunities to collaborate on developing triggers for other hazards. This will help to scale up anticipatory action, as it will address hazards that the two organizations might not have been able to without this complementary support.

The trigger development process in Viet Nam demonstrated that forecast-based financing can be a powerful lobbying tool for enhanced climate services and impact-based forecasting. During interviews, the team from the Viet Nam Red Cross Society explained that prior to trigger development, IMHEN was only forecasting temperature, which is a weak indicator of the impacts of a heat wave. Now, thanks to collaborating to develop the triggers, IMHEN staff understand the importance of having impact-based forecasts that will identify how a heat wave is expected to affect people in different areas. As a result, IMHEN has started to issue forecasts as heat indexes, which combine temperature and relative humidity data. The National Centre for Hydro-Meteorological Forecasting, Viet Nam's main public-facing forecasting agency, has also expressed an interest in learning more about trigger development and impact-based forecasting.

¹ Established by the International Federation of Red Cross Red Crescent Societies, this is one of the main funding mechanisms for anticipatory action.

Together, these experiences highlight that forecast-based financing is helping to drive a shift: from a focus on the provision of information to seeking to understand which services best serve end users. This adds weight to the argument that this approach amplifies collaboration and enhances climate services.

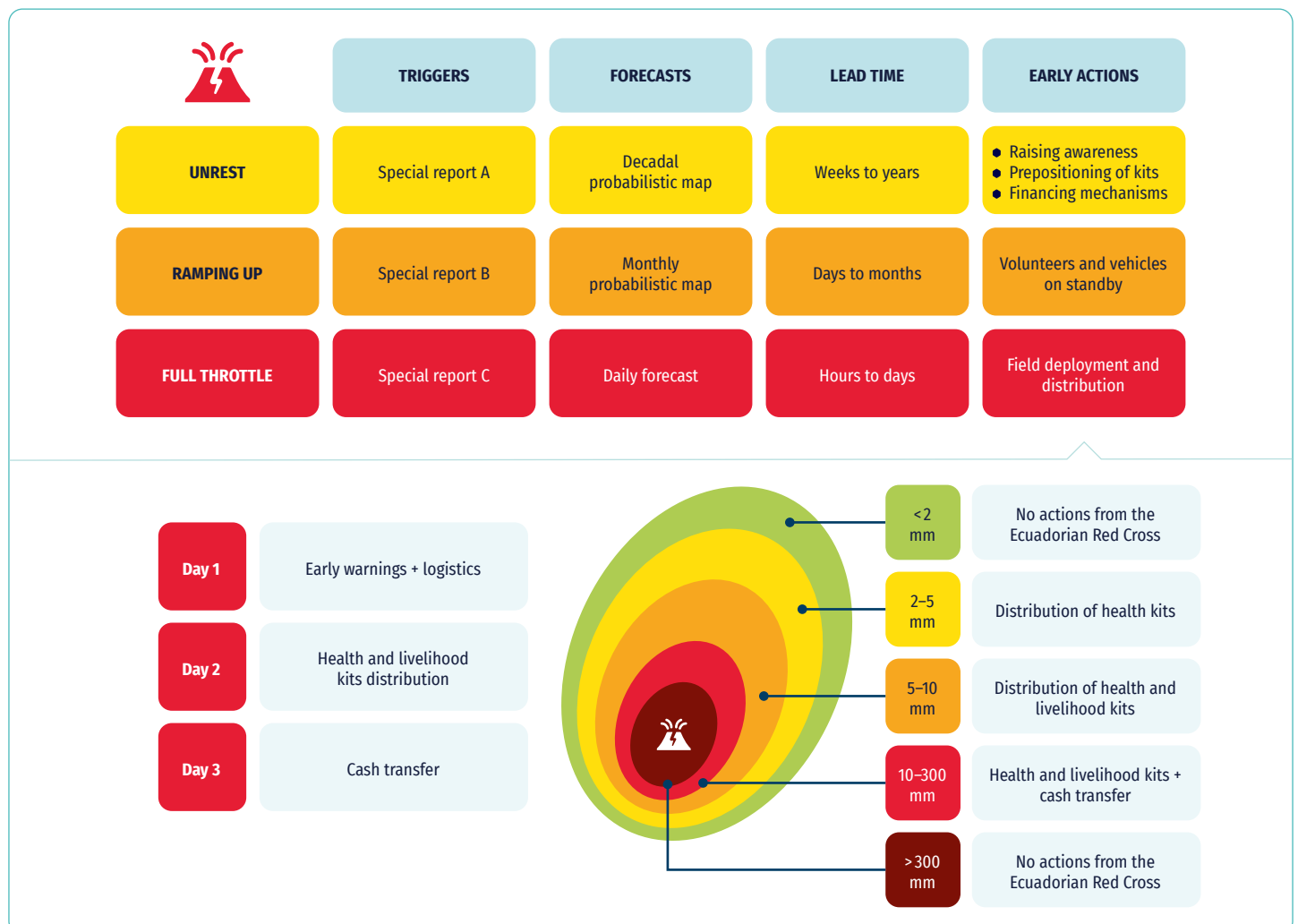
“Developing an impact-based forecasting service requires partnerships and collaboration. Partner organisations can help identify the impacts that are of most concern, assess user requirements, and understand the hazards that drive those impacts. A strong collaborative approach brings together the producers of weather, climate and risk information with those who use the information to make decisions.”

– [ARRCC et al. 2020 \(p.33\)](#) 

Ecuador

Hazard	Volcanic ashfall
Actors	Ecuadorian Red Cross; Instituto Geofísico (Geophysical Institute); Instituto Nacional Meteorología e Hidrología (National Institute of Meteorology and Hydrology); Estudio Regional del Fenómeno El Niño (Regional Study of the El Niño Phenomenon); German Red Cross
Lead time	Variable
Trigger	Three stages: <ul style="list-style-type: none"> ● Volcanic unrest (weeks or years in advance) ● Increase in volcanic activity ● Volcanic eruption, at which point a forecast of ashfall is issued within hours.

Figure 2. Triggers, forecasts, lead times and early actions for volcanic ashfall in Ecuador



The success of Ecuador’s forecast-based financing programme for volcanic ashfall was due in large part to the close collaboration between the technical and humanitarian partners involved. This partnership enabled both sides to develop mutually beneficial services, and to act in an innovative and effective way to reduce the impacts of a hazard that is difficult to anticipate.

Core components of the partnership included early engagement and widespread collaboration. For example, the Geophysical Institute used hazard and exposure factors to rank the threat of different volcanoes in Ecuador; it also ran 1,500 simulations for three high-threat volcanoes. The information provided, which included the projected thickness of ashfall, and its impacts on infrastructure, agriculture and public health, enabled the Ecuadorian Red Cross to better understand the risks posed by volcanic ashfall and its possible impacts on populations.

The Geophysical Institute continues to be crucial for the operationalization of triggers for volcanic ashfall, sending daily models and reports as needed. These outline the behaviour of each of the volcanoes being monitored, which all have unique characteristics and variables.

“[Forecast-based financing] really works because of the relationship we have with Red Cross staff. It wouldn’t have worked without good contact, trust and communication; we go back and forth [with ideas] and have always worked in a very positive manner.”

– Benjamin Bernard, volcanologist, Geophysical Institute

The Geophysical Institute and the Ecuadorian Red Cross both highlighted benefits that have emerged as a result of their collaboration, which extend beyond the process of developing triggers. For example, the Geophysical Institute had long planned to create hazard maps and analysis of volcanoes, but as these were needed for this project, they were prioritized. The project prompted the Geophysical Institute to standardize its hazard maps, for example by using defined parameters for each volcano. It also moved beyond its usual hazard-risk thresholds to conduct impact-based analysis for volcanoes, creating impact thresholds that can be used by humanitarian actors such as the Ecuadorian Red Cross.

Forecast-based financing has been an iterative learning process for all parties involved. For example, when the Sangay volcano erupted in September 2020, lessons from the field helped the Geophysical Institute to realize the need to consider the grain size of volcanic ashfall, as finer grains are much more dangerous to people. Forecast-based financing



Collecting observational data for joint trigger development. © Geophysical Institute

has even helped to catalyse new partnerships: the trigger development process prompted the National Institute of Meteorology and Hydrology and the Geophysical Institute to collaborate for the first time.

The inputs from partners extended beyond trigger development. For example, the Geophysical Institute used its expertise in volcanoes, as well as drawing on existing collaborations (e.g., with the International Volcanology Human Health Network), to help codesign the livelihood and health kits that were given to beneficiaries as part of the early actions for ashfall. It provided invaluable inputs, such as the need to prioritize the protection of eyes and skin as crucial areas affected by ash, and helped to identify goggles and face masks that seal and protect people from ash, including child-sized protective equipment.

Collaboration through this project has built the partners’ capacity. The Ecuadorian Red Cross has benefitted from having Geophysical Institute staff participate in events such as dialogue platforms, and help to run training and capacity-building exercises. These follow a ‘train the trainer’ approach, whereby Geophysical Institute staff train individuals, who then go back and train others in their communities. The Geophysical Institute even recorded training videos for use in virtual sessions during the Covid-19 pandemic.

At the same time, the Geophysical Institute benefits from the extensive network of community volunteers that the Ecuadorian Red Cross has on the ground. Through this, it has been able to train 150 citizen science observers, who enhance ashfall forecasts by observing and reporting back on ash type, quantity and accumulation – activities that the Geophysical Institute does not have the human or economic capacity to undertake otherwise. Communication occurs via WhatsApp and is a two-way dialogue, with the Geophysical Institute reporting back if there are developments in its models.

Kenya

Hazard	Riverine floods
Actors	International Centre for Humanitarian Affairs; Kenya Red Cross Society; Kenya Meteorological Department
Lead time	The Early Action Protocol (EAP) for Riverine Floods has a seven-day trigger lead time, which uses Global Flood Awareness System (GloFAS) data Kenya Meteorological Department forecasts, with a three-day lead time, act as a potential 'stop' mechanism
Trigger	<p>Preactivation: based on rainfall forecasts issued by the Weather Research and Forecasting model from the Kenya Meteorological Department or Intergovernmental Authority on Development's Climate Prediction and Applications Centre, indicating more than 150mm rain expected within the next seven to ten days.</p> <p>Triggers:</p> <ol style="list-style-type: none"> 1 Stations in Nzoia Basin have a five-year return period discharge of 5.3m / 469.6 cubic metres per second (m³/s), with an 85 per cent probability of exceedance 2 Stations in Athi Basin have a five-year return period discharge of 469.2m³/s, with an 85 per cent probability of exceedance 3 Stations in Tana Basin have a five-year return period discharge of 5.1m / 1,191.6m³/s, with an 85 per cent probability of exceedance

Kenya is a successful example of using a joint process to develop triggers, one that highlights the importance of both technical and political engagement. From the beginning, the project team worked to embed trigger development in political processes, as well as technical ones. They engaged with political actors at the cabinet level, aiming to garner support from the highest level of government. They also targeted United Nations agencies and universities with their engagement efforts.

The project team achieved success partly by building on existing relationships in the political and technical sectors, using these as entry points for conversations about trigger development and forecast-based financing. For example, their previous work in projects such as the 'Towards Forecast-based Preparedness Action' project gave them an

avenue through which they could approach partners and invite them to collaborate on forecast-based financing as well.

The team saw an opportunity to enhance the trigger-development process by bringing in the Kenya Meteorological Department, which was eager to expand its services, for example into impact-based forecasts. Forecast-based financing demonstrates that there is a demand for such services, which added legitimacy to the Kenya Meteorological Department's call to expand into this field.

Through addressing both political and technical actors in parallel, the team ensured that the robust trigger methodology developed was complemented by political appetite and resources, as well as the will to act should the trigger be activated. By involving both sides in the development process, Kenya has also laid firm foundations for ownership of its EAP for Riverine Floods – the document that outlines the triggers for a hazard, as well as the funding available and the early actions to be taken – to move beyond the Red Cross. For example, the government's National Disaster Management Operations Centre will be responsible for activating these forecast-based financing triggers.

“Part of the success of the trigger development in Kenya was [that] the investment was done at a political and technical level.”

– Irene Amuron, technical advisor,
Red Cross Red Crescent Climate Centre



Kenya Red Cross Society members in the field.
© International Centre for Humanitarian Affairs

The benefits of pursuing this approach are numerous. For example, it has fostered an active, accountable technical working group on forecast-based financing, which was involved in all stages of developing the triggers and the EAP, including identifying thresholds, defining stop mechanisms, prioritizing impacts and identifying the risks of each early action (e.g., acting in vain). This group now meets each month, with the head of the National Disaster Emergency Operations Centre as its chair.

The project team also expects that this partnership-led approach to trigger development will enable them to scale up forecast-based financing. This is important, as FbA by the DREF funding is not enough to cover all of the early actions the team would like to undertake. By co-developing triggers and early actions with other international and national stakeholders, they can now jointly decide who is responsible for funding which early actions.

“Since we decided to be brave from the beginning, we wanted to continue in that way.”

– Dr Halima Saado Abdillahi, director of research and learning, International Centre for Humanitarian Affairs, Kenya Red Cross



Challenges to working in partnership

Despite the successes outlined in this briefing, there are persistent challenges to working in partnership – whether to develop triggers for forecast-based financing, or in other elements of anticipatory action. The guidelines developed by ARRCC et al. (2020; p.35) outline some of these, including:

- insufficient understanding of impact-based financing and/or forecast-based financing by new collaborators
- insufficient buy-in and understanding among new collaborators of the value added by forecast-based financing
- confusion about who is responsible for the production of impact-based forecasts
- the need to involve additional ministries, which have different governance and accountability structures
- insufficient incentives or resources to make the shift to anticipatory action
- insufficient capacity to produce impact-based forecasts.

However, these guidelines suggest that it is possible to overcome these challenges when “existing and future [hydrometeorological] capacity building and early warning and early action investments are developed in a coherent way, incentivising the joint development of capabilities towards impact-based forecasting and anticipatory action” (ARRCC et al. 2020; p.35). It is therefore crucial to advocate for sustainable partnerships as part of the process of creating impact-based forecasts.



Best practices for working in partnership

The case studies in this briefing outline some of the steps required to achieve a ‘gold standard’ in developing triggers for forecast-based financing. However, it is imperative to recognize that each country builds partnerships in unique contexts, with varying levels of capacity and resources. As Catalina Jaime, senior risk advisor at the Red Cross Red Crescent Climate Centre, highlighted in an interview, “each country will have different ways of working; no single solution fits all”.

While acknowledging the need to tailor trigger development to country contexts, some overarching best practices can be drawn from the case studies presented here. The following list highlights those that can support countries interested in developing their own triggers for forecast-based financing.

1 Emphasize coproduction and creation in trigger development.

Engaging technical and humanitarian partners from the start maximizes engagement and alignment. This means moving beyond technical working groups to actual policy, administrative and funding considerations, such as establishing data-sharing agreements and memorandums of understanding, and developing joint projects. The stakeholders consulted for these case studies recommend viewing a partnership as more than a formality; instead, it is a relationship constructed between two (or more) parties, one that needs trust to be built and open communication to succeed. Much of what was achieved during the joint trigger-development processes was not possible just because of a formal agreement to work together, but a commitment to building a positive relationship in which all stakeholders felt supported and able to reach out to each other. As practical ways to do this, they suggest:

- work together from the start of the project
- recognize that true partnership is a lot of work and may require significant time investments

- ensure that staff have sufficient time to put in the work needed to nurture a partnership, or allocate funds to hire someone who can
 - ensure that you are building ownership into the codevelopment process by ensuring that each stakeholder can provide inputs that are heard and acted upon.
- 2 Invest in long-term processes when developing triggers.** This mitigates risk and increases the possibility of robust analysis and evidence-based decision-making. Moreover, it allows for genuine partnerships to develop and systems to shift to anticipatory action.
 - 3 Consider the political element inherent in trigger development.** National hydrological and meteorological offices are often constrained by the political mandates issued by governments. It is critical that trigger-development processes include advocacy efforts to emphasize the importance and relevance of this approach to government stakeholders.
 - 4 Trigger development should integrate and build upon existing systems and services.** Projects can increase the sustainability and uptake of their triggers by using existing weather and climate services. Before ‘reinventing the wheel’ with new systems, practitioners should explore what is already being used, and how it could be adapted or built upon for forecast-based financing.
 - 5 Develop a common language and shared goals for trigger development.** Blending two sectors is not always straightforward. Practitioners advise working closely together to develop a common language, which helps to ensure that all actors have the same understanding of the terminology. This includes defining exactly what you are talking about, rather than assuming everyone interprets terms in the same way.
 - 6 In trigger development, go slow to go fast.** Developing new meteorological and climate services does not happen overnight. It requires substantial time and resources to be invested, as well as cultural and organizational shifts. It is useful to link trigger-development processes strategically to wider, longer-term needs and activities, rather than framing them as an isolated project.
 - 7 Use open-source software for trigger development when possible.** This enables the public (e.g., citizen scientists) to contribute data and information, maximizing the potential for wider collaboration.
 - 8 Invest in joint processes to develop triggers that lead to effective early actions.** Without robust forecasting and analysis at the start, other stages of the forecast-based financing approach – however well researched and prepared – are unable to be implemented effectively.
 - 9 Trigger-development partnerships can extend to donors.** There have been promising results from countries where external donors and funders have supported trigger development, such as the World Bank in Bangladesh.
 - 10 Build alignment between donors.** To date, technical and humanitarian funding streams for forecasting services have largely been siloed, with the former investing in forecasting activities and the latter in impact-based forecasting. Coordinating with both sets of donors could lead to products and services that meet the needs of both sectors.
 - 11 Make triggers as local as possible.** Practitioners should work to understand the context in which the trigger is being defined, and then tailor it to that unique context and capacity. As far as possible, triggers – as well as early warnings and actions – should be embedded into a country’s existing disaster-risk systems and architecture, rather than forecast-based financing operating as a parallel, but separate, process.
 - 12 Prioritize impact-based forecasts for triggers.** These make forecasts relevant to the humanitarian sector by spelling out the anticipated outcome of a weather forecast (e.g., flooding in a particular area). The stakeholders interviewed for this briefing indicated that impact-based forecasts are what they need to make informed decisions and act early.
 - 13 Use trigger development to increase demand for forecast-based financing.** For example, it can be an opportunity to lobby for expanded climate services that include the production of impact-based forecasts.

Ecuador: Volcanic Ashfall Early Action
Final Report on Early Action Phase

bit.ly/3cHQ0Lr 

Kenya: EAP for Riverine Floods

bit.ly/3wWm9p4 

Mongolia: EAP for Dzud

bit.ly/3BoBTEI 

Viet Nam: Heatwaves Project Summary

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Further reading

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