*Excerpt from*

# Landscape of Anticipatory Action for Health in a Changing Climate

**A FEINSTEIN INTERNATIONAL CENTER PUBLICATION**

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## Storms and flooding

The human health impact of storms and flooding occur during and after these weather events and include risks of injury or death as well as waterborne disease. The following information provides evidence around health outcomes of Anticipatory Action (AA) for storms and floods along with examples of AA currently happening in Bangladesh and Uganda using the 4Ms (Model, Mandate, Method, Means) framework.

### Evidence review

Weather forecasts for storms and flooding are increasing in accuracy, and the use of these forecasts is widely credited with the reduction in lives lost during extreme weather events (e.g., Ritchie 2024). The most common health measures in AA plans for storms and flooding are prevention of waterborne or vector-borne disease. This includes provision of mosquito nets, water purification tablets, water-holding vessels, soap, latrines, clean water, cash, and evacuation. For example, coordinated humanitarian action by the Bangladeshi government supported by both Red Crescent and United Nations agencies for Cyclone Remal in 2024 resulted in more than 400,000 additional people receiving health services related to the event.

Despite the large number of AA frameworks for storms and flooding, the health benefits of these frameworks have not always been clear. Most of the storm and flooding AA frameworks reviewed do not mention the health sector or coordination with health authorities. While a hazard-driven approach seems sensible for a clearly defined event such as a cyclone, for example, the lack of integration between humanitarian cyclone-focused actions and health authorities/frameworks could reduce the efficacy of the hazard-driven approach. Several studies did not detect any difference in health outcomes after the activation of flood AA frameworks. In Bangladesh in 2017, cash was provided to people in anticipation of a flood event, and the post-event evaluation did not detect any change in reported health outcomes among recipients and nonrecipients (Gros et al. 2019). Similarly, the evaluation of a flood activation in Mozambique in 2022 did not detect a change in health outcomes (Popat et al. 2024).

Based on a meta-analysis, there is limited evidence to support the effectiveness of hygiene kits (Yates et al. 2021). This doesn't imply they are ineffective but rather highlights a gap in research. The authors of the meta-analysis state that "hygiene kit distributions are governed by 'best practice' rather than 'evidence-based approaches'" (Yates et al. 2021, 248). Additionally, the variability in kit contents makes it challenging to assess the overall impact of

hygiene kit distributions (Yates et al. 2021). Individual items—such as soap—do have some evidence base, though there is still a gap in research observed. For example, one study from 1998 reported a 27% reduction in diarrheal episodes in households where soap was present compared to those without it, though newer evidence was not found in the literature review for this report (Peterson et al. 1998).

### Example of high-potential design

**Model:** Meteorological threshold in a weather forecast. This threshold should be designed based on impacts in the specific location, considering total amount of rainfall, flash flood potential, river flood potential, and any potential combination with storm surge flooding.

**Mandate:** Civil society organizations support a government-coordinated effort to evacuate populations. Provide cash through large-scale social safety net systems, and if WASH is the focus of the AA protocol, work with WASH and health sectors for scale-up of relevant actions.

**Method:** Multiagency evacuation plans, combined with the scale-up of gendered health support for affected populations. Cash transfers that use adapted safety net infrastructure to reach vulnerable people based on hydrological forecasts combined with community surveillance information. Scale-up of existing public health interventions for ensuring water safety and other health-promoting activities during and after the event.

**Means:** Government funding and support for evacuation, cash transfers, and safe water supply, supplemented by international humanitarian assistance in high-risk shortfall areas.

### Case study: Government of Bangladesh

Bangladesh has become a pioneer in Anticipatory Action (AA) to reduce flood impacts. The government and humanitarian partners have embraced forecast-based early actions as a complement to traditional emergency response. Notably, after collaborative advocacy, AA was incorporated into Bangladesh's Standing Orders on Disaster in 2019, giving it a formal mandate in national disaster policy (Rahman et al. 2024).

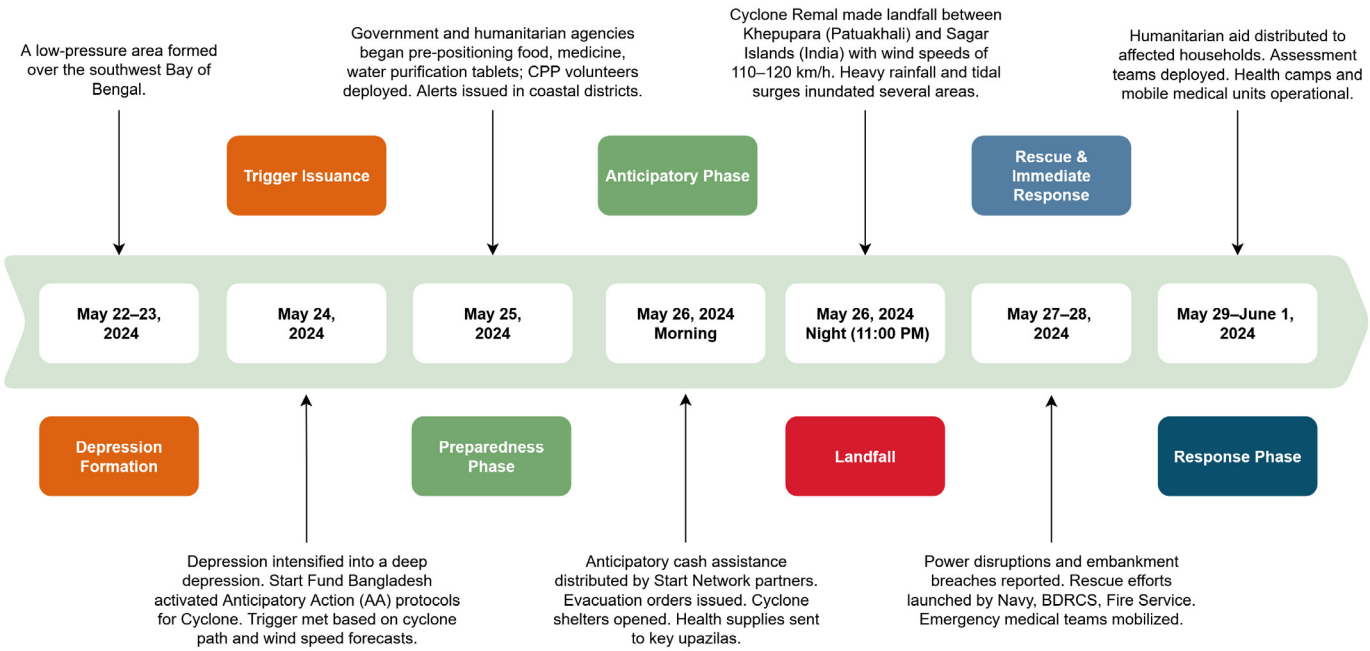
Government (Ministry of Disaster Management and Relief (MoDMR) and Departments): MoDMR is the lead government body for disaster policy and response. The Department of Disaster Management (DDM) under MoDMR and the Need Assessment Working Group (NAWG) contributed to identifying at-risk populations and coordinating with humanitarian partners. The Flood Forecasting and Warning Centre (FFWC), while under the Ministry of Water Resources, provided the critical forecasts forming the trigger basis and worked closely with DDM to issue early warnings. Local government institutions (District Commissioners, Upazila and Union Disaster Management Committees) were responsible for executing evacuations, disseminating warnings, and supervising aid distribution on the ground. By 2024, government leadership in AA had strengthened: MoDMR co-chaired an Anticipatory Action Technical Working Group and took charge of convening stakeholders once a trigger was imminent, a marked change from 2020 when UN agencies led the activation (United Nations Bangladesh 2025).

By 2024 AA for floods in Bangladesh moved from a donor-driven pilot to a nationally owned mechanism, backed by policy, multistakeholder coordination, and clear delineation of responsibilities among key actors (GoB 2019). Initially, in 2020, coordination was ad hoc and centrally driven by the UN due to the pilot nature of the activation. An immediate lesson was the need for a dedicated platform to manage AA across stakeholders. By 2021, Bangladesh set up an Anticipatory Action Technical Working Group (TWG) under the Disaster Emergency Coordination Group, including government ministries, BDRCS, UN agencies, and NGOs. This TWG met regularly to develop common trigger protocols, share data (e.g., vulnerability mapping), and plan who does what when a trigger hits. As a result, roles became more clearly defined over time; for instance, during the July 2024 flood trigger, MoDMR/Department of Disaster Management led the overall coordination, BDRCS and IFRC managed the field implementation in their EAP areas, WFP handled large-scale cash transfers through its networks, and other agencies (FAO, UNICEF, etc.) activated specific early actions in their sectors. There was still room for improvement; e.g., ensuring truly joint targeting so the same household could receive a package of multisectoral support, but the leadership shifted toward the national government. The establishment of forecast-based financing in Bangladesh's domestic financing through the Bangladesh Climate Change Trust Fund and others is also being explored, which would further cement government mandate and ownership.

On May 26, 2024, Cyclone Remal made landfall near Mongla and Khepupara, with wind speeds exceeding 100 km/h, resulting in severe tidal

surges, widespread flooding, and infrastructure damage across 19 districts and 119 upazilas (IFRC 2024c; United Nations Bangladesh 2024). It also affected around 4.6 million people and killed at least 16 (UNICEF Bangladesh 2024). The response to Cyclone Remal demonstrated the effectiveness of AA. Key stakeholders, including BDRCS, IFRC, and various government agencies, undertook coordinated early actions based on early warning systems, standard operating procedures, and community-based preparedness mechanisms. These are presented in Figure 9 below.

**FIGURE 9.** Timeline of Cyclone Remal




The following sections review AA implemented during Cyclone Remal through both the government-led framework and the humanitarian-led framework. Using the 4M structure—Model, Mandate, Method, and Means—these frameworks highlight how national systems and humanitarian actors jointly operationalized early warnings, mobilized resources, and engaged communities to mitigate cyclone impacts.

### Government-led framework

**Model:** The National Early Action Protocol (NEAP) sets cyclone-specific triggers based on three components: wind speed, storm surge, and rainfall. Thresholds are defined across four impact levels (low to very high) and linked to lead times and forecast likelihoods. Trigger matrices determine when to initiate community, government, or humanitarian responses. Activation occurs if any one hazard crosses its threshold. Despite forecast uncertainty, AA proceeds under a "no regret" principle, accepting potential false alarms to ensure timely lifesaving responses in vulnerable coastal areas (GoB 2024).

The following decision trigger matrix (Table 3) outlines the trigger thresholds for activating AA under the NEAP. It presents impact levels based on wind speed, storm surge, and rainfall forecasts, combined with lead time and likelihood, to guide timely and coordinated responses by government and humanitarian actors.

**TABLE 3.** Decision trigger matrix for coordinated Anticipatory Action (AA) in Bangladesh, adapted and modified from the National Early Action Protocol (NEAP) (GoB 2024).

| LEAD TIME AND LIKELIHOODS OF IMPACTS | | WIND SPEED (KM/HR) | | | | STORM SURGE (M) | | | | RAINFALL IN 72 HR ACCUMULATED (MM) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 62-88 Low | 89-117 Medium | 118-221 High | ≥ 222 Very High | <1.5 Low | 1.5-3.5 Medium | 3.6-5 High | >5.0 Very High | <150 Low | 150-200 Medium | 200-250 High | >250 Very High |
| 36–48 hr | High (> 75%) | | | | | | | | | | | | |
| 48–72 hr | Medium (50–75%) | | | | | | | | | | | | |
| 72– 120 hr | Low (25–50%) | | | | | | | | | | | | |
| > 120 hr | Very Low (< 25%) | | | | | | | | | | | | |

- Activate Anticipatory Actions
- Readiness Anticipatory Actions
- Only Govt. Early Action (Support from partners, if required)
- Only Govt. Readiness (Support from partners, if required)
- Community Early Action
- Community Readiness
- Regular Monitoring

**Mandate:** The Ministry of Disaster Management and Relief (MoDMR) supervised national operations through the National Disaster Response Coordination Centre (NDRCC), co-leading clusters with UN and IFRC actors. Coordination was ensured from national to union levels via Standing Orders on Disasters (SOD), Union Disaster Management Committees (UDMCs), and CPP volunteers. Key clusters included shelter, WASH, health, and food security.

**Method:** MoDMR-led interventions included:

- Activation of 9,424 cyclone shelters across 19 districts (IFRC 2024a).
- Mobilization of over 78,599 CPP volunteers (IFRC 2025).
- Support to local governments in evacuation, logistical coordination, and real-time updates.

These interventions were aimed at reducing many health effects of cyclones, including injury, loss of life, and disease.

**Means:** The government leveraged structured disaster protocols and interagency coordination to maximize efficiency. Government infrastructure such as cyclone shelters and early warning dissemination mechanisms enabled timely response.

### Humanitarian-led framework

**Model:** The anticipatory model followed by BDRCS, IFRC, and other humanitarian actors was aligned with the Government of Bangladesh's National Early Action Protocol (GoB 2024) based on impact-based forecasts and predefined triggers. The Bangladesh

Meteorological Department (BMD) played a critical role by issuing early warnings, including the declaration of "Danger Signal No. 10" for the most at-risk districts (UNICEF 2024). These early warnings facilitated timely evacuation and the pre-positioning of relief supplies, ensuring humanitarian agencies could coordinate effectively within a 36–48-hour lead time. They also point toward an important model of integration between government systems and humanitarian interventions, with the humanitarian-led framework utilizing and benefitting from Bangladesh's national early warning system.

**Mandate:** On May 22, 2024, when a low-pressure system formed over the Bay of Bengal, the Anticipatory Action Technical Working Group (AA TWG)—comprised of all major humanitarian agencies in Bangladesh—collaborated closely with the government-led Forecast-Based Action Task Force under the MoDMR to prepare and respond (United Nations Bangladesh 2024). Together, they utilized national and international meteorological models to monitor the system, forecast its progression, and support the issuance of early warnings. Technical assistance was provided to the Bangladesh Meteorological Department, Flood Forecasting and Warning Centre, and the Cyclone Preparedness Programme to ensure alignment with the harmonized Early Action Protocol for Cyclones (United Nations Bangladesh 2024). More than 2,500 staff and 181,000 volunteers were mobilized (IFRC 2024c). CPP volunteers, jointly supervised by the government and BDRCS, played a pivotal role in early warning dissemination, evacuation, and risk communication.

**Method:** Early actions implemented by BDRCS included:

- Dissemination of evacuation alerts and awareness via mosque-based public address systems, Information, Education, and Communication (IEC) materials, and community volunteers
- Provision of pre-positioned relief (e.g., 9,600 tarpaulins, 5,400 jerry cans, 1,900 sleeping mats, and 2,750 hygiene parcels) (IFRC 2024b)
- Distribution of 8,754 oral rehydration solution (ORS) sachets and deployment of mobile medical teams treating over 11,000 individuals (IFRC 2025)
- Cash support to 28,000 vulnerable households, prioritizing women-headed and disabled families (IFRC 2025)
- Reverse osmosis plants supplying 59,000 liters of clean water and hygiene kits for 13,750 people (IFRC 2025)

**Means:** Enabling factors included pre-arranged financing, strong volunteer networks, and coordination through the HCTT and sector-specific clusters. Financing for humanitarian action was provided through humanitarian networks. IFRC activated CHF 1 million from its Disaster Relief Emergency Fund (DREF) and later launched a CHF 12.5 million appeal for extended response (IFRC 2025). However, only 22% of the emergency appeal had been funded by October 2024 (IFRC 2025).

**Take-aways:** Cyclone Remal demonstrated the growing maturity of Bangladesh's AA ecosystem, particularly regarding to collaboration between government and humanitarian actors. Forecast-based triggers, volunteer mobilization, and interagency coordination enabled lifesaving actions. The humanitarian model led by IFRC/BDRCS ensured targeted assistance, especially through multipurpose cash grants and mobile medical teams, while the government model ensured infrastructure coordination and mass-scale evacuation.

Each approach had distinct strengths and limitations. The government-led model benefitted from a well-structured national disaster management system, extensive shelter infrastructure, and strong coordination through Standing Orders on Disasters (SOD). However, it faced challenges related to bureaucratic rigidity, underresourced local healthcare systems, and gaps in decentralized execution. On the other hand, the humanitarian-led approach emphasized localized, people-centered interventions. This enabled swift volunteer deployment and the delivery of health services, including the treatment of approximately 11,000 individuals, the distribution of 8,754 oral rehydration solution (ORS) sachets, and psychosocial support services. However, the extensiveness of this approach was undermined by funding limitations, as only 22% of the emergency appeal had been met, restricting the scale and duration of response activities.

Persistent systematic challenges—such as limited financing and health service capacity gaps—highlight areas for reform and ongoing work. Building long-

term resilience requires stronger local governance, sustained financing, ongoing collaboration between government and humanitarian/development actors, and robust healthcare readiness. Lessons from Remal serve as a global template for scalable AA in climate-vulnerable contexts.

Box 8 provides another example, this time from Uganda, where an AA framework was developed that has health impact aims, among others.

**BOX 8.** Snapshot: Uganda Red Cross

Uganda Red Cross was one of the first organizations to formally develop an Anticipatory Action (AA) framework focused on flooding. Their aims were to:

- Save lives and prevent injuries
- Provide assistance to people at risk of losing homes
- Prevent waterborne diseases

In 2015, Uganda Red Cross provided jerry cans, soap, and water purification tablets based on a flood forecast, but an evaluation did not detect any change in reported diarrheal disease among recipients and nonrecipients (Jjemba et al. 2019).

**Model:** Uganda Red Cross Society (URCS) began implementing the Forecast-based Financing approach in 2014. URCS has developed several iterations of this program, now called AA. For flooding, the AA protocol of URCS relies on global hydrological forecasts as the country does not have local hydrological forecasting capacity. The Global Flood Awareness System (GloFAS), with a lead time of five days, is used with rainfall forecasts from Uganda National Meteorological Authority and the East African IGAD Climate Prediction and Applications Centre (ICPAC) to trigger early action. URCS identifies flood-prone populations based on historical experience.

**Mandate:** Uganda Red Cross Society's AA is grounded on the humanitarian mandate to reduce disaster risk and build community resilience. This model operates under the national disaster risk reduction strategy. URCS works in coordination with government authorities like the Uganda National Meteorological Authority (UNMA) and the Office of the Prime Minister (OPM).

**Methods:** Actions taken by the Uganda Red Cross upon receipt of these forecasts include the sensitization of communities at risk of flooding, distribution of water purification tablets, soap and water storage vessels (jerry cans), and facilitating the community in cleaning water sources. Furthermore, Uganda Red Cross promotes hygiene through awareness creation and assesses the water quality (IFRC 2021).

**Means:** Early actions are funded by Forecast-based Action by Disaster Relief Emergency Fund (DREF). Upon trigger activation, URCS mobilizes resources (human, financial, and logistical) to implement early actions.