Applied Policy Project – Technical Report

Addressing Flood and Drought Risks in Humanitarian Settings through Disaster Risk Management and Anticipatory Action

Prepared by: Jule Voss
Prepared for: IMPACT Initiatives

April 2023

Acknowledgements

I would like to thank Professor Kirsten Gelsdorf for introducing me to the world of global humanitarian aid and for providing invaluable feedback, support, and mentorship throughout this project. I also thank Professor Andrew Pennock for his insight and flexibility which enabled me to bring this project to fruition. I thank the entire team at IMPACT Initiatives, especially Nataliia Makaruk and Louise Thaller, for their steadfast commitment to delivering better for local communities affected by climate disasters and their generous contributions to this project. Finally, I thank Rain Voss, Graham Voss, and David Bass for their ongoing support and encouragement.

Disclaimer

The author conducted this study as part of the program of professional education at the Frank Batten School of Leadership and Public Policy, University of Virginia. This paper is submitted in partial fulfillment of the course requirements for the Master of Public Policy degree. The judgments and conclusions are solely those of the author, and are not necessarily endorsed by the Batten School, by the University of Virginia, or by any other agency.

Table of Contents

List of Figures and Tables

Acronyms

AA	Anticipatory Action
ABA	Area-Based Assessment
ABRA	Area-Based Risk Assessment
AVHRR	Advanced Very High Resolution Radiometer
CCA	Climate Change Adaptation
CERF	UN Central Emergency Response Fund
DRM	Disaster Risk Management
DRR	Disaster Risk Reduction
EAP	Early Action Plan
ECHO	European Civil Protection and Humanitarian Aid Operations
ECMWF	European Centre for Medium-Range Weather Forecasts
FAO	UN Food and Agriculture Organization
FBF	Forecast-Based Financing
FCDO	UK Foreign, Commonwealth, and Development Office
FTS	Financial Tracking Service
GIS	Geographic Information System
GloFAS	Global Flood Awareness System
GLOFFIS	Global Flood Forecasting Information System
HCT	Humanitarian Country Team
HNO	Humanitarian Needs Overview
HRP	Humanitarian Response Plan
IASC	Inter-Agency Standing Committee
IDP	Internally-Displaced Person
IFRC	International Federation of the Red Cross and Red Crescent
INFORM	Index for Risk Management
IPC	Integrated Food Security Phase Classification
IPCC	International Panel on Climate Change
KAP	Knowledge, Attitudes, and Practices
NCEP	National Centers for Environmental Predictions
NOAA	U.S. National Oceanographic and Atmospheric Administration
OCHA	Office for the Coordination of Humanitarian Affairs
SPEI	Standardized Precipitation Evapotranspiration Index
TAMSAT	Tropical Applications of Meteorology using Satellite data
UNDAC	UN Disaster Assessment and Coordination
UNDRR	UN Office for Disaster Risk Reduction
UNGA	UN General Assembly
USAID	U.S. Agency for International Development
USG/ERC	Under-Secretary General for Humanitarian Affairs/Emergency Relief Coordinator
VCI	Vegetation Condition Index
WASH	Water, Sanitation, and Hygiene
WFP	World Food Programme

Glossary

Anticipatory Action: actions taken in anticipation of a crisis, either before the shock or at least before substantial humanitarian needs have manifested themselves, which are intended to mitigate the impact of the crisis or improve the response.

Coping Capacity: the ability of people, organizations and systems, using available skills and resources, to manage adverse conditions, risk or disasters.

Disaster Risk Management: the application of disaster risk reduction policies and strategies to prevent new disaster risk, reduce existing disaster risk, and manage residual risk, contributing to the strengthening of resilience and reduction of disaster losses.

Disaster Risk Reduction: activities aimed at preventing new and reducing existing disaster risk, managing residual risk, and which contribute to strengthening resilience and the achievement of sustainable development.

Early Warning Systems: an integrated system of hazard monitoring, forecasting and prediction, disaster risk assessment, communication and preparedness activities systems and processes that enables individuals, communities, governments, businesses and others to take timely action to reduce disaster risks in advance of hazardous events.

Hazard: a process, phenomenon or human activity that may cause loss of life, injury or other health impacts, property damage, social and economic disruption or environmental degradation.

Predictive Analytics: the analysis of current and historical data to anticipate an event or some characteristic of an event (its likelihood, severity, magnitude, or duration).

Risk: the potential loss of life, injury, or destroyed or damaged assets which could occur to a system, society or a community in a specific period of time, determined probabilistically as a function of hazard, exposure, vulnerability and capacity.

Threshold: the minimum specific levels of a predefined trigger mechanism which must be met in order to activate response activities.

Trigger Mechanism: a component of anticipatory action which translates the components of a shock (such as drought or flooding) and/or its impacts (such as food insecurity) into technical specifications.

Vulnerability: the conditions determined by physical, social, economic and environmental factors or processes which increase the susceptibility of an individual, a community, assets or systems to the impacts of hazards.

Executive Summary

Flood and drought hazards are the leading cause of disasters affecting human populations globally and account for 75 percent of the total number of people affected by disasters in the past two decades (UNDRR, 2020a). Despite widespread agreement on the importance of localization in the humanitarian system, local communities are often unequipped to adequately address flood and drought hazards, leading to a loss of lives and livelihoods, financial costs to the broader humanitarian system, and reduced resilience and early recovery. This issue is especially urgent given the worsening impacts of climate change and increasing humanitarian funding shortfalls.

This report is prepared for IMPACT Initiatives, a Geneva-based think-and-do tank which aims to inform evidence-based decision-making in the international aid system through data, partnerships, and capacity building programmes. IMPACT is well-placed to contribute to policy solutions to this problem through its area-based assessments (ABAs) and seeks to develop new tools and methods to integrate flood and drought risk assessments into its existing portfolio.

Effective action to equip local actors to adequately address flood and drought risks in their communities requires high quality local-level data, adequate funding, effective programming options, and an enabling political environment. Given IMPACT Initiatives' comparative advantage in data collection and analysis, this report will focus on solutions which enable IMPACT to align its data collection methodologies with the most suitable policy approaches to addressing flood and drought risks at the local level.

Three policy approaches are considered:

- **Traditional humanitarian response**, which takes place immediately after a flood or drought event occurs and continues until basic needs have been met and relevant actors can transition into more long-term, development-focused activities;
- **Anticipatory action (AA),** which uses predictive models to anticipate and preemptively respond to floods and droughts in the weeks and days leading up to a major event; and
- **Disaster risk management (DRM)**, which is implemented well-ahead of an identified flood or drought hazard and aims to reduce disaster risk and manage residual risk through structural and informational adaptations.

Using the criteria of technical feasibility, political feasibility, cost-benefit ratio, timeliness, and equity, this report recommends that IMPACT Initiatives and its partners (1) prioritize **DRM** where it is politically feasible; (2) reallocate resources towards **AA** where DRM is *not* politically feasible and AA *is* technically feasible; and (3) focus on **traditional response** where timeliness is an overwhelming concern.

1. Introduction

In the forward to the 2023 UN World Water Development Report, UN Secretary-General António Guterres writes that “vampiric overconsumption and overdevelopment, unsustainable water use, pollution and unchecked global warming are draining humanity lifeblood, drop by drop” (UNESCO, 2023). One of the most devastating consequences of anthropogenic climate change is the increased incidence and severity of extreme climate events. According to the UN Office for Disaster Risk Reduction (UNDRR), more than 75 percent of the total number of people affected by disasters[1] in the past two decades are the result of just two types of events: floods and droughts (UNDRR, 2020a).

The human cost of flood and drought events is not borne equally. Some of the most vulnerable populations are those already experiencing humanitarian crises, such as armed conflict, previous natural hazards, forced displacement, or complex emergencies. This population comprises 339 million people in need of immediate humanitarian assistance in 2023, including nearly 60 million internally displaced people (IDPs) worldwide (OCHA, 2022a; IDMC, 2022).

This report considers innovative, evidence-based approaches to addressing flood and drought risks in humanitarian settings, utilizing a style of public policy analysis inspired by Bardach and Patashnik (2015). It aims to provide specific and evidence-based recommendations to IMPACT Initiatives for developing new tools and approaches to integrate risk analysis into existing area-based assessments (ABAs).

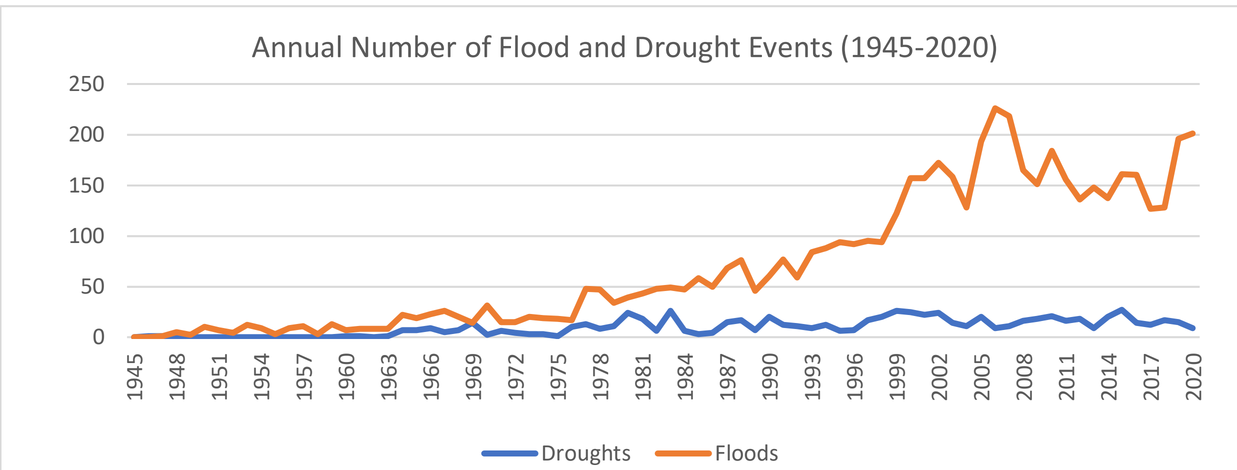
The report also adopts as an orienting principle a focus on locally-led action, in line with IMPACT Initiatives’ area-based approach and commitments made by the international community at the 2016 World Humanitarian Summit to support the localization of humanitarian action (IASC, 2016). This approach emphasizes that **any effective solution to flood and drought risks must address communities’ self-identified needs and take into account the specificities of the local social, political, economic, and environmental context**. By putting local communities at the center not only of the assessment and data collection process but also proposed solutions, the area-based approach is a pragmatic solution to addressing self-identified needs, but one which has not yet been adopted at scale across the humanitarian sector.

[1] This includes earthquakes, extreme temperatures, landslides, storms, volcanic activity, wildfires, droughts, and floods.

2. Problem Statement

Since the 1980s, the average number of droughts has increased nearly 22 percent globally, and the number of floods has increased 197 percent (OCHA, 2021). The growth in the frequency and severity of extreme hydrological events, as shown in Figure 1, has contributed to record levels of humanitarian need with one out of every 23 people now requiring humanitarian assistance, more than double the percentage just four years ago (OCHA, 2022a). **Despite widespread agreement on the importance of localization in the humanitarian system for meeting these immense challenges, local communities are often unequipped to adequately address flood and drought hazards, leading to a loss of lives and livelihoods, financial costs to the broader humanitarian system, and reduced resilience and early recovery.**

Figure 1. Global Trends in Flood and Drought Events.



Source: Author's own elaboration. Data from the EM-DAT as cited in the 2022 Global Humanitarian Overview (OCHA, 2021).

3. Policy Landscape

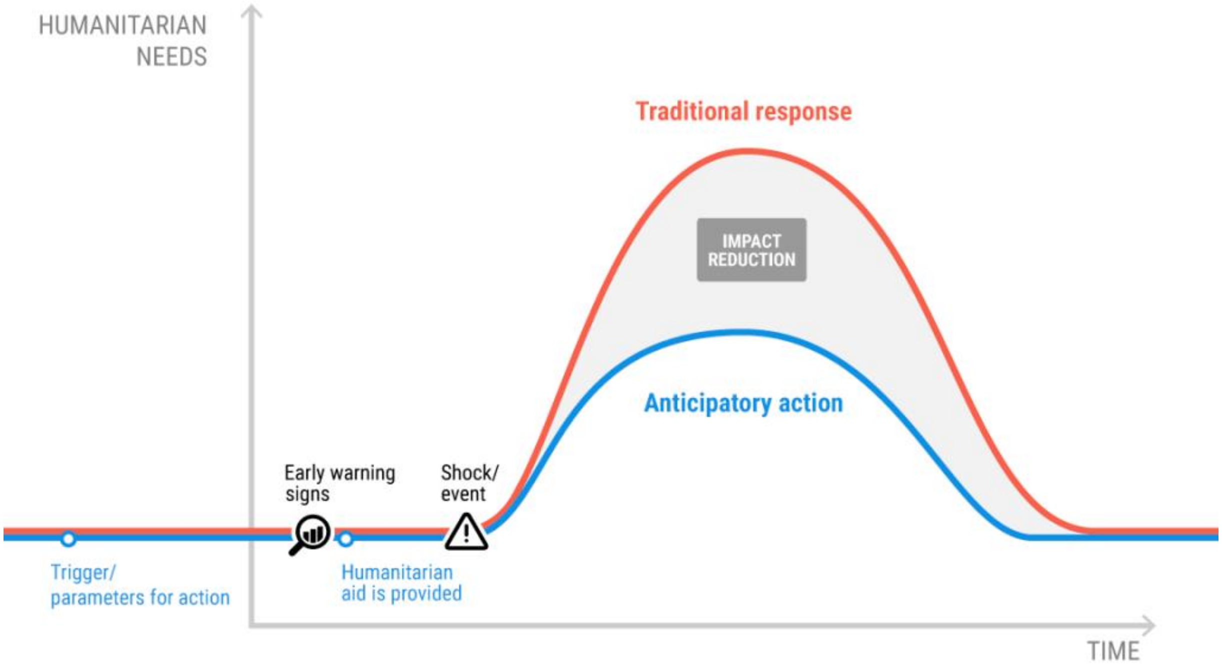
While trying to predict emergencies before they happen has long been a part of humanitarian aid (Maxwell et al., 2020), the ongoing impacts of climate change have increased the urgency for greater preparedness and risk mitigation for climate hazards in humanitarian contexts. Such proactive approaches are based on predictive risk analysis as opposed to more traditional needs-based assessments and have generated widespread interest among policymakers in the humanitarian sector, including high-level UN officials, the Red Cross/Red Crescent Movement, international NGOs and consortiums, and donor governments.

The gap in the collection, analysis, and use of climate-risk data has been recognized throughout the humanitarian program cycle and in global frameworks on climate change adaptation (CCA) and disaster risk reduction (DRR). Key frameworks including the Sendai Framework for Disaster Risk Reduction (2015-2030), the 2030 Agenda for Sustainable Development, and the UNDRR Guidance Note on Integrating Disaster Risk Reduction and Climate Change Adaptation in the UN Sustainable Development Cooperation Framework (2020b) have all recognize the need for smarter policy solutions to hydrometeorological risks (See Annex I for a full list of relevant policy frameworks).

Inter-agency humanitarian evaluations in Mozambique and Ethiopia have also identified the need for better preparedness and early warning systems based on predictive data (Baker et al., 2020; Steets et al., 2019). In 2019, the IASC revised its template for Humanitarian Needs Overviews (HNOs) to include a section on risk analysis which was accompanied by an interagency guidance note on analyzing risks and determining the most likely evolution of the humanitarian situation (OCHA, 2020). This document was the first specific guidance on the use of risk analysis in HNOs and "requires Humanitarian Country Teams (HCTs) to project the evolution of current humanitarian consequences and needs, including types, numbers and locations of people in need, based on a risk, vulnerabilities and capacities analysis" (UNDRR, 2021). These analyses are typically produced by country-level cluster coordination partners through a one-time "HNO analysis workshop" and rely heavily on data from the INFORM risk index (See Annex II for review of the risk analysis in HNOs and Humanitarian Response Plans [HRPs] from 2020 to 2022).

One approach to disaster preparedness and risk mitigation which has received significant attention is **anticipatory action**. Anticipatory action (AA) is an approach to humanitarian response in which aid is distributed in anticipation of a crisis with the goal of mitigating its humanitarian consequences (OCHA, 2019, as cited in de Wit, 2019). It is designed to provide faster, more cost-effective, and dignified aid to affected communities. As shown in Figure 2 below, AA approaches rely on several key components, including multiple sources of data, well-developed predictive models and triggers, and a variety of response activities.

Figure 2. Timeline of Anticipatory Humanitarian Action.



Source: Centre for Humanitarian Data (n.d.).

In September 2021, OCHA and the Governments of Germany and the UK convened a high-level virtual event on AA. The event was opened by the UN Secretary-General and garnered tens of millions of dollars in commitments towards AA (Aly, 2021). The need for AA was also highlighted in one of five draft resolutions on humanitarian assistance approved by the UN General Assembly in December 2021. Most recently, in remarks on the launch of the 2023 Global Humanitarian Overview, the UN Under-Secretary General for Humanitarian Affairs and Emergency Relief Coordinator (USG/ERC) Martin Griffiths cited recent floods in Pakistan and Bangladesh as evidence of the importance of preparedness and risk mitigation and reiterated OCHA's commitment to expanding their AA pilot (OCHA, 2022b). This increased attention to and funding for AA is evidence of an opening window of opportunity to address the effects of climate change through data-driven solutions with the support of key policy entrepreneurs throughout the humanitarian ecosystem.

Key Funding Pledges from the OCHA High-Level Event on Anticipatory Action.

- The UN Food and Agriculture Organization (FAO) pledged that at least 20 percent of emergency funding will go to AA by 2025;
- Save the Children pledged 15 percent of flexible funding towards AA by 2024;
- Google announced a 1.5 million USD grant to the Centre for Humanitarian Data for forecasting and predictive models (Aly, 2021).

3.1. Long-Term Trends

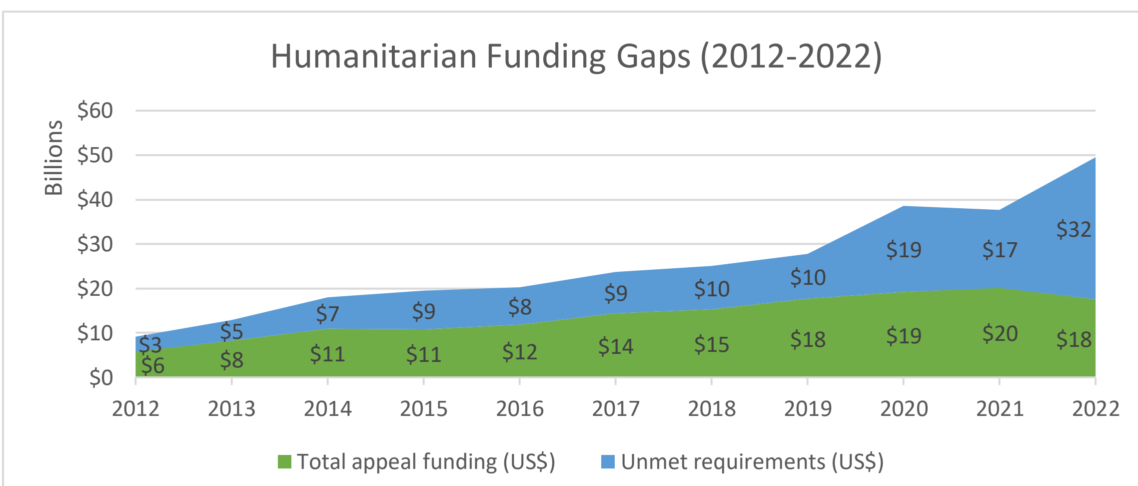
This growing interest in proactive measures is especially relevant in light of several long-term trends which are likely to increase the importance of data-driven preparedness and risk mitigation to address flooding and droughts in humanitarian response.

- **Predictions are likely to improve.** The potential for accurate and timely data has dramatically improved in recent years due to the rapid pace of technological advancement, remote sensing capabilities, and advanced modeling techniques. According to research from the Start Network, 20 percent of humanitarian needs from 2014-2017 were highly predictable, and another 35 percent were at least somewhat predictable (Weingärtner & Spencer, 2019).

- **Climate change is likely to worsen.** In the absence of a dramatic change in global climate action, the IFRC predicts that 200 million people will be in need of climate-related disaster assistance by 2050—a 50 percent increase from 2018 levels—and the cost of climate-related disasters will increase by 20 billion USD by 2030 (IFRC, 2019).

- **Large humanitarian funding gaps are expected to persist.** In 2021, the humanitarian system experienced a funding gap of over 17 billion USD, and this gap has been increasing for most of the past decade, as shown in Figure 3 below (OCHA FTS, 2022). As humanitarian actors try to do more for less, greater preparedness offers a potential strategy to increase cost-effectiveness. According to an impact evaluation of the OCHA AA pilot program in Bangladesh, the total cost of the humanitarian response per person reached was around $18 compared to $26 for similar flooding events prior to the pilot program (Moser, 2021).

Figure 3. Trends in Humanitarian Funding.



Source: Author's own elaboration. Data from OCHA FTS (2022).

4. Client Overview

IMPACT Initiatives is a Geneva-based think-and-do tank which aims to inform evidence-based decision-making in the international aid system through data, partnerships, and capacity building programmes. Its mission is "to shape practices and influence policies in humanitarian and development settings in order to positively impact individuals and communities." In 2021, IMPACT announced a new commitment to informing the humanitarian aid community's efforts to increase climate resiliency through its REACH, PANDA, and AGORA initiatives.

4.1. IMPACT's Current Climate Portfolio

IMPACT Initiatives has conducted assessments of flood hazards, susceptibilities, and risks in Yemen (March 2020), the Central African Republic (July 2020), Syria (January 2021 and February 2023), Nigeria (October 2022), South Sudan (October 2022), and Ukraine (September 2022 and February 2023). These analyses leverage publicly available data to model flood susceptibility and provide essential information for implementing partners. They improve upon pre-existing global flood risk data by providing greater granularity and interpretability. In addition to examples mentioned above, REACH has also utilized a key informant methodology in Jonglei State, South Sudan (December 2020) and Northwest Syria (March 2021) to gather detailed data about knowledge, attitudes (KAP) and practices and humanitarian impacts related to flood risks and preparedness.

IMPACT's expertise in local flood susceptibility analysis is an important strength. However, in order to effectively address the information gap in climate-risk data, these analyses must be integrated with data from assessments of local hazards, vulnerabilities, and coping capacities. The combination of both flood susceptibility analysis and the KAP survey in Northwest Syria offers a promising example of this more integrated approach and should be seen as a potential model for future analyses.

Relative to research on flood hazards, recent analyses focused on drought conditions in Somalia (January and August 2022) and Greater Kapoeta, South Sudan (March 2022) are relatively weaker in terms of predictive analysis but have a stronger emphasis on food security, WASH, and health needs. Among these selected examples, the Greater Kapoeta assessment provides the most information on anticipated seasonal variations in drought conditions and the relationship between meteorological drought and agricultural drought. It also incorporated data from the Standardized Precipitation Evapotranspiration Index (SPEI) and Vegetation Condition Index (VCI). These data sources provide important explanatory information but could also be used in predictive drought analyses at the local level in this context. This would require combining past SPEI and VCI data and historical rainfall patterns with real-time monitoring of local weather patterns to develop a locally-specific prediction model for future drought events.

4.2. Area-Based Approach

IMPACT Initiatives is now seeking to expand its ABA portfolio to provide better information the impacts of climate change on particularly risk-prone communities at the local level. ABAs are a specific tool used to identify the needs and capacities of a local settlement community and provide in-depth information on the impact of a humanitarian crisis on local systems (including basic services, infrastructure, and natural resources). ABAs rely on an in-depth participatory assessment of needs and local solutions at the level of an area targeted for humanitarian interventions.

Overall, IMPACT is well-placed to address flood and drought risks through an area-based approach. Existing flood and drought analyses from IMPACT/REACH demonstrate clear expertise in the use of publicly available data to understand local hydrometeorological risks. If properly integrated into existing ABAs, these tools can provide the basis for effective, locally-grounded disaster risk management (DRM), CCA, and AA. IMPACT and its partners' focus on local response planning offers a comparative advantage relative to national-level preparedness approaches. The findings of this APP will inform the development of new tools, indicators, and methodologies for IMPACT to assess climate-related risks with the ultimate goal of aligning IMPACT's information products with the kinds of data needed for the design of effective policy solutions for drought and flood risks in humanitarian settings.

5. Background

The occurrence of floods and drought hazards does not create disaster risk (i.e., the potential loss of life, injury, or destroyed or damaged assets). Rather, *disaster risk* is determined probabilistically as a function of hazard, exposure, vulnerability, and capacity. Note that the exact formula used to calculate risk varies according to the source (cf., INFORM, n.d.; UNDRR, n.d.; World Risk Report, 2022), but the vast majority are conceptually equivalent to the following equation:

$$Risk = \frac{Hazard \times Exposure \times Vulnerability}{Capacity}$$

Where,

- Hazard = a process, phenomenon, or human activity that may cause loss of life, injury, or destroyed or damaged assets (e.g., flood, drought);
- Exposure = the scale of people, infrastructure, housing, and other tangible human assets located in hazard prone areas;
- Vulnerability = physical, social, economic, or environmental factors which increase or decrease susceptibility to impacts of a hazard;
- Capacity = ability of people, organizations, and systems, using available skills and resources to manage adverse conditions, risk, or disaster (UNGA, 2016).

Thus, the devastating consequences of heightened flood and drought risks facing local communities—such as the 673,000 new drought-induced displacements in Somalia between January and June 2022 and the 1.1 million people displaced by monsoon floods in Bangladesh—are not inevitable (OCHA, 2022a). They are the direct and indirect result of policy failures at multiple steps of the policymaking and implementation process.

5.1. Where Current Policies Have Failed to Support Locally-Led Action

Current policies do not support locally-grounded climate action due to the gaps and limitations of existing data sources, funding mechanisms, and programming approaches.

5.1.1. Existing Data Sources. In recent years, significant progress has been made towards improving the availability and interpretability of climate-risk data. Global risk analyses and early warning systems have increased the availability of critical information to decision-makers globally. However, these tools and similar weather prediction models often do not provide the level of granularity necessary for locally-led humanitarian action. In Myanmar, for example, MacLeod et al. (2022) note that the reliability of flood predictions from the Global Flood Awareness System (GloFAS) and the Global Flood Forecasting Information System (GLOFFIS) is highly variable depending on the area with some areas benefiting from highly accurate predictions while others lack reliable data. The authors suggest that these models could be improved through the incorporation of real-time upstream riverine measurements.

Even when hazards are theoretically highly predictable, effective policy solutions requires that data on these hazards is actually collected, analyzed, shared, understood, and acted upon by humanitarian agencies (Lentz & Maxwell, 2022). As illustrated by Levine et al. (2020), there are compelling reasons why humanitarian actors might be resistant to implementing proactive approaches to disaster risks, including the immense scale of *present* humanitarian needs, making utilization difficult.

5.1.2. Existing Funding Mechanisms. Even when high quality local data is available, humanitarian actors still need to secure funding for any programmatic interventions. However, this funding is often difficult to obtain, especially for preparedness and DRR activities. Only five percent of total humanitarian funding goes to DRM and less than one percent goes to AA (Dupraz-Dobias, 2022; Weingärtner & Spencer, 2019). This low level of funding is compounded by the low proportion of funding toward local and national actors for *any* type of humanitarian assistance—in 2020, only 3.1 percent of total humanitarian aid went to these groups (Dizolele et al., 2022). Thus, assuming that local actors are just as likely to devote funds to DRR as international actors, just 1.6 percent of total funds would be spent on locally-led DRR measures.

Only 5% of total humanitarian funding goes to disaster risk reduction and less than 1% goes to anticipatory action.

This gap in funding is in part a result of the lack of support from humanitarian funders. Donor governments such as the United States, Germany, the European Commission, and the United Kingdom are often unable or unwilling to mobilize funds for a disaster that had yet to occur, particularly given the scale and scope of present humanitarian needs (Levine et al., 2020). Moreover, the UN Central Emergency Response Fund (CERF) managed by the UN Office for the Coordination of Humanitarian Affairs (OCHA) is a major source of funding for rapid onset and underfunded humanitarian emergencies, but its "life-saving criteria" explicitly disallows preparedness and DRR interventions (CERF, 2020).[2]

5.1.3. Existing Programming Approaches. Existing programming approaches to tackle flood and drought risks are often not locally-led, not adopted at scale across the humanitarian sector, and/or based on insufficient data and risk analysis. The primary guidance for DRR in humanitarian settings is the UNDRR Guidance Note for Scaling Up DRR in Humanitarian Action (UNDRR, 2021). However, despite increased attention to this issue at the global level and the inclusion of risk analysis in all HNOs since 2020 per the interagency guidance note on analyzing risks, these efforts have not necessarily translated into better preparedness or DRR as reflected by HRPs (See Annex I). Moreover, both the UNDRR guidance note and the HNO risk analysis template are targeted at the country-level and are not intended to prioritize locally-led action.

AA—which is often viewed as more compatible with humanitarian action than DRR due to its short-term focus on "emergency response"—has received greater attention among humanitarian actors than DRR but still struggles with localization and data availability. Pilot programs have been undertaken in more than half a dozen countries but have struggled with a lack of local participation (in the Philippines), delayed activation (in Ethiopia, Somalia, and Sudan), and unexpectedly high levels of vulnerability among target populations due to unpredicted overlapping emergencies (in Bangladesh, Ethiopia, and Mozambique) (de Suarez et al., 2021; Gettliffe, 2021; Gros et al., 2019; Sozi, 2021; Start Network, 2022; Tozier et al., 2022; van den Homberg, 2020). Aly (2021) points to these kinds of operational challenges as the primary reason why fragile and conflict-affected states have thus far been excluded from many AA pilot programs.

5.2. Consequences of Policy Failures

The failure to effectively collect, analyze, and use predictive climate risk data to respond to extreme hydrological events results in the preventable loss of lives and livelihoods, delayed and more expensive humanitarian response efforts, and increased vulnerability to future climate shocks.

5.2.1. Loss of Lives and Livelihoods. While available evidence on data-driven climate action remains limited, several recent program evaluations suggest that better predictive analytics can

[2] Note that these strict "life-saving criteria" are limited to CERF funds and do not apply to other OCHA-led initiatives, including the UN Disaster Assessment and Coordination system (UNDAC) which supports preparedness in disaster-effected countries (UNDAC, 2022).

save lives and livelihoods. An early 2009 study by the IFRC found that the number of lives lost relative to the total number of people affected during seasonal floods in West and Central Africa was reduced by nearly 44 percent following the implementation of an early action approach. More recently, in a 2021 evaluation of the AA pilot program in Bangladesh, the UN Food and Agriculture Organization (FAO) found that the successful use of flood risk data allowed for the rapid distribution of watertight storage drums and animal feed to affected communities, and that families who received this aid saved more rice seeds and were less likely to sell off livestock than those in similar areas who did not receive aid (FAO, 2021). Similarly promising results were also found in after-action reviews of OCHA AA pilots in Ethiopia and Somalia during the 2021 drought (Abdelmoula, 2021; Sozi, 2021).

5.2.2. Financial Costs to the Humanitarian System. In addition to undermining the basic humanitarian imperative to address human suffering wherever it is found, the lack of accurate climate risk data can also increase the financial costs of humanitarian response. A recent meta-analysis of 25 evaluations of AA programs suggests that AA approaches are generally more cost-effective than traditional humanitarian response (Weingärtner et al., 2020). For example, WFP (2019) estimates that AA in Nepal yielded an immediate cost savings of 34 USD per dollar invested and reduced long-term recovery.

5.2.3. Reduced Resilience and Early Recovery. The lack of effective risk reduction and early action in humanitarian settings contributes to reduced community resilience and slower recovery after a flood or drought occurs. While more research is needed to fully understand this link, initial evidence suggests that AA can contribute to overall resilience in humanitarian settings, especially in communities which experience cyclical disasters, for example, by protecting agricultural seeds and livestock or providing cash transfers to reduce reliance on high-interest debt post-disaster (Anticipation Hub, n.d.).

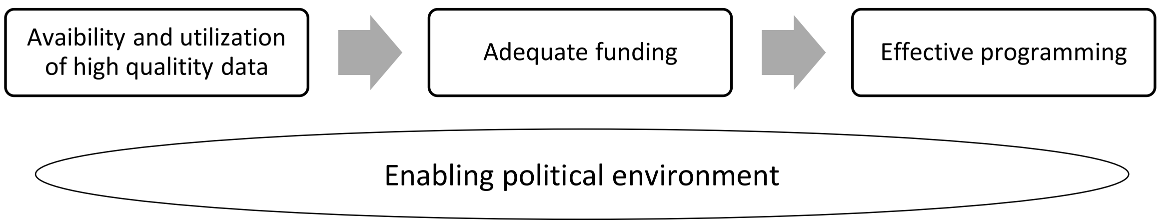
5.2.4. Bias and Impartiality. While the use of predictive analytics can in theory help identify and address the specific disaster-related risks facing vulnerable populations such as women and girls, people with disabilities, elderly, migrants, LGBTQ+ people, and ethnic and linguistic minorities, (Jones et al., 2020), existing climate-related data and early warning systems often do not achieve this goal. For example, in a 2019 study of flood early warning systems, Brown et al. found that women in Nepal were 20 percentage points less likely to be aware of safe evacuation routes in the event of flooding and 44 percentage points less likely to have participated in a vulnerability and capacity assessment during the design phase of the early warning system.

The existing triggers for many national-level AA pilots also contribute to inequitable outcomes. Under OCHA's pilot program, most drought-related triggers rely on data from the Integrated Food Security Phase Classification (IPC) which does not recommend gender-disaggregated data for most of its indicators despite widespread evidence that women and girls are more likely to experience food insecurity within the household (Ward, 2022). Thus, under the status quo, funding will not be released until household or area-level food insecurity metrics reach a particular threshold, even though women and girls may have experienced heightened food insecurity for months prior.

6. Review of Existing Methods and Risk Analysis Tools

In order for humanitarian action to successfully equip local actors to adequately address flood and drought risks in their communities and avert the harmful consequences of inaction, all of the gaps and limitations described in the previous section (i.e., availability and utilization high quality data, adequate funding, and effective programming) must be addressed; there must be alignment between data, funding, and programming decisions; *and* there must be an enabling political environment which supports locally-led risk-informed action, as shown in Figure 4 below.

Figure 4. Policy Design Process for Locally-Led Climate-Risk Action.



Source: Author's own elaboration.

Given IMPACT Initiatives' comparative advantage in data collection and analysis, this report will focus on solutions to address the first component of this process: availability and utilization of high quality, locally-specific climate risk data.

There are several existing tools which aim to solve this problem by providing data on climate-related risks and hazards. These include:

- Index for Risk Management (INFORM) [General risk analysis]
- Global Flood Awareness System (GloFAS) [Flood hazard, real-time]
- Global Flood Forecasting Information System (GLOFFIS) [Flood hazard, predictive]
- Standardized Precipitation Evapotranspiration Index (SPEI) [Drought hazard, real-time]
- Vegetation Condition Index (VCI) [Drought hazard, real-time]
- Integrated Food Security Phase Classification (IPC) [Food insecurity, real-time and predictive]
- Tropical Applications of Meteorology using Satellite data (TAMSAT) [Drought, predictive]

While each of these data tools has strengths and weaknesses, none provide the complete and accurate information necessary for locally-led action on flood and drought risks in humanitarian settings (either lacking comprehensive local-level data or in-depth vulnerability and capacity analysis), and most do not provide user-friendly presentations of the data and findings.

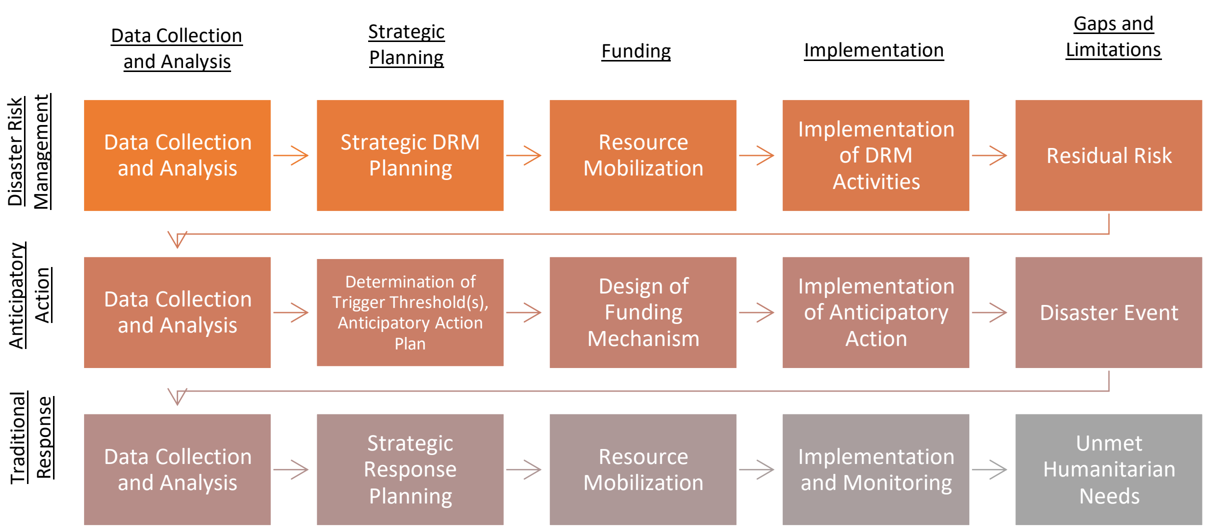
Instead, Lentz and Maxwell (2022) recommend a reverse-engineered approach to policy development in which policymakers begin by determining the set of potential hazards and actions which could be undertaken to mitigate their impact and *then* assess the kinds of information which are needed to inform those actions. Lentz and Maxwell (2022) go on to write: "Rather than ask, 'What can we do with the information (early warning and otherwise) that we have to inform action?' we propose asking, 'What information do we need for anticipatory (and other) action?'" It is this approach that is explored in greater detail in the following sections.

"Rather than ask, 'What can we do with the information (early warning and otherwise) that we have to inform action?' we propose asking, 'What information do we need for anticipatory (and other) action?'"

7. Programming Approaches

There are a range of programming options that local, national, and international humanitarian actors can use to address flood and drought hazards. **However, given the reality of limited resources and capacities at the global and local levels, it is important to understand which kinds of programming options are most likely to be effective for a particular locality before undertaking an intensive ABA.** This section outlines three of the most promising categories of programming interventions which should be considered to address flood and drought risks within the context of an area-based approach. Note that while each programming option follows the same program cycle as shown in Figure 5 below, the timing, data requirements, and kinds of response activities differ between each programming option, meaning that the kinds of research questions and key indicators needed to inform effective strategic planning will differ between these alternative frameworks. Under any approach, the self-identified needs of the local community are at the center of the assessment and strategic planning process.

Figure 5. DRM, AA, and Traditional Response Program Cycle.



Source: Author's own elaboration.

The following sections describe these approaches, including a checklist of specific activities which may be undertaken within each broader policy orientation for both flood and drought hazards. For all programming options considered below, the responsibility for strategic planning and implementation of humanitarian response is shared among a range of stakeholders, including civil society, local/national government, UN agencies, international humanitarian NGOs, and development actors as well as the private sector and donors.

Under the area-based approach used by IMPACT Initiatives, the research process involves close coordination with local authorities and humanitarian actors, and the geographic focus is assumed to be a specific settlement, defined as “the place where people live as a socially defined and spatially bound unit, which reflects the interaction of dynamic social, cultural, economic, political and environmental features in space and time” (Urban Settlements Working Group, 2020, p. 9). Once an ABA is completed, its findings are disseminated by IMPACT to funders and local partners, but it is the responsibility of external agencies to take up the recommendations and implement appropriate programming solutions.[3] The funding for program implementation may be obtained through donor government agencies (e.g., the U.S. Agency for International Development [USAID], the UK Foreign, Commonwealth, and Development Office [FCDO], the European Civil Protection and Humanitarian Aid Office [ECHO]) and pooled humanitarian funds such as the UN Central Emergency Response Fund (CERF) and country-based pooled funds (CBPFs) and distributed to implementing actors by the coordination group.

7.1. Traditional Response

Traditional disaster response refers to actions taken directly before, during, or immediately after a disaster in order to save lives, reduce health impacts, ensure public safety, and meet the basic subsistence needs of the people affected (UNGA, 2016). It focuses on the immediate and short-term needs of affected populations. Traditional humanitarian response takes place immediately after a flood or drought event occurs and continues until basic needs have been met and relevant actors can transition into more long-term, development-focused activities.

For flood and drought hazards, there are a range of primary support services which can be provided as a component of traditional response, which are listed in Table 1 below.

[3] Depending on the structure and goals of a specific area-based project, the follow-up/strategic planning and implementation process may also be led by AGORA, an interagency initiative of IMPACT Initiatives and ACTED.

Table 1. Traditional Response Programming Options.

Flood Hazards	Drought Hazards
✓ Emergency shelter ✓ Food assistance ✓ Health and WASH services ✓ Community-based protection (including livelihoods assistance/cash transfer programming)	✓ Emergency shelter ✓ Food assistance ✓ Health and WASH services ✓ Community-based protection (including livelihoods assistance/cash transfer programming)

7.2. Anticipatory Action

AA refers to actions taken in anticipation of a crisis, either before the shock or at least before substantial humanitarian needs have manifested themselves, which are intended to mitigate the impact of the crisis or improve the response (OCHA, 2019, as cited in de Wit, 2019). Anticipatory actions are implemented once a pre-determined trigger (e.g., rainfall) meets a specific threshold (e.g., 30 mm of rainfall in 2 days) and (in theory) before the anticipated flood or drought event occurs. While this timeframe may vary according to the specific context and type of hazard, it is typically less than 3 months and more than 48 hours ahead of the anticipated event.

The primary forms of support which can be provided under the alternative are listed in Table 2 below (cf., FAO, 2021; Gros et al., 2022; Start Network, 2022).

Table 2. AA Programming Options.

Flood Hazards	Drought Hazards
✓ Sandbags around rivers and tributaries ✓ Watertight storage vessels for seeds and other valuables ✓ Raising and reinforcing shelters ✓ Drain clearage	✓ Pre-positioned food storage ✓ Livestock vaccinations and animal medical kits

7.3. Disaster Risk Management

Disaster risk management (DRM) is the application of disaster risk reduction policies and strategies to prevent new disaster risk, reduce existing disaster risk, and manage residual risk, contributing to the strengthening of resilience and reduction of disaster losses (UNGA, 2016). Community-based DRM promotes the involvement of potentially affected communities in program activities at the local level. This includes community assessments of hazards, vulnerabilities, and capacities and their involvement in planning, implementation, monitoring, and evaluation of local action. DRM must be implemented well-ahead of an identified flood or drought hazard. While the exact timeline depends on the specific kind of DRM activities, this report will focus on DRM activities which can be expected to be completed between 24 and 3 months ahead of a disaster event.

The primary forms of support which can be provided under the DRM alternative are listed in Table 3 below.

Table 3. DRM Programming Options.

Flood Hazards	**Drought Hazards**
✓ Raising and reinforcing shelters ✓ Digging drainage channels ✓ Graveling pathways ✓ Relocation or evacuation planning ✓ Nature-based interventions/green infrastructure ✓ Flood safety training/community education	✓ Drought-resistant crops and animals ✓ Well/borehole rehabilitation ✓ Community education and awareness raising on drought-resistant farming and livelihoods practices

8. Key Criteria

Within an area-based approach, effective programming solutions must adequately address the self-identified needs of the local community in relation to flood and drought risks. In order to do this, it must be, at a minimum, **technically and politically feasible**. If these criteria are met, the area-based approach should prioritize the programming options that have the greatest **cost-benefit ratio** and are the most **timely** and **equitable**.

For the purposes of this report, these criteria will be defined and operationalized according to the definitions provided in Table 4 below. The key areas of focus represent key considerations for how well a given approach would perform in a particular settlement area, and the sources of evidence identify the references which can be used to project outcomes against each of the identified criteria.

Table 4. Criteria Matrix.

Criteria	Definition	Key Areas of Focus	Sources of Evidence
Technical Feasibility	Can this programming option feasibly be implemented based on the currently available scientific knowledge and logistical constraints?	Predictability of hazard	Scientific literature
		Transportation logistics[4]	Data from the Humanitarian Data Exchange, ReliefWeb from past flood events
Political Feasibility	Will relevant local and national government actors veto the proposed policy approach?	Host government opposition to long-term interventions for displaced populations	Public statements by local and national officials
Cost-Benefit Ratio	What is the ratio of anticipated benefits to anticipated costs to the local area? This includes both direct and indirect costs and benefits.	Food Security	Case studies from humanitarian and development program documents
		Health	
		Livelihoods	
Timeliness	How long from the start of implementation will the community begin to see benefits?	N/A	Case studies from humanitarian and development program documents
Equity	Will this programming approach equally benefit relevant population subgroups in the given settlement?	Women and children	Stakeholder consultations
		People with disabilities	
		Host communities and displaced people	
		Other marginalized groups (ethnicity, religion, etc.)	

Unlike other Applied Policy Projects, the goal of this technical report is not to recommend that IMPACT Initiatives prioritize one alternative approach over another across its entire ABA portfolio. Given the highly localized nature of flood and drought hazards and the diverse needs of local communities, there is no one-size-fits-all set of programming options to address flood and drought hazards. These programming alternatives—and therefore the assessment tools which seek to inform them—must be adapted for each settlement community. However, a global perspective can offer particular insights into what programmatic approaches are most likely to solve the problem of climate-related vulnerability, whether that be traditional response, DRM, or AA, based on the characteristics of the local community. This will be the task of the following sections on findings and recommendations.

[4] Note that this is mainly relevant to flood hazards which are likely to impact physical infrastructure such as roads and bridges in and out of settlements.

9. How Can Humanitarian Actors Determine Which Programming Approach to Adopt?[5]

The following sections describe, using available theoretical and empirical evidence, how well each approach scores against the five criteria identified above and the conditions under which each alternative will score well under the specified criterion. Note that the traditional response option is widely considered the status quo for area-based response to flood and drought hazards; therefore, the other alternatives will be described in relation to this benchmark.

Unique to this report, some outcomes can be predicted regardless of the community where an intervention takes place while others are highly variable. This report distinguishes between fixed criteria, for which likely outcomes do not vary significantly according to the local context or hazard, and variable criteria, for which likely outcomes depend in part or in whole on context-specific characteristics and cannot be assessed independently of specific cases. Table 5 (below) summarizes each alternative according to the five criteria.

[5] While the ultimate decision about which programming approach to adopt will often be made by external stakeholders, this analysis is intended to support IMPACT Initiatives' knowledge-leadership, strategic planning, and advice-giving on area-based approaches to flood and drought risks as well as to directly inform potential projects under the AGORA initiative.

Table 5. Outcomes Matrix.

	Traditional Response (Status Quo)	**Anticipatory Action**	**Disaster Risk Management**
Technical Feasibility (Variable, by location)	Biggest barrier to technical feasibility is *environmental access barriers*. Data source: ACAPS environmental barriers indicators	Biggest barrier to technical feasibility is *low prediction skill.* Data source: Brier prediction skill scores	*Few major barriers* to technical feasibility; therefore, DRM is considered highly technically feasible in all settings.
Political Feasibility (Variable, by location)	Biggest barrier to political feasibility is *political access barriers*. Data source: ACAPS political barriers indicators	Biggest barriers to political feasibility are *political access barriers and funding limitations*. Data source: ACAPS political barriers indicators + analysis of funding criteria from likely funders	Biggest barriers to political feasibility are *political access barriers, funding limitations, and resistance to long-term infrastructure development by national governments*. Data source: ACAPS political barriers indicators + analysis of funding criteria from likely funders + statements by national government officials.
Cost-Benefit Ratio Relative to Traditional Response (Variable, by hazard)	**Flood:** 0 **Drought:** 0	**Flood:** 34 (WFP, 2019 – Nepal) **Drought:** 2.5-7 (Atkinson, 2018 – Ethiopia; FAO, 2018; FAO, 2019; both cited in Weingärtner et al., 2020 – Sudan, Kenya, Madagascar, & Ethiopia)	**Flood:** 0 to 60 (Hugenbusch & Neumann, 2016; Mechler et al., 2014 – meta-analysis) **Drought:** 1.5-116 (Hugenbusch & Neumann, 2016 – meta-analysis)
Timeliness (Fixed)	24-72 hours after disaster occurs	**Before implementation:** 12 months, with considerable uncertainty **After implementation:** <6 hours after threshold is met	4-24 months, with certainty
Equity (Fixed)	Moderate	High	High

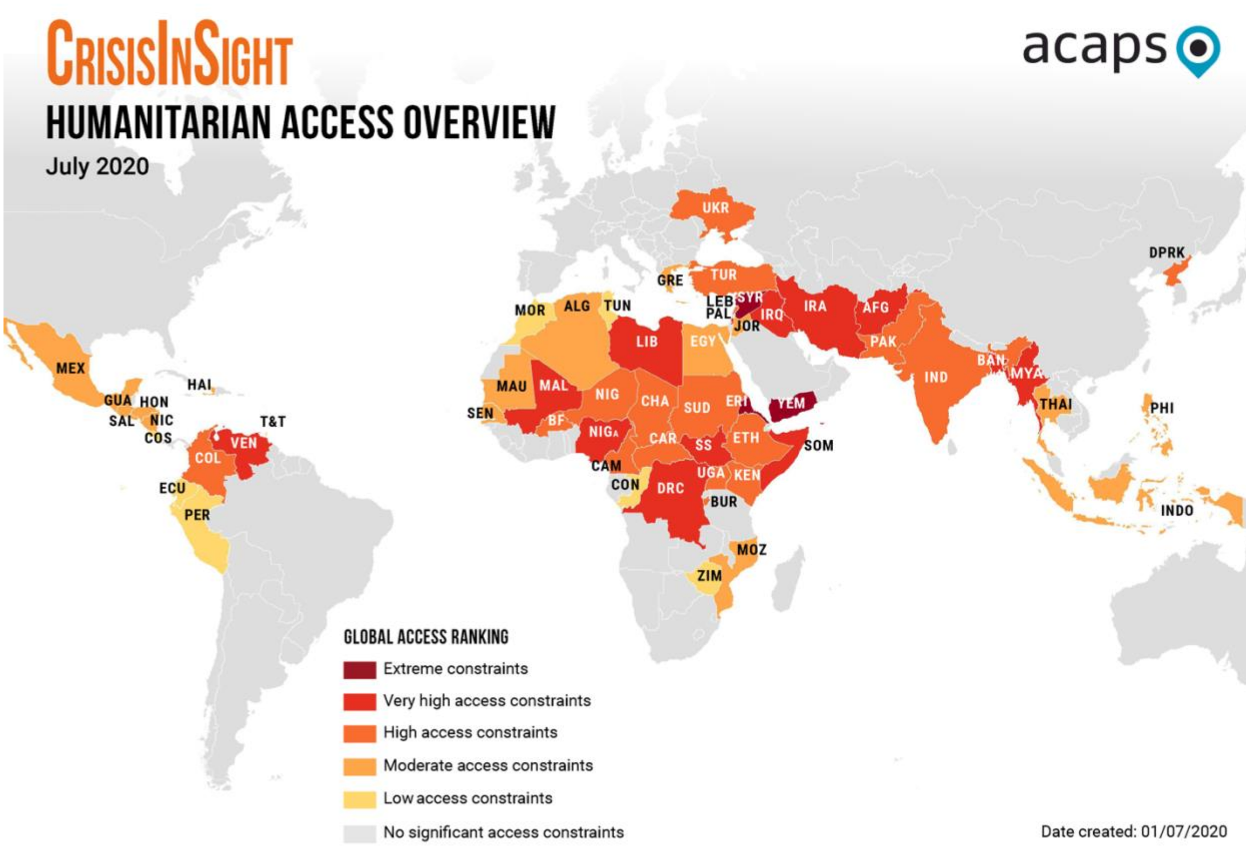
9.1. Technical Feasibility

Definition: Technical feasibility asks whether the programming option can feasibly be implemented based on the currently available scientific knowledge and logistical constraints.

Traditional Response

For traditional humanitarian response, the primary barriers to feasibility are related to humanitarian access, or the ability to physically connect affected populations with material resources and staff personnel. According to the most recent Humanitarian Access Overview (July 2022) from ACAPS, there are four countries with extreme access constraints, fifteen with very high constraints, and eighteen with high constraints (see Figure 6 below).

Figure 6. Humanitarian Access Constraints, January to June 2022.



Source: ACAPS (2022).

Barriers to access can be further divided into two categories: physical/environmental constraints (which determine technical feasibility) and political/security constraints (which impact political feasibility). Physical and environmental constraints are likely to provide the greatest barrier to technical feasibility for traditional response compared to the other alternatives because these programming options must take place *after* a flood or drought event has occurred. For example, delivering emergency shelter assistance after a flood event may be technically infeasible if all roads in and out of a particular community are flooded and have become unnavigable.

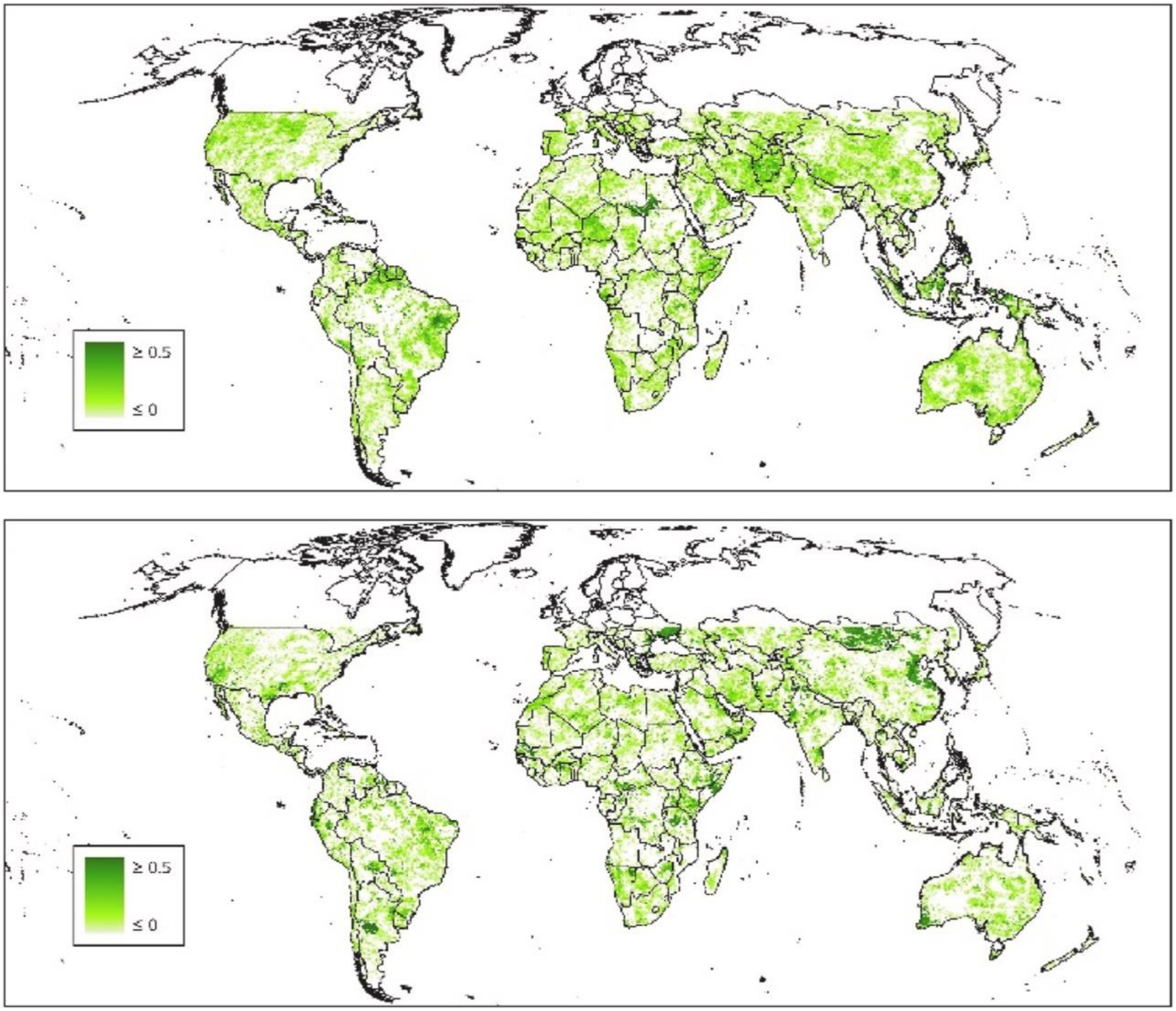
The technical feasibility of this alternative in a given country can be determined based on the number of environmental constraints identified in the most recent ACAPS report. A country with 3-4 constraints will have low technical feasibility; a country with 1-2 constraints will have moderate technical feasibility; and a country with no constraints will have high technical feasibility for this alternative.

Note that technical feasibility may also vary significantly at the sub-regional level. Therefore, the conclusions drawn from ACAPS data should be checked against the impressions of IMPACT's country teams and other local partners who may increase or decrease the rating based on their substantive experience with humanitarian access in the area. This can also be informed by IMPACT's remote sensing and geographic information system (GIS) capacities, particularly in areas with recurrent humanitarian crises where IMPACT has previously conducted research.

Anticipatory Action

Because AA can be designed and implemented ahead of a flood or drought event, it does not depend on the ability to overcome environmental barriers which occur as a direct result of the disaster event. Instead, the primary barrier to technical feasibility for AA is prediction skill or the extent to which flood and drought events can be accurately forecasted. According to Lala et al. (2022), forecast ability can be measured as the maximum prediction Brier skill scores from two major climate predictions (The National Centers for Environmental Predictions [NCEP] Climate Forecast System version 2 and the European Centre for Medium-Range Weather Forecasts [ECMWF] Seasonal Forecast System 5). Brier skill scores range from $-\infty$ to 1 with 1 signifying perfect prediction ability and scores less than zero signifying that the prediction model is a worse predictor of weather patterns than a simple historical average. The Brier skill scores shown in Figure 7 (below) are "month-to-month" scores, meaning they refer to the ability to predict a flood or drought event one month before it occurs. Figure 7 shows that eastern Brazil, East Africa, Afghanistan, and Indonesia all have high prediction skill scores for droughts, and coastal Ecuador and Peru, the Horn of Africa, and parts of Ukraine, Mongolia, and China all have high prediction skill scores for floods.

Figure 7. Global Drought (Top) and Flood (Bottom) Prediction Month-to-Month Brier Skill Scores.



Source: Lala et al. (2022).

Based on this map, it is determined that:

- **An area with a prediction score of 0.4 or higher has high technical feasibility for AA.**
- **An area with a prediction score between 0.2 and 0.4 will have moderate technical feasibility.**
- **An area with a prediction score of less than 0.2 has low technical feasibility.**

Disaster Risk Management

Unlike traditional response or AA, DRM does not require humanitarian access immediately following a disaster nor accurate climatological predictions. Like AA, however, it *does* require accurate vulnerability analysis to determine what areas are most at risk for particular hazards based on exposure, susceptibility, and coping capacity. The data for this kind of analysis is widely available (e.g., the INFORM risk index, the World Bank risk management tool) and can be supplemented by IMPACT's own remote sensing/GIS analysis to provide greater spatial resolution at the local level. Moreover, while specific DRM programs may be infeasible for a particular context, it is widely recognized that flood and drought risks are highly manageable. **Therefore, DRM is considered highly technically feasible for all areas.**

9.2. Political Feasibility

Definition: Political feasibility looks at whether or not relevant local and national actors will veto the proposed policy approach through government policy and/or the threat of violence.

Traditional Response

Analogously to technical feasibility, the political feasibility of the traditional response alternative in a given country can be determined based on the number of access-related political constraints identified in the most recent ACAPS report under Indicators 1-5 (Denial of Existence of Needs, Restriction, and Observation to Access Services, Impediments to Entry Into the Country, Restriction of Movement, Interference with Implementation of Humanitarian Activities)**.** A country with 13-18 constraints will have low political feasibility, a country with 7-12 constraints will have moderate political feasibility, and a country with 0-6 constraints will have high political feasibility.

Anticipatory Action

Like a traditional response, the political feasibility of AA is negatively affected by access-related political constraints. However, it can also face additional hurdles from humanitarian funders (donor governments like the US, UK, and EU and UN pooled funds) who are unwilling or unable to provide money for anticipatory programs due to strict "life-saving" criteria or other limitations. Therefore, it is necessary to consider the funding policies of the largest donors to humanitarian response in a given area:

- **If the funding criteria for major funders in a given area allow AA, political feasibility is the same as for traditional response.**
- **If funding criteria for major funders are unclear or only some allow funds to be used for AA, political feasibility is downgraded one level (i.e., high feasibility becomes moderate, moderate feasibility becomes low).**
- **If funding criteria for major funders does not allow AA, political feasibility is low.**

Disaster Risk Management

Politically, DRM confronts the most barriers. In addition to access-related constraints and funding criteria described above, national governments often oppose long-term investments in situations of forced displacement, believing that any long-term infrastructure investments would reduce the likelihood of displaced populations returning to their country or region of origin. For example, in Cox's Bazar, Bangladesh, the national government has prohibited humanitarian agencies from building any permanent structures in the settlement of over one million Rohingya refugees despite frequent cyclones and floods which often destroy the current bamboo and tarpaulin shelters (Ganguly, 2021). Political feasibility must therefore take into account any public statements by local and national governments about the kinds of long-term investments which would characterize DRM:

- **If national or local government officials have a stated policy prohibiting permanent shelter or other long-term investments, political feasibility for DRM is low.**
- **If there are strong anti-refugee or anti-IDP sentiments expressed by local or national government officials without a clear policy, political feasibility is downgraded one level from AA.**
- **If else, political feasibility is equal to political feasibility for AA.**

9.3. Cost-Benefit Ratio

Definition: Cost-benefit ratio is the ratio of expected benefits to costs, as reported in relevant literature and meta-evaluations, relative to traditional response.

Overall, there is very limited evidence on the cost of various humanitarian interventions, and the existing literature has significant gaps in both methodology and comprehensiveness (Weingärtner et al., 2020). Therefore, the outcomes discussed under this section should be considered highly preliminary.

Traditional Response
Traditional response is commonly used as a baseline in humanitarian cost-benefit analyses as it is considered unethical to provide no aid. Thus, according to the definitions adopted in this report, the cost-benefit ratio of traditional response is 0.

Anticipatory Action
There are several studies which attempt to calculate the cost-benefit ratio for AA programs addressing flood and drought risks. While there are some methodological limitations which will be discussed below, these studies generally find positive cost-benefit ratios for both types of hazards, in the range of 2.5-34 to 1.

In a recent review of Save the Children's early action response to drought in Ethiopia, Atkinson (2018) finds that the average cost-benefit ratio of the program was 2.6 to 1 with real per-household expenditures of approximately $140. However, there are several limitations to this study, including not taking into account potential false negatives and false positives of the trigger mechanism and the use of an unweighted average of "mild," "medium," and "severe" drought scenarios, which is not necessary an accurate representation of the counterfactual scenario. FAO (2019, cited in Weingärtner et al., 2020) finds that the cost-benefit ratio for a drought AA program in Madagascar was 2.5 to 1 with a sensitivity analysis suggesting a range between 1.8 and 3.6. Similar programs in Kenya, Sudan, and Ethiopia yielded a cost-benefit ratio of 6.7, 3.5, and 7 respectively (FAO, 2018, cited in Weingärtner et al., 2020). However, no further details were provided about the FAO studies.

For floods, WFP (2019) calculates an estimated cost-benefit ratio of 34 to 1 for a forecast-based financing program for floods in Nepal. They assume a 20 percent false negative rate and a 30 percent false positive rate for their trigger mechanism and calculate cost savings over a 20 year timespan to account for learning effects. The counterfactual scenario is the traditional humanitarian response to flooding in Nepal.

Disaster Risk Management

Compared to AA, DRM benefits from a broader body of cost-benefit research. Therefore, this section presents evidence from a meta-analysis of the costs and benefits of DRM programs, conducted by Hugenbusch and Neumann (2016). They find that the reported cost-benefit ratio for DRM programs ranges from 0 to 60 for floods and 1.5 to 116 for droughts (similar research by Mechler at al. [2014] finds that the average cost-benefit ratio for DRM for floods is 5). This large range points to the differential cost of structural interventions (such as building dykes and levees) compared to non-structural interventions (such as informational campaigns), with the former often being far more expensive. It is also important to note that these studies include many analyses from developed countries with higher costs for labor and materials.

9.4. Timeliness

Definition: Timeliness is defined as the time elapsed from the start of implementation of traditional response, AA, or DRM activities to when the community will begin to see benefits.

Traditional Response

Assuming that traditional response is technically and politically feasible, and sufficient funds are made available to carry out necessary activities, traditional humanitarian response has a short lead time. Aid can be distributed to affected populations as quickly as 24-72 hours after a flood or as soon as a drought event is widely recognized. While greater preparedness improves the quality and speed of aid delivered, traditional response as defined in this report assumes that the majority of resources and planning are mobilized after an event occurs, which by definition means a short gap between the start of implementation and the realization of benefits.

Anticipatory Action

Based on recent pilots, AA programs typically take around 12 months to develop and implement, and benefits are not actually realized until environmental conditions meet pre-specified trigger thresholds and resources are deployed. Once a trigger threshold is met, however, AA programs can be extraordinary timely. In a flood AA program in Bangladesh, for example, the UN Food and Agriculture Organization (FAO) reported that CERF funding was released less than 4 hours after river levels reached the agreed upon threshold and 19 days before peak flooding occurred (FAO, 2021).

Disaster Risk Management
The programming options identified under the category of DRM can take anywhere from 4 to 24 months to implement, a broadly similar timeline as AA. However, DRM has less uncertainty about the timeliness of benefits. Unlike AA which poses the risk of false negatives and false positives (or simply may not be triggered for many months), once fully implemented, DRM solutions immediately begin protecting the community from disaster risk.

9.5. Equity

Definition: Equity asks will this programming approach equally benefits relevant population subgroups in the given settlement.

Traditional Response
In terms of equity, traditional response can vary significantly between contexts. The fast (and at times haphazard) implementation process that generates short lead times also means that equity considerations are often inconsistently taken into account. While it is possible to have a highly equitable traditional response, the lack of planning and accurate real or near real-time data makes this outcome less likely compared to either AA or DRM, resulting in a ranking of moderate on this criterion.

Anticipatory Action
In terms of equity, AA has the potential to be highly equitable. According to Jones et al. (2020), the use of predictive analytics can help promote equity by identifying and addressing the specific disaster-related risks facing vulnerable populations such as women and girls, people with disabilities, elderly, migrants, LGBTQ+ people, and ethnic and linguistic minorities. Because AA frameworks are pre-specified before a disaster occurs, equity considerations can be “baked in” to the response plan instead of added piece-meal to a chaotic response effort. Therefore, AA scores highly on this criterion.

Disaster Risk Management
Like AA, DRM allows for greater planning and targeting of especially vulnerable populations. While the degree to which DRM (or AA) actually integrates equity considerations will depend on the level of disaggregation in the underlying assessment, it has the potential to specifically address the needs and capacities of especially vulnerable populations and therefore scores highly in terms of equity.

10. Findings

This structured analysis has highlighted a number of key lessons about the suitability of and ongoing knowledge gaps in applying DRM and AA approaches to humanitarian settings:

1) Technical feasibility is entirely variable based on context and cannot be systematically predicted. While political feasibility also varies according to context, it differs in that, in a given context, traditional response will always score better than or equal to AA, which will score better than or equal to DRM on this criterion.

2) While traditional response fairs well on the criterion of timeliness compared to the other two alternatives (recognizing that AA may outperform traditional response once effectively implemented), both DRM and AA score better in terms of equity, an important consideration given the widespread focus on the age, gender, and disability agenda in humanitarian response.

3) While this analysis has demonstrated that secondary data can be used to effectively determine which approach should be used in framing an area-based risk assessment (ABRA), it has also highlighted gaps in existing evidence. **Future policy research and scholarship** should focus on assessing the costs of alternative approaches, given increasing humanitarian funding gaps and the relative lack of methodologically-rigorous cost-benefit analysis. **IMPACT Initiatives** should also consider collecting additional data before undertaking a full ABRA through its remote sensing/GIS capacities to ensure that an appropriate approach is being used, given that much of the data used in this report to assess technical and political feasibility is at the national rather than local level.

11. Recommendations

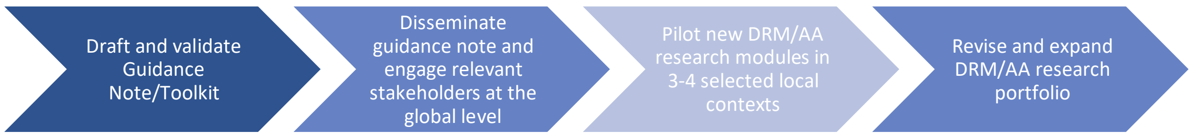
Given its strong performance on the criteria of technical feasibility, equity, and cost-benefit ratio, I conclude that DRM will often be the best approach for addressing flood and drought hazards in humanitarian settings, and IMPACT should prioritize developing an effective research toolkit for informing DRM programming. While the cost-benefit ratio for DRM has a large range, it is expected that interventions in humanitarian settings will be, on average, less expensive than the large, structural measures which are often used in more developed countries and therefore will still score well on this criterion relative to AA.

However, if the political feasibility of DRM programming is low or moderate (and the technical feasibility of AA is at least moderate), I recommend that IMPACT include an optional research module focused on AA. This is particularly appropriate given the high degree of overlap between the kinds of research questions which are necessary to inform DRM and AA approaches.

Finally, if timeliness is an overwhelmingly important criterion in a given local context, such as in the immediate aftermath of a major flood or drought event, IMPACT should focus its research efforts on traditional response, maintaining the status quo.

12. Next Steps

Figure 8. Implementation Plan.



Source: Author's own elaboration.

12.1. Guidance Note/Toolkit on Integrating DRM and AA into Area-Based Approaches

In order to better equip local communities to adequately address flood and drought risks through an area-based approach, IMPACT Initiatives should begin by developing a *Guidance Note/Toolkit on Integrating DRM and AA into Area-Based Approaches.* This guidance note should provide specific technical guidance to IMPACT's country teams on how to conduct an ABRA which includes modules on DRM and AA approaches. The research design described in this guidance note should address the following primary research questions:

(1) What are the hazards affecting this community? What is the exposure of the population and other assets to such hazards?
(2) What are the physical, social, economic, or environmental factors which increase or reduce the vulnerability of this community?
(3) What kinds of adaptations and coping strategies (positive and negative) have already been attempted, and what kinds of adaptations and coping strategies could be attempted that would lead to more comprehensive and sustainable community resilience?
(4) What information is already available to this community about hydrometeorological risks? What are perceptions of risk and existing information sources? What information tells you about future risks?
(5) Who are the actors responsible for the local disaster management system, and what are their capacities and needs for enhancing capacity?

12.2. Dissemination and Stakeholder Engagement

Throughout the research design process, IMPACT Initiatives should engage with a variety of internal and external stakeholders. This is essential to building support for the initiative among country teams who may be resistant to allocating additional time and human resources to already intensive ABAs and with external stakeholders such as the UN Office for Disaster Risk Reduction (UNDRR) and the START Network which are well-placed to fund and/or implement the strategic recommendations which emerge out of the research process.

This should include at least one (and potentially multiple) online presentations to various stakeholder groups to (1) solicit feedback on the draft guidance note/toolkit, (2) answer technical questions about implementing the guidance note/toolkit, and (3) link IMPACT Initiative's DRR and AA research with broader policy processes within the humanitarian sector. This is particularly important given that IMPACT is a relatively small organization and does not directly implement the humanitarian programs that it seeks to inform.

12.3. Pilot Stage

After drafting and validating its technical guidance, IMPACT should select 3-4 areas to pilot the new ABRA tool. These should be selected on the basis of the following criteria:

(1) Appropriateness for DRM and AA programming. As this report has demonstrated, not all locations are appropriate for DRM or AA programming. Therefore, IMPACT should focus on selecting areas with the highest potential suitability for these approaches based on the criteria outlined in this report. At least two of the selected areas should be strong candidates for local DRM programming and at least one of the selected areas should be a strong candidate for local AA programming.

(2) Previous engagement in-country. IMPACT Initiatives should select areas within countries where IMPACT has had a long-standing presence and/or conducted other recent major assessments (e.g., multi-sector needs assessments). This will increase the likelihood that in-country staff have the expertise needed to carry out a complex, multi-part research process with fidelity to the original guidance.

(3) Quality of local partners. IMPACT should prioritize areas where there is a strong local civil society and/or international organization presence which will likely be able to take up the recommendations of the ABRA. This is essential as the potential benefits of an assessment to local populations will only be realized insofar as they are taken up by partner organizations.

Note that apart from IMPACT's own previous engagement in-country, the information needed to select areas on the basis of these criteria are not likely to be readily apparent and may require additional data collection. Therefore, I recommend that IMPACT Initiatives conduct a scoping exercise (including initial remote sensing/GIS analysis to refine the recommendations which could be drawn from this report with respect to appropriateness) for at least 6 areas before selecting 3-4 for the initial pilot stage.

12.4. Monitoring and Evaluation

After the conclusion of the pilot stage, IMPACT Initiatives should assess the successes and failures of the initial ABRAs with the DRM/AA component. This process should include an appraisal of the technical, logistical, and political aspects of the research process, including most importantly, the outcomes for affected populations in communities where an ABRA was undertaken. Based on this appraisal, IMPACT should consider revising and expanding its DRM and AA research portfolio or reinvesting its resources into other areas if it is determined that this approach has not had meaningful impacts on local communities' ability to address flood and drought hazards.

References

Abdelmoula, A. (2021). After-action review: Somalia anticipatory action drought. UN CERF. https://cerf.un.org/sites/default/files/resources/21-RR-SOM-47081_Somalia_CERF_Report.pdf.

ACAPS. (2022). Humanitarian access overview: July 2022. https://www.acaps.org/sites/acaps/files/products/files/acaps_humanitarian_access_overview_july_2022_0.pdf.

Aly, H. (2021). The push to anticipate crises gains steam. *The New Humanitarian.* https://www.thenewhumanitarian.org/the-wrap/2021/9/13/the-push-to-anticipate-crises-gains-steam.

Anticipation Hub. (n.d.). Evidence database. https://www.anticipation-hub.org/experience/evidence-database/evidence-list.

Atkinson, E. (2018). Social cost benefit analysis of the early action fund. Save the Children. https://resourcecentre.savethechildren.net/document/social-cost-benefit-analysis-early-action-fund/.

Baker, J., Nichols, T., Alfonso, F., & Etajo, P. (2020). Inter-agency humanitarian evaluation of the response to Cyclone Idai in Mozambique**.** https://reliefweb.int/report/mozambique/inter-agency-humanitarian-evaluation-response-cyclone-idai-mozambique-july-2020.

Bardach, E., & Patashnik, E. (2015). Practical Guide for Policy Analysis: The Eightfold Path for More Effective Problem Solving, 5th eds. CQ Press.

Boult, V. L., Asfaw, D. T., Young, M., Maidment, R., Mwangi, E., Ambani, M., Waruru, S., Otieno, G., Todd, M. C., & Black, E. (2020). Evaluation and validation of TAMSAT-ALERT soil moisture and WRSI for use in drought anticipatory action. *Meteorological Applications*, *27*(5), e1959. https://rmets.onlinelibrary.wiley.com/doi/full/10.1002/met.1959.

Brown, S., Budimir, M., Sneddon, A., Lau, D., Shakya, P., & Crawford, S. U. (2019). Gender transformative early warning systems: Experiences from Nepal and Peru. Rugby, UK: Practical Action. https://wrd.unwomen.org/sites/default/files/2021-11/GENDER~1_1.PDF.

Centre for Humanitarian Data. (n.d.). Anticipatory action. https://centre.humdata.org/anticipatory-action/#:~:text=Additional%20resources-,What%20is%20anticipatory%20action%3F,needs%20arising%20from%20different%20shocks.

CERF. (2020). Central Emergency Response Fund: Life-saving criteria. https://cerf.un.org/sites/default/files/resources/CERF%20Life-Saving%20Criteria%202020.pdf.

De Suarez, J. M., Uprety, M., & Carthy, A. (2021). Evaluation report of OCHA's anticipatory action trigger: Ethiopia. Red Cross/Red Crescent Climate Centre. https://reliefweb.int/report/ethiopia/evaluation-report-ochas-anticipatory-action-trigger-ethiopia-26-april-2021.

De Wit, S. (2019). Getting ahead of crises: A thesaurus for anticipatory humanitarian action. https://cerf.un.org/sites/default/files/resources/Thesaurus_single%20column_WORKING_DRAFT.pdf.

Dizolele, M. P., Kurtzer, J., & Abdullah, H.F. (2022). Localizing humanitarian action in Africa. Center for Strategic and International Studies. https://www.csis.org/analysis/localizing-humanitarian-action-africa#:~:text=Funding%20given%20directly%20to%20local,after%20a%20fall%20in%202019.

Dupraz-Dobias, P. (2022). Most aid funds go to just a few disasters. What about the rest? *The New Humanitarian.* https://www.thenewhumanitarian.org/news-feature/2022/06/07/disasters-Peru-Nepal-aid-finding-risk-reduction#:~:text=Disaster%2Drelated%20financing&text=Ricardo%20Mena%2C%20UNDRR's%20director%2C%20told,towards%20disaster%20risk%20reduction%20measures.%E2%80%9D.

FAO. (2018). Horn of Africa. Impact of Early Warning Early Action. Protecting Pastoralist livelihoods Ahead of Drought. Rome: FAO.

FAO. (2019). Impact of Early Warning Early Action Madagascar. Protecting farming livelihoods from drought and food insecurity. Rome: FAO.

FAO. (2021). Bangladesh – Impact of anticipatory action: Striking before the floods to protect agricultural livelihoods. Dhaka. https://www.fao.org/3/cb4113en/cb4113en.pdf.

Ganguly, M. (2021). Rohingya refugees in Bangladesh at risk during monsoon. Human Rights Watch. https://www.hrw.org/news/2021/08/02/rohingya-refugees-bangladesh-risk-during-monsoon.

Gettliffe, E. (2021). UN OCHA anticipatory action: Lessons from the 2020 Somalia pilot. Centre for Disaster Protection. Working Paper No. 9. https://static1.squarespace.com/static/61542ee0a87a394f7bc17b3a/t/618d24e555a91564ba37ba2d/1636639974596/WP_9_22Oct.pdf.

Gros, C., Bailey, M., Schwager, S., Hassan, A., Zingg, R., Uddin, M. M., Shahjahan, M., Islam, H., Lux, S., Jaime, C., & de Perez, E. C. (2019). Household-level effects of providing forecast-based cash in anticipation of extreme weather events: Quasi-experimental evidence from humanitarian interventions in the 2017 floods in Bangladesh. *International Journal of Disaster Risk Reduction*, *41*, 101275. https://www.sciencedirect.com/science/article/pii/S2212420918313608.

Gros, C., Easton-Calabria, E., Bailey, M., Dagys, K., de Perez, E. C., Sharavnyambuu, M., & Kruczkiewicz, A. (2022). The effectiveness of forecast-based humanitarian assistance in anticipation of extreme winters: a case study of vulnerable herders in Mongolia. Disasters, 46(1), 95-118. https://onlinelibrary.wiley.com/doi/abs/10.1111/disa.12467.

Hugenbusch, D., & Neumann, T. (2016). Cost-benefit analysis of disaster risk reduction: A synthesis for informed decision making. Aktion Deutschland Hilft. https://www.aktion-deutschland-hilft.de/fileadmin/fm-dam/pdf/publikationen/ADH_Studie_EN_rev3.pdf.

IASC. (2016). The Grand Bargain. https://interagencystandingcommittee.org/grand-bargain.

IFRC. (2009). Early warning, early action an evaluation of IFRC West and Central Africa Zone flood preparedness and response 2008. Dakar: IFRC. https://www.preventionweb.net/files/12247_EarlywarningEN.pdf.

IFRC. (2019). The cost of doing nothing: The humanitarian price of climate change and how it can be avoided. https://www.ifrc.org/sites/default/files/2021-07/2019-IFRC-CODN-EN.pdf

INFORM. (n.d.). Methodology. European Commission Disaster Risk Management Knowledge Centre. https://drmkc.jrc.ec.europa.eu/inform-index/InDepth/Methodology.

Internal Displacement Monitoring Center. (IDMC, 2022). Global report on internal displacement 2022. https://www.internal-displacement.org/global-report/grid2022/.

IPCC. (2022). 6th assessment report: Impacts, adaptation, and vulnerability. https://www.ipcc.ch/report/ar6/wg2/downloads/report/IPCC_AR6_WGII_FullReport.pdf.

Jones, C., Guerten, N., Hillesland, M., & Koechlein, E. (2020). Applying an inclusive and equitable approach to AA. https://www.fao.org/3/cb1072en/cb1072en.pdf.

Lala, J., Lee, D., Bazo, J., & Block, P. (2022). Evaluating prospects for subseasonal-to-seasonal forecast-based anticipatory action from a global perspective. *Weather and Climate Extremes, 38*, 100510. https://www.sciencedirect.com/science/article/pii/S2212094722000895.

Lentz, E., & Maxwell, D. G. (2022). Anticipating, mitigating, and responding to crises: How do information problems constrain action? https://www.sciencedirect.com/science/article/abs/pii/S2212420922004617.

Levine, S., Wilkinson, E., Weingärtner, L., & Mall, P. (2020). Anticipatory action for livelihood protection. ODI. https://www.anticipation-hub.org/Documents/Policy_Papers/Anticipatory_action_for_livelihood_protection_a_collective_endeavour.pdf.

MacLeod, D., Easton-Calabria, E., Coughlan De Perez, E., & Jaime, C. (2022). Extreme weather events in Myanmar: data needs for more effective humanitarian action. *South Asia@ LSE.* http://eprints.lse.ac.uk/116552/1/southasia_2022_08_30_extreme_weather_events_in_myanmar_data_needs_for.pdf.

Maxwell, D., Lentz, E., Gottlieb, G., & Simmons, C. (2020). 2020 in hindsight? The ecosystem of humanitarian diagnostics and its application to anticipatory action. Tufts University: Feinstein International Center. https://fic.tufts.edu/publication-item/2020-hindsight-the-ecosystem-of-humanitarian-diagnostics-and-its-application-to-anticipatory-action/.

Mechler, R., Czajkowski, J., Kunreuther, H., Michel-Kerjan, E., Botzen, W., Keating, A., McQuistan, C., Cooper, N., & O'Donnell, I. (2014). Risk nexus. Making communities more flood resilient: The role of cost-benefit analysis and other decision-support tools. Zurich Flood Alliance. https://riskcenter.wharton.upenn.edu/wp-content/uploads/2020/03/ZAlliance-decisiontools-IB.pdf.

Moser, P. (2021). Acting before the flood: An anticipatory humanitarian action pilot in Bangladesh. OCHA. https://reliefweb.int/report/bangladesh/acting-flood-anticipatory-humanitarian-action-pilot-bangladesh-march-2021.

OCHA Financial Tracking Service (FTS). Appeals and response plans 2022. (2022). https://fts.unocha.org/appeals/overview/2022.

OCHA. (2020). Addendum HNO + HRP guidance: Analyzing risks and determining the most likely evolution of the humanitarian situation. https://reliefweb.int/report/world/addendum-hno-hrp-guidance-analysing-risks-and-determining-most-likely-evolution.

OCHA. (2021). Global Humanitarian Overview 2022. https://reliefweb.int/report/world/global-humanitarian-overview-2022.

OCHA. (2022a). Global Humanitarian Overview 2023. https://reliefweb.int/report/world/global-humanitarian-overview-2023-enaresfr.

OCHA. (2022b, December 1). Press conference on the launch of the 2023 Global Humanitarian Overview by Under-Secretary-General for Humanitarian Affairs and Emergency Relief Coordinator Martin Griffiths. Geneva, Switzerland. https://reliefweb.int/report/world/press-conference-launch-2023-global-humanitarian-overview-under-secretary-general-humanitarian-affairs-and-emergency-relief-coordinator-martin-griffiths-1-december-2022.

OCHA. (n.d.). Indicator registry. https://ir.hpc.tools/.

Sozi, C. (2021). After-action review: Ethiopia anticipatory action drought. UN CERF. https://www.unocha.org/sites/unocha/files/20-RR-ETH-46461_Ethiopia_CERF_Report_Final.pdf.

Start Network. (2022). Impact assessment of anticipatory action on flooding in Sudan. https://reliefweb.int/report/sudan/impact-assessment-anticipatory-action-flooding-sudan.

Steets, J., Meier, C., Berhanu, D., Tsehay, S., & Abreha, A. H. (2019). Inter-agency humanitarian evaluation of the drought response in Ethiopia. https://www.humanitarianresponse.info/sites/www.humanitarianresponse.info/files/documents/files/final_report_iahe_ethiopia.pdf.

Tozier, A., Clatworthy, Y., Easton-Calabria, E., Coughlan de Perez, E., Lux, S., & van Aalst, M. (2022). Managing multiple hazards: lessons from anticipatory humanitarian action for climate disasters during COVID-19. *Climate and development, 14*(4), 374-388. https://www.tandfonline.com/doi/full/10.1080/17565529.2021.1927659.

UN General Assembly A/71/644. (UNGA, 2016). Report of the open-ended intergovernmental expert working group on indicators and terminology relating to disaster risk reduction. https://www.preventionweb.net/files/50683_oiewgreportenglish.pdf.

UN General Assembly Draft Resolution A/76/L.27. (UNGA, 2021). Strengthening of the coordination of humanitarian and disaster relief assistance of the United Nations, including special economic assistance. https://documents-dds-ny.un.org/doc/UNDOC/LTD/N21/370/57/PDF/N2137057.pdf?OpenElement.

UN Sustainable Development Goals. (2015). https://sdgs.un.org/goals.

UNDAC. (2022). This is UNDAC. UN Disaster Assessment and Coordination. OCHA. https://www.unocha.org/sites/unocha/files/UNDAC_Brochure_2022.pdf.

UNDRR. (2015). Sendai Framework for Disaster Risk Reduction, 2015-2030. https://www.preventionweb.net/files/43291_sendaiframeworkfordrren.pdf.

UNDRR. (2020a). Human cost of disasters: An overview of the last 20 years (2000-2019). https://www.preventionweb.net/files/74124_humancostofdisasters20002019reportu.pdf?_gl=1*sf379i*_ga*MTM5MDAzMjc5Mi4xNjc5NTA1NDA1*_ga_D8G5WXP6YM*MTY3OTYxNjk3Ni40LjAuMTY3OTYxNjk4MC4wLjAuMA.

UNDRR. (2020b). Integrating disaster risk reduction and climate change adaptation in the UN Sustainable Development Cooperation Framework: Guidance note on using climate and disaster risk management to help build resilient societies. https://unsdg.un.org/resources/integrating-disaster-risk-reduction-and-climate-change-adaptation-un-sustainable.

UNDRR. (2021). Scaling up disaster risk reduction in humanitarian action 2.0: Recommendations for the humanitarian programme cycle. https://www.undrr.org/publication/scaling-disaster-risk-reduction-humanitarian-action.

UNDRR. (n.d.). Disaster risk. https://www.preventionweb.net/understanding-disaster-risk/component-risk/disaster-risk.

UNESCO. (2023). UN World Water Development Report 2023: Partnerships and Cooperation for Water. https://unesdoc.unesco.org/ark:/48223/pf0000384655.

Urban Settlements Working Group. (2020). Settlements approach guidance note: Where boundaries and action merge. IMPACT Initiatives.

Van den Homberg, M. J., Gevaert, C. M., & Georgiadou, Y. (2020). The changing face of accountability in humanitarianism: Using artificial intelligence for anticipatory action. *Politics and Governance*, *8*(4), 456-467. https://www.cogitatiopress.com/politicsandgovernance/article/view/3158.

Vicente-Serrano, S. M., Beguería, S., & López-Moreno, J. I. (2010). A multiscalar drought index sensitive to global warming: the standardized precipitation evapotranspiration index. *Journal of climate*, *23*(7), 1696-1718. https://journals.ametsoc.org/view/journals/clim/23/7/2009jcli2909.1.xml?tab_body=pdf.

Ward, J. (2022). GBV risks, food insecurity, and the Integrated Food Security Classification – What are basics that food security and GBV actors need to know? GBV Area-of-Responsibility Helpdesk. https://gbvaor.net/sites/default/files/2022-09/Food%20Security%20IPC%20GBV%20final_070922.pdf.

Weerts, A. (2018, April). Global Flood Forecasting Information System (GLOFFIS). In *EGU General Assembly Conference Abstracts* (p. 14017). https://ui.adsabs.harvard.edu/abs/2018EGUGA..2014017W/abstract.

Weingärtner, L., & Spencer, A. (2019). Analyzing gaps in the humanitarian and disaster risk financing landscape. Start Network. *Financial Flows Mapping: The Potential for a Risk Finance Facility for Civil Society,* Paper No. 2. https://static1.squarespace.com/static/61542ee0a87a394f7bc17b3a/t/61b8eca4965661498df5e00a/1639509156992/ODI+paper+02.pdf.

Weingärtner, L., Pforr, T., & Wilkinson, E. (2020). The evidence base on AA. World Food Programme (WFP). https://docs.wfp.org/api/documents/WFP-0000110236/download/.

WFP. (2019). Forecast-based financing in Nepal: A return on investment study. https://www.wfp.org/publications/forecast-based-financing-nepal-return-investment-study.

World Risk Report. (2022). Bündnis Entwicklung Hilft. https://weltrisikobericht.de/weltrisikobericht-2022-e/#.

Annex I: Risk Analysis in HNOs and HRPs (2020-2022)

Documents Reviewed:

Humanitarian Needs Overviews (HNOs) N = 31	Humanitarian Response Plans (HRPs) N = 25
Afghanistan (2021, 2022) Y	Afghanistan (2021, 2022)
Cameroon (2020, 2021, 2022) N	Cameroon (2020, 2021)
Ethiopia (2020, 2021) N	Ethiopia (2020)
Iraq (2021, 2022)	Iraq (2020, 2021, 2022)
Libya (2020, 2021, 2022)	Libya (2020)
Nigeria (2020, 2021, 2022)	Nigeria (2020, 2021, 2022)
Somalia (2021, 2022)	Somalia (2021, 2022)
South Sudan (2021, 2022)	South Sudan (2021, 2022)
Sudan (2020, 2021, 2022)	Sudan (2020, 2021, 2022)
Syria (2020, 2021, 2022)	Syria (2020)
Ukraine (2020, 2021, 2022)	Ukraine (2020, 2021, 2022)
Yemen (2021, 2022)	Yemen (2022)
Zimbabwe (2021)	Zimbabwe (2021)

Findings from HNOs:

- All HNOs reviewed from 2020-2022 included a risk analysis section according to revised HNO template and guidelines provided in the interagency guidance note on analyzing risks. A new version of the Joint Intersectoral Analysis Framework will be published and rolled out with the Humanitarian Program Cycle 2024.
- Most HNOs cite the INFORM Risk and Severity indices as a measure of baseline risk. INFORM Warning also in development and likely to contribute to increased attention to anticipatory action and early warning systems in HNO risk analyses.
- The quality and level of detail of risk analyses varies dramatically by country. Some HNOs (e.g., Afghanistan, Nigeria, Somalia) include in-depth descriptions of multiple hazards analyzed by sub-national region while other documents reviewed (e.g., Cameroon, Iraq, Libya) only include national-level statistics and focus on the potential impact of these hazards without mention of their predicted likelihood or severity.
- Where anticipatory action pilots exist (e.g., Ethiopia), they are typically mentioned in the risk analysis section of the HNO.
- Most scenarios described in HNOs focus on conflict-related risks but no not adequately address the multiple and intersecting hazards faced by affected populations, e.g., armed conflict, flood, drought, extreme winter.

Findings from HRPs:

- While the 2019 revision of the HNO template required the new risk analysis section, no analogous section was included in the HRP template. Where present, descriptions of contingency planning focus on humanitarian access rather than anticipated hydrometeorological hazards such as flooding and drought.

- Anticipatory action is mentioned in Sudan, Somalia, Nigeria, Ethiopia, and Afghanistan, most often linked to IPC analyses. Additional links with DRR are described in Ukraine, Sudan, and Cameroon, including a DRR indicator for WASH services (Ukraine), links with national DRR plans as part of the Nexus approach (Sudan), and early childhood education as a form of risk reduction in conflict settings (Cameroon).

HNO indicators referenced:

- # of flood-affected people
- # of people affected by drought
- # of people affected by earthquake
- # of people in need of winterization support
- % of population in IPC 3 and 4
- % of people employing ‘emergency’ livelihoods coping strategies
- % of people in IPC 5
- % of people affected by disease outbreaks
- Rainfall figures
- Normalized Difference Vegetation Index
- Severe acute malnutrition and moderate acute malnutrition prevalence

Annex II: Global Frameworks on Climate Change Adaptation and Disaster Risk Reduction

Global Framework	Description	Targets, Indicators, and Information Needs
Sendai Framework for Disaster Risk Reduction (2015-2030)	The Sendai Framework for Disaster Risk Reduction was adopted at the Third UN World Conference in Sendai, Japan on March 18, 2015. It seeks to reduce global disaster risk and losses in lives, livelihoods, and health, focusing on the priority areas of (1) Understanding disaster risk, (2) Strengthening disaster risk governance, (3) Investing in disaster risk reduction, and (4) Enhancing disaster preparedness for effective response.	The Sendai Framework outlines seven global targets and 38 indicators to measure global progress on disaster risk reduction. While Global Targets A-D focus on measuring damage post-disaster, the most relevant for measuring climate-related risks are Global Targets E and G. **Global Target E** aims to substantially increase the number of countries with national and local disaster risk reduction strategies by 2030, and **Indicator E-2** is defined as "the percentage of local governments that adopt and implement local disaster risk reduction strategies in line with national strategies." This is particularly relevant given IMPACT Initiatives' partnership with ACTED on local response planning and the importance of accurate climate-risk data to inform local DRR strategies. Likewise, **Global Target G** seeks to substantially increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessments to the people by 2030, and **Indicator G-5** is defined as "the number of countries that have accessible, understandable, usable and relevant disaster risk information and assessment available to the people at the national and local levels."
IPCC 6th Assessment Report:	The 6th Assessment Report of the Intergovernmental Panel on	While the 6th IPCC Assessment Report does not provide any specific

Impacts, Adaptation, and Vulnerability (2022)	Climate Change (IPCC) is the most recent global assessment of scientific, technical, and socio-economic information concerning climate change.	guidance on the measurement of climate-related risks related to flooding and drought, it does outline 12 categories of general climate-related risk under three sub-headings: . Impacts on water scarcity and food production • Water scarcity • Agriculture/crop production • Animal and livestock health and productivity • Fisheries yields and aquaculture production B. Impacts on health and wellbeing • Infectious diseases • Heat, malnutrition, and other • Mental health • Displacement C. Impacts on cities, settlements, and infrastructure • Inland flooding and associated damages • Flood/storm induced damages in coastal areas • Damages to infrastructure • Damages to key economic sectors These twelve focus areas provide a clear framework for organizing the types of risk associated with various climate hazards and can be considered as a basis for kinds of indicators which can be developed for local risk assessment tools.
2030 Agenda for Sustainable Development	The 2030 Agenda for Sustainable Development was adopted by all UN Member States in 2015 and serves as the primary policy blueprint for sustainable development at the global level. Its 17 Sustainable Development Goals (SDGs) range from an end to extreme	While climate adaptation and DRR relates to many of the SGDs, the most relevant are **Goal 1** on poverty and **Goal 13** on climate change. **Target 1.5** of the SDGs is to build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and

	poverty to the strengthening of global partnerships for sustainable development.	other economic, social and environmental shocks and disasters and its second indicator (**1.5.2.**) measures the ratio of direct economic loss attributed to disasters in relation to global gross domestic product (GDP).[6] Under **Goal 13,** the most important target is **Target 13.1** to strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries. This target has three indicators, which link to the Sendai Framework discussed above: • **Indicator 13.1.1:** Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population. • **Indicator 13.1.2:** Number of countries that adopt and implement national disaster risk reduction strategies in line with the Sendai Framework for Disaster Risk Reduction 2015–2030. • **Indicator 13.1.3:** Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies.
UNDRR Guidance Note on Integrating Disaster Risk Reduction and Climate Change Adaptation in the UN Sustainable Development	The UNDRR Guidance Note on Integrating DRR and Climate Change Adaptation in the UN Sustainable Development Cooperation Framework provides high-level guidance to UN Country Teams (UNCTs) on formulating and implementing	Key information needs for UNCTs identified by the guidance note include: • Multi-hazard hazard, exposure, vulnerability and risk assessments, including sectoral and transboundary assessments.

[6] Note that this indicator also appears under Goal 11: Sustainable Cities and Communities as Indicator 11.5.2.

Cooperation Framework (2020b)	Cooperation Frameworks to operationalize DRR in their respective country contexts. It identifies several potential sources of information on disaster hazards, exposure, and vulnerability which should be used to develop these frameworks (see column to the right).	• Hazard, exposure, vulnerability, environmental sensitivity and disaster risk maps. • Records of climate variability and change, and climate change impacts models and projections • Records of disaster and epidemiological morbidity, loss and damage records and Average Annual Loss estimates. • Climate and disaster risk management capacity assessments, including assessments of capacities for management of transboundary risks such as drought, riverine flooding, desert locust swarming or disease outbreaks. In humanitarian contexts, the guidance note further identifies the need for climate risk analysis that is integrated with other context-specific risks (e.g., predicated displacement patterns and conflict risk).
The Grand Bargain (2016)	The Grand Bargain is an agreement between donor governments and humanitarian aid organizations that emerged out of the 2016 World Humanitarian Summit. Among other commitments to prioritize funding for local actors and increase multi-year and non-earmarked funding, the Grand Bargain also includes efforts to improve joint and impartial needs assessments.	Key commitments under the Grand Bargain include: • Conducting risk and vulnerability analysis with development partners and local authorities, in adherence to humanitarian principles, to ensure the alignment of humanitarian and development programming (Objective 5, improving joint and impartial needs assessments) • Performing joint multi-hazard risk and vulnerability analysis, and multi-year planning where feasible and relevant, with national, regional and local coordination in order to achieve a shared vision for outcomes.

		(Objective 10, enhance engagement between humanitarian and development actors)
OCHA Cluster Indicator Registry	This database provides a list of recommended indicators developed by the global clusters to track humanitarian needs and support monitoring throughout the humanitarian programme cycle.	The only indicator included in the registry which relates to climate risk analysis is the percentage of shelter interventions incorporating hazard mitigation measures. It is recommended that this indicator be disaggregated according to type of shelter, type of settlement, displacement site/situation, and type of response provider.

Annex III: List of Climate-Related Risk Analysis Tools

1. Index for Risk Management (INFORM). The INFORM indices were developed by the Joint Research Center of the European Commission. They include five different tools: INFORM Risk, INFORM Subnational Risk, INFORM Warning (in progress), INFORM Severity, and INFORM Climate Change. INFORM Risk was the first tool developed and is most often cited in policy documents. It is based on 60 country-level indicators sourced from publicly-available data measuring hazards, vulnerability, and (lack of) coping capacity. It produces a total risk score across all hazards on a scale of 0-10. The INFORM Subnational Risk index is an adaptation of INFORM Risk index which provides risk scores at the subnational level. Currently available in 13 countries and regions, subnational INFORM analysis must be carried out by external actors with support from and validation by the European Commission.

2. Global Flood Awareness System (GloFAS). GloFAS is the flood forecasting and monitoring program of the European Commission's Copernicus Emergency Management Service. It provides daily flood forecasts and monthly seasonal stream forecasts based on remote sensing data from the Copernicus Sentinel-1 satellite. It only provides data on riverine floods.

3. Global Flood Forecasting Information System (GLOFFIS). GLOFFIS is an ensemble[7] flood forecasting model developed by the Dutch non-profit Deltares. GLOFFIS includes multiple global models and several high resolution local models; however, real-time forecasts from GLOFFIS are not consistently made open-access, limiting its current utility for humanitarian actors (Weerts, 2018).

4. Standardized Precipitation Evapotranspiration Index (SPEI). The SPEI was first proposed by Vicente-Serrano et al. (2010) and measures the frequency and severity of droughts based on mean precipitation and temperature. It can be calculated directly in R using the SPEI package and near-real time results are frequently updated on the SPEI Global Drought Monitor website.

5. Vegetation Condition Index (VCI). The VCI is a measure of current vegetation health in comparison to historical trends and can be used as an indicator of drought and drought-like conditions. It uses remote sensing/satellite data to compare vegetal land cover with historical maximums and minimums and ranges from 0 (poor vegetation condition) to 100 (ideal vegetation condition). VCI is typically calculated using data gathered from the U.S. National Oceanographic and Atmospheric Administration's Advanced Very High Resolution Radiometer (NOAA-AVHRR) and is available on the NOAA STAR website.

[7] Ensemble models are a class of prediction algorithms that aggregate forecasts from multiple sources to produce more accurate results.

6. Integrated Food Security Phase Classification (IPC). The IPC is a global partnership to monitor acute and chronic food insecurity and acute malnutrition. IPC analyses are conducted by an in-country IPC Technical Working Group and are currently available for 54 countries.[8] IPC reports provide a food insecurity rating at the subnational level ranging from Phase 1 (Minimal/No Food Insecurity) to Phase 5 (Catastrophe/Famine) as well short-term projections of future conditions. IPC ratings have often been used as the trigger for drought anticipatory action programs.

7. Tropical Applications of Meteorology using Satellite data (TAMSAT). TAMSAT was developed at the University of Reading in 1977 and provides rainfall-based estimates of agricultural conditions throughout Africa. It has high spatial resolution and aims to translate meteorological drought forecasts into accurate predictions of agricultural drought. TAMSAT has been used as the basis for the TAMSAT-ALERT drought forecast model developed in Kenya (Boult et al., 2020).

[8] Note that this includes countries in West Africa and the Sahel which instead use the Cadre Harmonisé (CH), a similar assessment framework which is harmonized with the IPC.