

**Connecting MEACAM
Early Warning
Information**



**to Anticipatory Action
and Disaster Risk
Reduction Interventions**



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Introduction

Climate change is projected to intensify weather patterns across the Middle East and North Africa (MENA) over the coming decades, resulting in rising temperatures, higher precipitation variability, and more frequent extreme droughts and floods.^{1,2} Since the 1980's, regional natural hazard-related disasters have nearly tripled, affecting over 40 million people.³ Moreover, infrastructure degradation in Iraq, Syria, and Yemen – caused by years of prolonged conflict and political turmoil – have exacerbated water management challenges, increasing vulnerability during drought and flooding events.⁴

Purpose of this report

The Middle East Anticipatory Climate Action Model (MEACAM) provides publicly available near real-time agricultural drought⁵ and flood⁶ forecasts in Iraq, Syria, and Yemen, and estimates of how many people will be affected by these events.⁷ This report examines early actions that could be triggered using the MEACAM forecasts – once integrated into an early action plan (EAP) or national or regional early warning system – to strengthen disaster response and mitigation efforts in Iraq, Syria, and Yemen. The report serves as a foundation to ground MEACAM in humanitarian action and disaster risk reduction (DRR) efforts designed to mitigate the impact of agricultural drought and flooding.

¹ Bitar, Ahmad Al, Sami Najem, Lionel Jarlan, Mehrez Zribi, and Ghaleb Faour. [Precipitation and Soil Moisture Datasets Show Severe Droughts in the MENA Region](#) 2021.

² Mohyee E., et al. [Climate Security Nexus: Climate Inequality and Food Security between Middle East & North African Countries](#), *Journal of Scientific Business & Environmental Studies* 14, no. 4, 2023.

³ Banerjee, [Natural Disasters in the Middle East and North Africa: A Regional Overview](#) World Bank, 2014.

⁴ Lange, Manfred. [Impacts of Climate Change on the Eastern Mediterranean and the Middle East and North Africa Region and the Water–Energy Nexus](#) *Atmosphere* 10, no. 8, 2019.

⁵ Drought predictions updated every 14 days; Mercy Corps, [MEACAM Research Report: Drought in Focus](#) May 7, 2025

⁶ Flood predictions are updated every 6 hours.

Mercy Corps, [MEACAM Research Report: Floods in Focus](#) May 7, 2025

⁷ Mercy Corps, [Middle East Anticipatory Climate Action Model: Conceptual Overview](#) November 12, 2024

Background

Drought

Drought duration and intensity are increasing across the MENA region due to both climate change and poor resource management. The Intergovernmental Panel on Climate Change (IPCC) reports that across the MENA region, 61% of the population is exposed to high or very high water stress.⁸

In Iraq, water resources from the Tigris and Euphrates rivers face severe stress due to decreased precipitation, high temperatures, excessive agricultural extraction, and asymmetrical and politically sensitive water management.^{9,10,11} Rainfed cropland, mostly located in the northern governorates, are more prone to crop failure in low rainfall years due to a reliance on water-intensive and inefficient spate irrigation, as well as low adoption rates of alternative irrigation systems. Drought in Iraq can have significant negative implications on food security and socio-economic stability, which drives environmental out-migration, while also heightening the risk of local waterborne disease transmission.^{12,13}

Prior to the ongoing conflict, half of the population in Yemen lacked access to clean water and sanitation. Drought conditions and conflict have heavily contributed to Yemen ranking among the most water-stressed nations globally, with projections that Sana'a may become the first city globally to exhaust its water supply.¹⁴ Yemen's agricultural sector, which employs a large

⁸ IPCC, [Climate Change 2022 – Impacts, Adaptation and Vulnerability: Working Group II Contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change](#) Cambridge University Press, 2023.

⁹ Lange, Manfred. [Impacts of Climate Change on the Eastern Mediterranean and the Middle East and North Africa Region and the Water–Energy Nexus](#) *Atmosphere* 10, no. 8, 2019.

¹⁰ Waha, Katharina, Linda Krümmenauer, Sophie Adams, Valentin Aich, Florent Baarsch, Dim Coumou, Marianela Fader, et al. [Climate Change Impacts in the Middle East and Northern Africa \(MENA\) Region and Their Implications for Vulnerable Population Groups](#) *Regional Environmental Change* 17, no. 6, August 2017 (1623–38).

¹¹ Williams, P. 2012. [Euphrates and Tigris Waters Turkish-Syrian and Iraqi Relations](#). In *Water resource conflicts and international security: A global perspective*. Edited by D.K. Vajpeyi, 19-49.

¹² Harry Istepanian, [The Rising Tide of Environmental Migration in Iraq: A Looming Crisis](#) Iraq Climate Change Center, 2024

¹³ Internal Displacement Monitoring Centre and Norwegian Refugee Council, Roger Guiv, [When Canals Run Dry: Displacement triggered by water stress in the south of Iraq](#) February 2020

¹⁴ Khosravi, Mohsen, Seyyed Morteza Mojtabaiean, and Mina Aghamaleki Sarvestani. [A Systematic Review on the Outcomes of Climate Change in the Middle-Eastern Countries: The Catastrophes of Yemen and Syria](#) *Environmental Health Insights* 18, November 2024

proportion of the labor force,¹⁵ is suffering due to drought and persistent strains on water sources.¹⁶ These conditions have diminished farmers' ability to cope amid weakened governmental capacity for effective water management and disaster response.^{17,18}

Syria is also contending with the effects of significant drought. The country's agriculture sector is particularly sensitive to lower rainfall levels due to the predominance of rainfed crops, as demonstrated by the severe impact of recent agricultural droughts during the winter growing seasons of 2020, 2021, and 2025.^{19,20} Before the conflict, the Assad regime expanded the country's irrigation by expanding canals, drilling boreholes, and subsidizing diesel for farmers to lower water pumping costs.^{21,22} During the conflict, borehole drilling and water management was largely unregulated.^{23,24} About half of irrigated cropland is sourced from groundwater and many farms still use traditional irrigation techniques like spate irrigation. During periods of below-average rainfall farmers now face the prospect of shrinking profits, additional costs to deepen or dig new boreholes, and accessing lower-quality water.²⁵

¹⁵ The agriculture sector account for about 28% of value-added GDP in 2018 and 29% of total employment in 2023 according to the World Bank.

World Bank, [Employment in agriculture \(% of total employment\) \(modeled ILO estimate\) - Yemen, Rep.](#)

World Bank, [Agriculture, forestry, and fishing, value added \(% of GDP\) - Yemen, Rep.](#)

¹⁶ The Washington Institute for Near East Policy, [From Palms to Sands: How Climate Change Is Destroying Green Yemen](#) 2024

¹⁷ Khosravi, Mohsen, Seyyed Morteza Mojtabaiean, and Mina Aghamaleki Sarvestani, [A Systematic Review on the Outcomes of Climate Change in the Middle-Eastern Countries: The Catastrophes of Yemen and Syria](#) *Environmental Health Insights* 18, November 2024

¹⁸ Ali Al Falahi and Zhu Guangcan, [Challenges and solutions in water management: a comprehensive study of Yemen's water policies and practices](#) Water Policy, March 1, 2025

¹⁹ Karam Shaar Advisory, [Ring the Alarm Bells: Syria May Be Facing Its Worst Drought in Decades](#) 2025

²⁰ Crisis Analytics Syria, [Measuring Agricultural Production: drought and the 2018 to 2022 growing seasons in Northeast Syria](#) July 2022

²¹ IWMI, [Groundwater Governance in the Middle East and North Africa](#) December 2016

²² Myriam Saadé-Sbeih, Ahmed Asaad Haj, Omar Shamali, François Zwahlen, and Ronald Jaubert, [Groundwater Balance Politics: Aquifer Overexploitation in the Orontes River Basin](#) *Water Alternatives*, 2018

²³ Alper Baba, Ruwad AL Kareem, and Hamidreza Yazdani, [Groundwater resources and quality in Syria](#) Groundwater for Sustainable Development, Volume 14, August 2021

²⁴ The number of boreholes in former SSG and SIG-controlled northwest Syria nearly doubled since 2011.

MDPI, [Irrigation Water in Northwest Syria: Impact of the Recent Crisis and Drought](#) *Water*, Volume 16, Issue 21, October 29, 2024

²⁵ REACH, [Socio-Economic Water Survey \(SEWS\): Tel Tamer, Al-Hasakeh September 2024 \(Dry Season\) April 2025 \(Wet Season\), Syria](#) 2024-2025

Flooding

Increasingly erratic weather patterns are also causing more frequent flooding across the MENA region.²⁶ Iraq is predicted to have less frequent but more intense rainfall events, making both fluvial and flash flooding during heavy rainfall events a serious hazard, particularly in the winter months.²⁷ This flooding can damage cropland (e.g., seed/crop losses), displace populations, disrupt access to services, and cause injury and loss of life. Additionally, undersized drainage systems and weak urban planning²⁸ are unable to handle increased runoff from heavy rains, increasing the risk of flooding and infectious disease outbreaks.²⁹

Yemen faces similar challenges related to increased rainfall events, especially in wadis, which are compounded by high levels of household vulnerability due to the ongoing humanitarian crisis. These risks were realized in 2022, 2024, and 2025 when intense precipitation during the summer rainy season injured or killed hundreds of people,³⁰ displaced thousands more,^{31,32} contaminated water sources,³³ and caused the widespread closure of roads and disruption of public services.³⁴ IDPs are disproportionately exposed to flash floods in Yemen because about half of IDP sites are located in flood-prone areas.³⁵

Regions of Syria are also at risk of both pluvial flooding and flash floods during the winter rainy season on a near-annual basis. Major flash floods disproportionately affect northern Syria,

²⁶ Tarek Merabtene and Yilmaz Abdullah Gokhan, [Flood Risk Management in the MENA Region: Challenges and Opportunities](#) ISPRS Proceedings, 2011

²⁷ Giovanis, Eleftherios, and Ozgur Ozdamar, [The Transboundary Effects of Climate Change and Global Adaptation: The Case of the Euphrates-Tigris Water Basin in Turkey and Iraq](#) *Empirical Economics*, 26 November 2024

²⁸ Bakhtiyar A. Ali and Dana K. Mawlood, [Urban Flood Simulation in Erbil City by Using Storm Water Management Model \(SWMM\)](#) *Zanco Journal of Pure and Applied Sciences*, 35, 5

²⁹ Giordano, Leanne, Hilary Boudet, and Alexander Gard-Murray, [Local Adaptation Policy Responses to Extreme Weather Events](#) *Policy Sciences* 53, no. 4, December 2020

³⁰ Arab News, [Yemenis warned of harsh weather to come as flood deaths pass 100](#) August 28, 2023

³¹ World Bank Group, [Yemen Climate Risk Country Profile](#) 2023

³² ReliefWeb, [Yemen: Floods - Aug 2025](#) 2025

³³ WHO, [Severe flooding hits Yemen's Hodeida governorate](#) August 24, 2024

³⁴ *ibid.*

³⁵ WHO, [Severe flooding hits Yemen's Hodeida governorate](#) August 24, 2024;

CCCM Cluster and REACH, [Flood Hazard Analysis of IDP Sites in Yemen](#) April 29, 2024

where most IDP camps are located and rainfall levels are highest.^{36,37} Many IDP sites are located in particularly flood prone areas,³⁸ including the Al-Areesh IDP camp in Al-Hasakeh that was inundated by flood waters in late 2018 and early 2019.³⁹ While the risk of river flooding in Syria is comparatively lower than flash flooding, the Orontes River overflowed after the Assad government opened the al-Rastan dam in Homs during the 2023 earthquake.⁴⁰ This caused significant downstream flooding in Idlib, highlighting the potential threat of river flooding caused by dam failure in the country.

Disaster risk management and anticipatory action

Anticipatory action (AA), also known as early action, are measures to protect people from the direct and secondary impact of disasters before they occur (Figure 1). Early actions are taken when conditions meet a pre-defined threshold or series of thresholds, known as triggers. Humanitarian early actions, such as those shown for drought and floods in Tables 2 and 3, generally involve the activation of ex-ante emergency interventions when the trigger is activated.⁴¹ This approach aims to enable aid actors to intervene *before* the onset of a crisis event. Furthermore, AA complements long-term DRR strategies and is meant to cover hazard exposure that current DRR efforts cannot yet fully address.

Selecting an early action depends on the nature of a hazard, anticipated consequences, and an implementing agency's capacity. Early actions should be feasible for an implementing agency to deliver in a short time frame and meet the priority needs of the local community. For example, timely early action generally requires arranging rapid cash transfer mechanisms with financial service providers and pre-positioning essential items for distribution.

³⁶ FloodList, [Syria – Floods in Displacement Camps in Idlib and Aleppo](#) January 20, 2021

³⁷ FloodList, [Syria – Floods Cause Severe Damage to Displacement Camps](#) March 2023

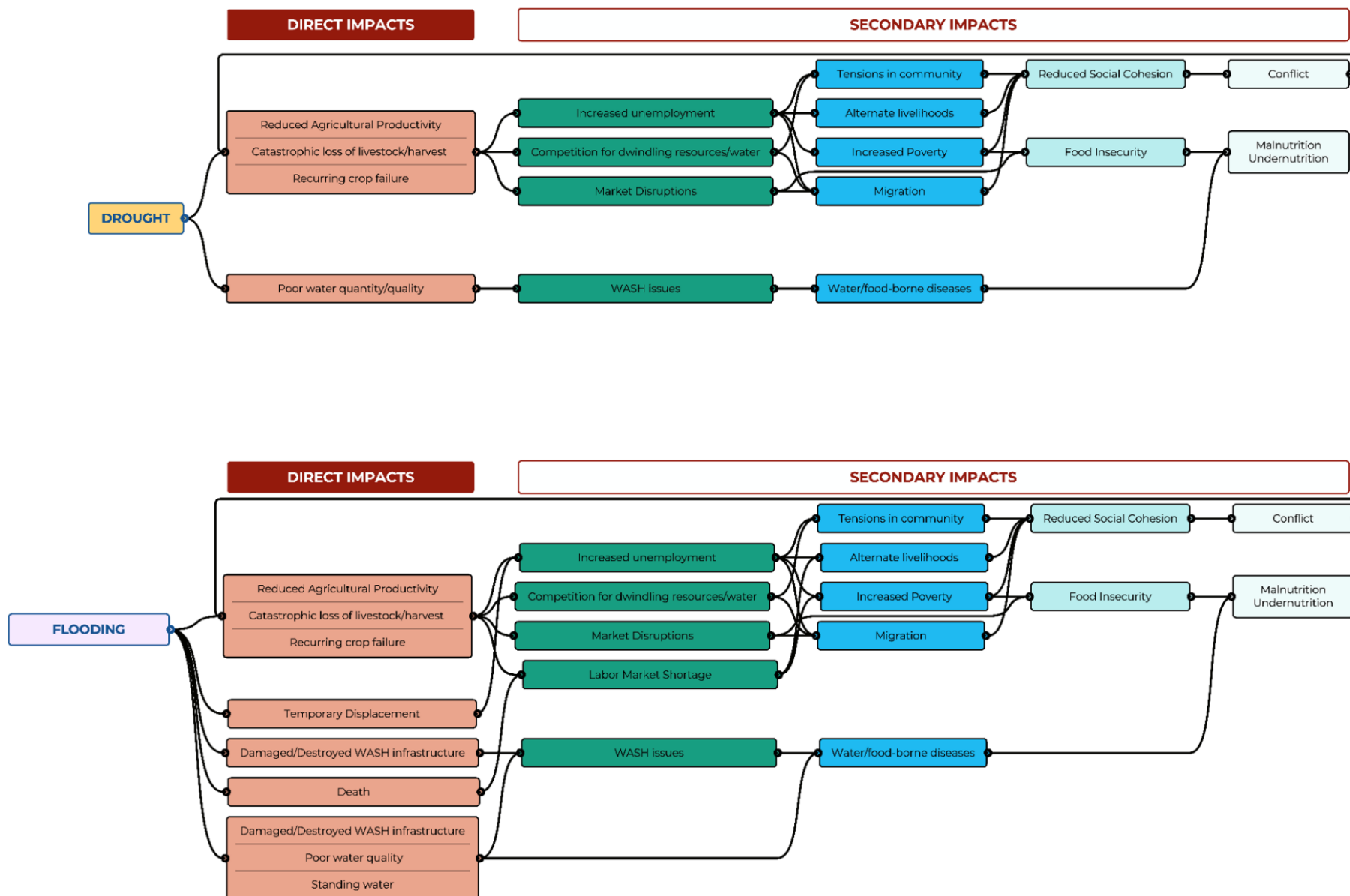
³⁸ CCCM Cluster and REACH, [Syria - West Dana sub-district | Idlib: IDP Camps and Informal Sites Flood Susceptibility and Flood Hazard Assessment \(February 2021\)](#) March 10, 2021

³⁹ REACH and UNOSAT, [Syrian Arab Republic: Areesh Camp - Impact of Flooding, Areesh Camp](#) April 2019

⁴⁰ DFS, [Northwest Syria Earthquake February 2023, Bi-Weekly Highlights - 17/02/2023](#)

⁴¹ IFRC, [Anticipatory Action Brochure](#)

Figure 1. Direct and secondary impacts of flooding and droughts.



Methodology

This report outlines AA/DRR interventions that could be informed by MEACAM platform agricultural drought and flash flood predictions. To achieve this objective, the team conducted a scoping literature review to gather evidence from peer-reviewed and grey literature on AA and DRR activities according to the search terms and search criteria outlined in Table 1. This review sought to answer two primary questions:

1. What disaster risk reduction activities that mitigate the impacts of drought and flooding are being carried out in the MENA region?
2. Which early actions are best fit to reduce the negative impacts of drought and flooding in the MENA region?

Table 1. Definitions of search terms and strategy for review

Review	Search terms	Databases	Inclusion criteria	DRR activities
DRR review	Flood* Drought* Heavy rainfall "Coastal flood*"	ReliefWeb NGOs UNDRR IFRC/RCCC Government	- Current, completed, or planned implementation of adaptation, resilience-building, preparedness, capacity-building, or direct mitigation strategy - Country focus: Syria, Yemen, Iraq, AND other climatically similar countries/regions	- Comparative evaluation before/after event - Baseline/endline evaluation - Uptake, adherence
Evaluations of DRR activities	Flood* Drought* Heavy rainfall "Coastal flood*" AND Baseline Endline	Pubmed Scopus Google Scholar ReliefWeb NGOs UNDRR IFRC/RCCC	- Must be an evaluation of a DRR activity related to flooding or drought - Must include some time-varying OR uptake/adherence component - Must be from a climatically similar country to Syria, Yemen, or Iraq	- Impact to mitigate - Early actions
Early action review	Flood* Drought* Heavy rainfall "Coastal flood*"	IFRC GO FAO WFP UNOCHA	- Must be an EAP/AA framework - No limit on date - Must list early actions and not only include information on the trigger - Country focus: Syria, Yemen, Iraq, AND other climatically similar countries/regions - Triggering mechanism must be based off rainfall forecasts	- Early actions - Evidence on the impact of the early actions

Evaluations of early actions	Flood* Drought* Heavy rainfall "Coastal flood*" AND Evaluation Review	Pubmed Scopus Google Scholar UN reports RCRC reports	- Must be an evaluation of an anticipatory action activation related to flooding or drought - Must be from a climatically similar country to Syria, Yemen, or Iraq	- DRR activities
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What disaster risk reduction activities are being implemented for flooding and droughts?

The risk of drought and flooding in the MENA region is compounded by the urgent need to rehabilitate and develop infrastructure and water management systems. As such, it is necessary to understand DRR activities designed to mitigate the impact of drought and flooding. Annex 1 presents an overview of identified DRR activities in Iraq, Syria, and Yemen related to drought and flooding for which open-source information was available.

Iraq

National Disaster Management

In Iraq, a national disaster risk reduction law was drafted and endorsed but has been awaiting final approval since 2014. Similarly, a national disaster risk reduction strategy was developed in 2012 but, while having been updated, it remains in draft form.^{42,43} However, the Federal Government of Iraq does have a 25-year plan for drought management that promotes climate-smart agricultural techniques.⁴⁴

Across Iraq, four institutions maintain and monitor weather and hazard monitoring networks intended for early warning: the Iraq Meteorological Organization and Seismology (IMO), the Ministry of Agriculture, the Ministry of Water Resources, and the Ministry of Environment.

⁴² ODI, [Anticipatory Action in the MENA Region: State of Play and Accelerating Action](#), Overseas Development Institute, 2022

⁴³ RCCC, [A Feasibility Study Exploring the Potential of Anticipatory Action in Iraq](#) 2024

⁴⁴ Republic of Iraq, [Iraq LDN TSP Country Report](#) 2019

Together, these institutions hold primary responsibility over weather and hazard monitoring networks across Iraq, including drought and flood forecasting and early warnings.

Other DRR activities related to drought and flooding in Iraq

Beyond government initiatives, the team identified two other early warning systems in Iraq related to drought, focusing on IDPs⁴⁵ and agricultural communities;⁴⁶ the former being an online platform with no alert system or community outreach, and the latter being a funded but not-yet-started program. Most of the identified programs targeted agricultural communities and focused on climate-smart agricultural practices, primarily water-saving drip irrigation techniques. Of these, women were highlighted as the primary recipients of training or participation in most DRR activities.

Syria

National Disaster Management

In Syria, the Ministry of Defense's Meteorological Department is responsible for providing weather information, though, only two of the Department's weather stations appear functional.⁴⁷ Since the beginning of the Syrian conflict, social media accounts have publicly posted weather information and natural hazard alerts,⁴⁸ and the MetOffice⁴⁹ has released the Syria Weather Hazard Assessment every three days by email. Recently, the newly formed Ministry of Emergency and Disaster Management announced the development of a multi-hazard early warning application⁵⁰ in support of a national DRR plan covering multiple hazards such as earthquakes, floods, and fires.

⁴⁵ IOM, [DTM Emergency Tracking Iraq Mission](#)

⁴⁶ WFP, [Promoting Climate Adaptation for Food Security and Stability in Iraq | World Food Programme](#) August 1, 2024

⁴⁷ [NOAA's Climate Data Online](#)

Only Aleppo and Damascus International Airport have weather stations recently reporting weather data on NOAA's Climate Data Online. However, recent data is limited to air temperature.

⁴⁸ On pages such as <https://t.me/AnasSyriaWeather>

⁴⁹ Met Office UK, [Find a Forecast](#)

⁵⁰ Qatar News Agency (QNA), [Syrian Emergency Minister to QNA: Qatar Plays Key Role in Enhancing National Disaster Response](#) May 12, 2025

During the conflict, the International Federation of the Red Cross and Red Crescent Societies (IFRC) developed a series of strategic priorities for the country, including drought and flood risk management.⁵¹

Other DRR activities related to drought and flooding in Syria

Most DRR activities are focused on conserving groundwater, specifically drip irrigation projects⁵² and borehole rehabilitation.⁵³⁵⁴

Yemen

National Disaster Management Plan

Similar to Iraq and Syria, Yemen's national disaster management plan was first drafted in 2006 and updated in 2010, but has not been approved.⁵⁵ The UN Office for the Coordination of Humanitarian Affairs (OCHA) is leading a coordination effort to develop an early warning system alongside the General Authority for Civil Aviation and Meteorology/Yemen Meteorological Service (CAMA/YMS), which is responsible for providing meteorological services. In addition to CAMA/YMS, the General Department of Monitoring Network (GDMN) is responsible for measuring water-related indices, though only approximately half of all stations were operational in 2023.⁵⁶⁵⁷ As a result, government-led DRR initiatives in Yemen have been limited. However, the Food and Agriculture Organization of the United Nations (FAO) publicly releases the Agrometeorological Early Warning Bulletin⁵⁸ every dekad (10 days), though it is not directly linked to any existing AA/EA programs.

⁵¹ IFRC, [2023 IFRC Network Country Plan - Syria](#) 2023.

⁵² Blumont, [Shelter and Food Emergency Response](#)

⁵³ Syria Red Crescent, [Water Systems rehabilitated in Tell Brak and Tell Hamees towns in Hasakeh](#) Feb 19, 2017

⁵⁴ ACTED, [Providing safe water to 16,000 people in northern Syria](#)

⁵⁵ ODI, Anticipatory Action in the MENA Region State of Play and Accelerating Action, Overseas Development Institute, 2022.

⁵⁶ Mercy Corps, [Middle East Anticipatory Climate Action Model: Conceptual Overview](#) November 12, 2024

⁵⁷ World Bank, [Weather, Climate and Water Services in the Middle East and North Africa](#) 2023

⁵⁸ For example: FAO, [Agrometeorological Early Warning Bulletin \(11 - 20 August 2025\)](#)

Other DRR activities related to drought and flooding in Yemen

Though a national Disaster Management Plan does not exist in Yemen, a range of DRR activities are being implemented across the country. Four early action programs were identified, though only one, implemented by the Yemen Red Crescent Society, involved community alerts and dissemination. The remaining three early actions used disaster forecasts, but no alerts or dissemination protocols, limiting their utility and reach.

Regional DRR

The MetOffice, WMO, NOAA,⁵⁹ and the Global Flood Awareness System (GLOFAS)⁶⁰ are global weather forecasting and flood early warning systems that cover Iraq, Syria, and Yemen, but the extent to which governments or local organizations are leveraging them is unknown.

Which early actions can help to reduce negative impacts from flooding and droughts?

The team identified five early action programs in Iraq, Syria, and Yemen that are designed to mitigate the primary and secondary impacts of drought and flooding (see Table A1). The Yemen Red Crescent (YRCS) program is designed to prevent damage to homes and shelters, and physical harm to people inside them in the event of flash flooding.⁶¹ Additionally, the Food and Agriculture Organization (FAO) has implemented drought-related AA initiatives in Yemen,⁶² Iraq,^{63,64} and Syria.⁶⁵ In Iraq, World Vision established a drought-focused AA system in 2024. Furthermore, a feasibility study conducted by the International Red Cross Red and Crescent Movement explored the potential for AA in Iraq, which may lead to Red Crescent-led EAPs in Iraq. Notably, communication among organizations working toward AA

⁵⁹ NOAA National Centers for Environmental Information, [Climate Data Online](#)

⁶⁰ Copernicus Emergency Management Service, [Global Flood Monitoring](#)

⁶¹ Yemeni Red Crescent, [Simplified Early Action Protocol \(MDRYE015\) Yemen](#) July 25, 2024

⁶² FAO, [Food Security and Nutrition Information Systems to Enhance Resilience of Rural Households in Yemen](#) 2021

⁶³ FAO, [Iraq: Protecting Iraqi Farmers by Anticipating Drought and Water Shortages](#) 2023

⁶⁴ FAO, [Iraq: Protecting Iraqi Farmers by Anticipating Drought and Water Shortages](#) 2025

⁶⁵ *ibid.*

has become more formalized following the first and second MENA Regional Dialogue Platform events on AA in 2024 and 2025.⁶⁶

Interventions included in these early action protocols meet the needs created by slow or sudden onset hazards. Given that drought is a slow onset hazard whose impacts vary across a continuum of hydrometeorological drying stages, early action interventions are designed to mitigate emerging escalating risks as drought progresses. For example, interventions centered on the agriculture sector – such as in-kind fodder assistance, veterinarian services for livestock, and the distribution of drought-tolerant seeds – meet the needs of farmers and herders created by *agricultural* drought conditions. Interventions designed to address risks created by lower water availability and quality as drought progresses are associated with the next stage of drought – *hydrological* drought – and involve water treatment kits, emergency water trucking, or water rationing plans. Potential early action interventions to mitigate the impact of drought are summarized in Table 2.

By contrast, flooding is a sudden onset disaster that requires early action that can be implemented with much shorter lead times. These interventions are designed to prevent household asset and livelihood losses and can be life-saving. Potential early action interventions to mitigate the impact of flooding are summarized in Table 3.

Table 2. Examples of early actions for drought events. The cells highlighted in blue indicate that the early action has been integrated into an anticipatory action program in Iraq or Syria.

DROUGHT			
Sector	Purpose	Early Action	Lead time
Food security and livelihoods	Prevent or reduce loss of livestock	Provide vaccines, fodder, or other materials when food and water are scarce	2-4 months
		Distribute animal feed and animal care kits	1-2 months
		Veterinary care such as livestock vaccination and dipping to prevent animal diseases	2-4 months
	Prevent or reduce the loss of livelihood	Directly purchase livestock or facilitate connections between traders and animal owners to promote sale before prices fall and/or animal conditions deteriorate	1-2 months

⁶⁶ Anticipation Hub, [MENA Dialogue Platform](#) July 10-12, 2024

	Prevent or reduce agricultural impacts	Provision of smaller-sized livestock species to diversify livelihoods	2-4 months
		Groundwater well rehabilitation	2-4 months
		Community capacity strengthening by establishing, reviving, or providing guidance or resources to local water management committees	1-4 months
	Prevent or reduce loss of income/livelihood	Cash assistance to minimize losses and damages to drought-affected households, which lowers the need for negative coping strategies (i.e. eating fewer meals, labor migration, dropping out from school, overfishing, non-sustainable firewood production)	1-2 months
	Prevent or reduce agricultural impacts	Distribution of fertilizer	2-4 months
		Distribution of drought-adapted seeds	2-4 months
		Development of micro-irrigation and precision agriculture to limit the pressure on water resources during periods of low precipitation	2-4 months
		Community capacity strengthening and training on good, climate-smart agricultural practices during drought e.g. conservation agriculture and integrated pest control (IPM)	1-4 months
Nutrition	Basic needs	Cash or vouchers for food	1-4 months
		Increase nutritional surveillance	1-4 months
		Replenishment of common cereal banks to be sold at a subsidized price	2-4 months
		Targeted school feeding interventions to supplement other food security interventions	1-2 months
Health	Prevent or reduce health impacts	Increase disease surveillance	2-4 months
	Prevent or reduce disease outbreaks	Launch health-focused public awareness campaigns to reduce the risks and effects of drought-related epidemics	1-4 months
		Promote vaccinations	2-4 months
	Prevent or reduce poor hygiene practices	Distribute hygiene kits (especially for women)	1 month
	Alleviate harm from minor injuries	Create mobile units that can treat people and render first aid at shelters or other areas where they are displaced.	1 month
WASH	Water conservation	Promote safe reuse of treated greywater for irrigation or flushing.	1-4 months
	Water quality	Distribute household water treatment kits, such as chlorine tablets and water filters.	1-4 months
Disaster management	Information sharing and early warning	Produce tailored advisories to people on how to cope with drought impacts	1-4 months

Table 3. Examples of early actions for flood events. The cells highlighted in orange indicate that the early action has been integrated into an anticipatory action program in Yemen.

FLOODING			
Sector	Purpose	Early Action	Lead time
Food security and livelihoods	Meet basic needs	Facilitate or provide cash or mobile money - cash transfers support vulnerable households during evacuation processes in meeting their basic needs and protecting livelihoods and assets. Cash will encourage people to evacuate by covering evacuation costs	< 3 days
	Prevent or reduce loss of livestock	Identify safe havens or alternative pastureland for animals and relocate them to elevated ground, where days-worth of provisions of food and water for livestock are provided	> 3 days
		Veterinary care/Vaccinations to address disease/parasite burden during/after the shock	> 3 days
	Prevent loss of crops	Clear/dig drainage systems - Mobilize communities to divert flood water from agricultural crops by digging trenches around fields	> 3 days
		Harvesting of crops early or engaging in aquaculture through cash-for-work programs	> 3 days
Nutrition	Meet Basic needs	Distributing food and water assistance at evacuation centers or hard to reach area	< 3 days
Health	Prevent or reduce waterborne diseases	Identifying and repairing or installing community water points at evacuation centers	> 3 days
	Prevent or reduce health impacts	Providing first aid along evacuation routes and at emergency shelters, and refresher trainings for first aiders	< 3 days
		Promoting health and hygiene practices such as using water purification tablets	< 3 days
		Deploying mobile health units able to travel and assist the population before and after the event, including by providing first aid at shelters or other areas where people are displaced	< 3 days
	Prevent or reduce vector-borne diseases	Distribute treated mosquito nets and mosquito repellent and provide information on how to use them effectively to reduce disease transmission, either in communities or at evacuation sites	< 3 days
WASH	Prevent or reduce health impacts	Launch public awareness campaigns to ensure children and communities know how to access safe drinking water and reduce consumption of contaminated water	< 3 days
		Distribute water purification tablets and soap and water storage vessels	< 3 days
		Reinforce/construct temporary latrines and reinforce/protect wells from contamination	> 3 days

Disaster management	Prevent loss of key documents	Distribute waterproof storage	< 3 days
	Lifesaving	Evacuate the most vulnerable people from flood zones using road transport and promote self-mobilization by providing cash voucher assistance	< 3 days
	Prevent or reduce damage to houses and infrastructure	Use sandbags to mitigate flood damage to facilities (schools, hospitals, housing) and infrastructure	< 3 days
		Assist communities in reinforcing house walls against flood waters	< 3 days
	Improve conditions at evacuation sites	Prepare evacuation shelters, including by guaranteeing minimum conditions for evacuation centers (water, electricity, latrines, food...etc.)	< 3 days
Education	Prevent or reduce impact on education	Identify alternative locations for learning on high ground	> 3 days
Shelter	Basic needs	Distribute pre-positioned emergency shelter kits for evacuation. Provide Basic Emergency shelter/repair kits (Including Tarpaulin sheets etc.) to households with unprotected and weak shelters	< 3 days
Awareness	Raise awareness and reinforce existing early warning systems	Conduct community awareness campaigns on risks to life and livelihoods, including on safe evacuation routes, location of temporary accommodation sites, important items to bring in case of evacuation, and emergency contact numbers	< 3 days

How can the MEACAM project help integrate Anticipatory Action into Disaster Risk Reduction and Management?

The MEACAM platform was designed to serve two purposes in Iraq, Syria, and Yemen: 1.) fill early warning information gaps for droughts and floods and 2.) create a centralized hub for hazard predictions and location-specific exposure information. The MEACAM platform acts as a drought and flood early warning information hub, and its drought and flood predictions can also serve as a data source for fully integrated early warning systems via the MEACAM API. While MEACAM is focused on early warning, the platform's river flood vulnerability module and the crop rainfall sensitivity layer can inform the targeting of DRR interventions.

The MEACAM team has promoted the platform as a source of early warning information to government ministries and directorates in Iraq, Syria, and Yemen, and realizes that integration with government plans is a gradual process. Despite some limitations at the state level,

MEACAM can already be used to inform humanitarian early action protocols and community response plans.

The drastic reduction in humanitarian aid funding starting in early 2025 suggests that funding available for early action and DRR programming in Iraq, Syria, and Yemen will shrink. However, the efficiency of early action programming⁶⁷ may boost its attractiveness to donors, as would pairing DRR projects with early action interventions. Integrating early action triggers into existing emergency funding mechanisms in Iraq, Syria, and Yemen could also move early action forward in these countries; for example, this could entail identifying and adopting context-specific triggers to inform an anticipatory Crisis Modifier⁶⁸ within ECHO-funded programs. Constrained donor funding also increases the need for DRR interventions led by local communities, including training on low-cost DRR activities (e.g., leveraging existing local resources) and the development of community EAPs.

Drought

The MEACAM platform produces one- to four-month agricultural drought predictions that identify affected areas and estimate exposed populations and cropland hectares. The potential lead time provided by MEACAM accommodates the lead times defined in all but one of the seven drought EAPs posted on Anticipation Hub,⁶⁹ which are summarized in Table A2 in the Annex. Therefore, the information provided by the MEACAM platform can be used to define a hypothetical trigger mechanism for drought EAPs in Iraq, Syria, and Yemen. The following three triggers, informed by IFRC drought EAPs, are examples (these triggers have not been implemented in the field) of activation mechanisms that could leverage MEACAM agricultural drought predictions:

Trigger 1 (four-month lead time): MEACAM agricultural drought warnings trigger an alert to relevant government actors and aid organizations serving areas projected to be impacted by agricultural drought.

⁶⁷ UN OCHA, [Saving lives, time and money: Evidence from anticipatory action](#) May 6, 2025

⁶⁸ DG ECHO Partners Helpdesk, [Crisis Modifier](#)

⁶⁹ Anticipation Hub, [Home](#)

Trigger 2 (three-month lead time): MEACAM agricultural drought warnings trigger fodder distributions to herders and conditional cash transfers for agriculture kits (drought resistant seeds) to farmers in areas with very high rainfall sensitivity.⁷⁰

Trigger 3 (two-month lead time): MEACAM agricultural drought warnings trigger the distribution of unconditional MPCA to households reliant on farming and herding in areas with very high rainfall sensitivity.

The early actions associated with each hypothetical trigger could spur a range of actions. The first trigger, activated with a four-month lead time, only entails alerts to local government actors and aid agencies and does not activate the distribution of assistance. In alignment with most of the existing IFRC EAPs, the three-month lead time provided by the second trigger activates interventions designed to safeguard agricultural livelihoods, fodder distribution, and conditional cash distribution for agriculture inputs. Other early actions that could be triggered by the second trigger include installing drip irrigation systems, establishing or re-activating community water management committees, vaccinating livestock, and launching awareness campaigns on identifying and preventing waterborne diseases. Additionally, starting or scaling-up nutritional and disease surveillance when the second trigger is met would be useful to ensure that emerging negative trends are captured contemporaneously so they can be used to guide future interventions.

The effect of agricultural drought is likely apparent when the third (two-month) trigger is activated; early action interventions at this time should focus on reducing household negative coping strategies. For example, one proposed response for this trigger is unconditional multipurpose cash for households reliant on farming or herding. Other suitable interventions include distributing animal care kits, facilitating the sale of livestock by providing market price analysis, providing WASH kits, distributing treated water, and offering trainings on drought management and water conservation/harvesting practices.

⁷⁰ Rainfall sensitivity is a map layer in the MEACAM's Drought module.

These proposed triggers would activate when MEACAM forecasts agriculture underperformance⁷¹ in over 50% of predicted months. The precise timeframe associated with the proposed triggers in Iraq, Syria, and Yemen are found in Table 4. The months specified in the prediction periods align with the proposed trigger mechanisms and are focused on predicting agricultural drought during the seasonal crop growth maximum (as defined by the crop growing season maps produced by FAO's Global Information and Early Warning System on Food and Agriculture [GIEWS]).⁷²

Table 4. Proposed trigger mechanisms in Iraq, Syria, and Yemen informed by the MEACAM platform's agricultural drought predictions⁷³

Region	Trigger	Prediction Period	Lead time	Action
Federal Iraq	Trigger 1	November - March	4 months	Alerts of possible agricultural drought conditions
	Trigger 2	December - March	3 months	Conditional cash transfers to farmers and fodder distribution
	Trigger 3	January - March	2 months	Unconditional MPCA to farmers and herders
Syria/KRG	Trigger 1	December - April	4 months	Alerts of possible agricultural drought conditions
	Trigger 2	January - April	3 months	Conditional cash transfers to farmers and fodder distribution
	Trigger 3	February - April	2 months	Unconditional MPCA to farmers and herders
Tihama (Yemen)	Trigger 1	August - December	4 months	Alerts of possible agricultural drought conditions
	Trigger 2	September - December	3 months	Conditional cash transfers to farmers and fodder distribution
	Trigger 3	October - December	2 months	Unconditional MPCA to farmers and herders
Northern/Central Highlands (Yemen)	Trigger 1	July - November	4 months	Alerts of possible agricultural drought conditions
	Trigger 2	August - November	3 months	Conditional cash transfers to farmers and fodder distribution
	Trigger 3	September - November	2 months	Unconditional MPCA to farmers and herders

⁷¹ Defined in the MEACAM Drought in Focus research report.

Mercy Corps, [MEACAM Research Report: Drought in Focus](#) May 7, 2025

⁷² FAO crop growing season maps for [Iraq](#), [Syria](#), and [Yemen](#).

⁷³ Prediction starting periods are defined as one month before the beginning of the growing season, and prediction end periods are based on the region's seasonal crop growth maximum. Predictions are intended to be observed in the first week of the specified month.

Flooding

The MEACAM platform provides flood predictions from 24 hours to 72 hours (3 days) in advance of the event. This range of lead times permits interventions that are within most of the IFRC's flood EAPs available on Anticipation Hub, which are summarized in Table A3 in the Annex. The following triggers, informed by IFRC flood EAPs, are examples of activation mechanisms that can leverage MEACAM flood predictions:

Trigger 1 – Readiness (72-hour lead time): If the forecasted 72-hour rainfall accumulation is equal to or greater than 50mm.

Trigger 2 – Activation (24-hour lead time): If the forecasted 24-hour rainfall accumulation is equal to or greater than 20mm.

The proposed triggers are based on the expansion of the MEACAM flood prediction module, which now includes heavy rainfall predictions in addition to existing flood predictions derived from satellite imagery.⁷⁴ The rainfall forecasts are obtained from ECMWF⁷⁵ and are categorized according to the rainfall volumes defined in the proposed trigger mechanism. The team added severe rainfall indicators to the MEACAM platform after assessing feedback from government officials and aid actors in Iraq, Syria, and Yemen. The team concluded that heavy rainfall forecasts are simpler to communicate as early warning triggers and the satellite-derived flood predictions are better suited as supplemental early warning information identify the precise locations and populations impacted by flooding.

The only flood EAP for a Middle East country posted on Anticipation Hub is an early action protocol in Yemen.⁷⁶ The protocol's readiness trigger activates when forecasts predict over 20mm of rainfall in a 24-hour period at any point within the following week, initiating supply pre-positioning and early warning messages. The activation trigger is met when the total forecasted rainfall is 20mm or more in any 24-hour period within the following three days. The

⁷⁴ As the EAP is developed, heavy rainfall thresholds should be contextualized per-region, according to the amount of rainfall that typically produces flash flooding.

⁷⁵ Google Earth Engine, [ECMWF Near-Realtime IFS Atmospheric Forecasts](#).

⁷⁶ IFRC, [Yemen | Floods - Simplified Early Action Protocol \(MDRYE015\)](#) July 25, 2024

early action interventions provided when this trigger is met include the distribution of multipurpose cash assistance, sandbags to protect IDP sites and shelters, emergency shelter/repair kits shelter kits, first aid kits for community committees, and the dissemination of early warning messaging in targeted communities and IDP sites.

The IFRC flood EAPs include a range of activities that can be applied to MEACAM-informed triggers. The first trigger provides a seven-day lead time and was originally proposed as a readiness trigger to pre-position in-kind assistance and MPCA. It is also suitable for disseminating early warning information, prompting maintenance work on drainage channels, and mapping evacuation routes, temporary shelters, and drinking water sources. The second proposed trigger provides a three-day lead time, which is the point at which most early action assistance is distributed, such as cash assistance (MPCA and cash for work), hygiene kits, shelter kits, waterproof bags, and sandbags to protect shelters.

Future outlook

Currently, MEACAM's agricultural drought and flood predictions can inform EAPs and national or regional early warning systems, though several additional datasets could enhance the platform. Perhaps the most beneficial addition would be the integration of weather forecasts produced by national or regional weather agencies, which would enhance the flood predictions with localized weather information. Multi-month weather forecasts would also be a useful indicator to add to the agricultural drought prediction model and facilitate longer-term DRR interventions to mitigate the impact of floods. National-level flash flood vulnerability layers for Iraq, Syria, and Yemen could also be prioritized to provide critical evidence needed to target DRR interventions and guide urban expansion and IDP site selection. Lastly, the integration of existing hazard predictions into the platform, such as FAO's Locust Watch⁷⁷, would serve to centralize early warning information for other types of hazards.

⁷⁷ FAO, [Locust Watch: Early Warning](#)

Conclusion

As the frequency, severity, and impact of droughts and floods in Iraq, Syria, and Yemen continue to intensify, sustained and effective funding for early action and DRR remains essential. Despite the dynamic security situations in these countries and a global reduction in aid funding, there is a clear need to enhance capacity to mitigate the impacts of natural hazards on highly vulnerable populations and for long-term investment in disaster risk reduction to reduce the impact of future natural disasters. Iraq, Syria, and Yemen face significant challenges in implementing such initiatives due to varying levels of institutional constraints, outdated infrastructure, political instability, and violent conflict.

The early warning information provided by the MEACAM platform is one of several elements needed to promote and facilitate early action and DRR in Iraq, Syria, and Yemen. Active collaboration among aid actors that respond to disasters is needed to promote early warning information and protocols and inform national-level emergency response plans. Among aid actors, the design of EAPs should be jointly defined by specialists from multiple sectors, with an effort to coordinate DRR and early action programming in areas vulnerable to natural disasters. The adoption of early warning information and disaster response planning by authorities in Iraq, Syria, and Yemen will likely be gradual. By working together and leveraging their collective strengths, aid agencies can enhance their influence and scale up early action and DRR interventions in each country to better meet the needs of vulnerable populations affected by natural disasters.

Table A1. An overview of DRR activities in Iraq, Syria, and Yemen related to drought and flooding.

Project	Implementer	Funder	DRR Strategy	Sector	Summary
IRAQ					
DROUGHT					
Government of Iraq weather and hazard monitoring	Iraq Meteorological Service, the Ministry of Agriculture, the Ministry of Water Resources and the Ministry of Environment	Various, including UKAid and USGS	Early Warning	Agriculture, EWS	EWS targeting farmers and agriculture. Limited functionality of EWS, moderate/high outreach in community
Iraq Climate Induced Displacement Tracking	UN-IOM, Displacement Tracking Matrix (DTM)	UN-IOM	Early Warning	IDPs	Online bulletins for climate-induced displacement, no alerts or community dissemination found.
Promoting climate adaptation for food security and stability in Iraq ⁸	WFP, local governments	USAID	Preparedness, Prevention, Early Warning	Agriculture, EWS	Community preparedness, prevention, and climate adaptation for food security. Community EWS is planned.
CGIAR International Center for Agricultural Research in the Dry Areas (ICARDA) ⁹	ICARDA	CGIAR	Prevention	Agriculture	Revive traditional water management practices to improve food security and reduce displacement.
Strengthening Climate resilience of vulnerable agricultural livelihoods in Iraq (SRVALI)	FAO, Iraq Ministry of Water Resources and the Ministry of Environment	Green Climate Foundation	Prevention	Agriculture, Protection	Fostering inclusive and sustainable community development by empowering women as change agents for water-efficient irrigation, Water User Associations (WUAs), climate-resilient agricultural practices, development of policies for climate-smart agriculture.

WFP and Italy partner with the Government of Iraq to boost climate resilience and agricultural livelihoods	WFP, Gov of Iraq, Italian donor	Italian Agency for Development Cooperation (AICS)	Prevention	Agriculture, Protection	Drought-tolerant crops and water-efficient irrigation, land management, financial support to farmers
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FLOOD

Mosul Dam emergency plan	UNDP, Gov of Iraq, Iraq Red Crescent Society, WHO, UNICEF	USAID	Preparedness	Protection, Health, Education	Community and hospital preparedness, simulations/drills, EWS for evacuation, physical strengthening of dam and downstream structures.
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DROUGHT AND FLOOD

Iraq Flood and Drought Monitor	University of Southampton, University of Princetown	UNESCO (IHP)	Early Warning	General	Online flood and drought monitor, no alerts or community dissemination found.
Iraq Climate Monitoring Dashboard	REACH Initiative, Action Contre La Faim (ACF) and The University of Mosul	Unknown	Early Warning	General	Public dashboard identifying climatic hotspots, no alerts or community dissemination.
Women for Safe and Green Iraq	UNDP; Iraqi ministries and governmental agencies	UNDRR	Prevention	Protection	Training women and girls in mitigation of climate risks and preparedness, as well as gender-responsive policies and strategies.
Climate Wise Women Initiative	FAO, Iraq Ministry of Agriculture, Sida	FAO	Prevention	Protection, Agriculture	Train women on climate adaptation strategies, water-efficient irrigation, climate smart agriculture.
Building Peace and Collaboration in the Community through Mediation – Iraq	UN Habitat	UNDRR	Prevention	Social Cohesion, Protection	Training women as mediators of community disputes to build engagement, improve social cohesion and promote DRR in community.

SYRIA					
DROUGHT					
Syria Resilience Initiative	Mercy Corps, the Cooperative for Assistance and Relief Everywhere, IRC.	FCDO, Dutch MFA, NORD	Prevention	Agriculture	Drought- and climate-friendly irrigation methods
Building Local Resilience in Syria (BLRS)	CARE, IRC, Mercy Corps	FCDO	Prevention	Agriculture	Climate-smart, agriculture interventions help vulnerable farming communities
YEMEN					
DROUGHT					
CGIAR International Center for Agricultural Research in the Dry Areas (ICARDA)	ICARDA	CGIAR	Prevention	Agriculture	Drought-tolerant crops and water-efficient irrigation
Peacebuilding through natural resource management	FAO, IOM	UN Peacebuilding Fund	Prevention	Protection, Peacebuilding	Supporting women and youth participation at the communal level using land and water conflict resolution to promote peace and sustainable resource use.
FLOOD					
Toolkit to improve mud building resistance to rain and floods	UNDP	UNDP	Prevention	Shelter	Toolkit for improving mud building resistance to rain and floods in Wadi and Hadramout
Yemen integrated urban services emergency project	Yemen Public Works	UNOPS, World Bank	Prevention	Urban Development, WASH	Construction of rainwater drainage canals to reduce urban flooding.

Simplified Early Action Protocol (SEAP)	Yemen Red Crescent Society	WMO, IFRC	Early Warning, Preparedness	EWS	EWS activated when heavy rainfall is forecasted; protocol includes simplified plans to act immediately to prepare communities.
DROUGHT AND FLOOD					
FEWS NET	FEWS NET	USAID	Early Warning	Agriculture, General.	Early warning platform for food-related climate crises.
Food Security Nutrition Information Systems (FSNIS)	FAO	FAO	Early Warning	Nutrition	Early warning bulletins online related to specific climatic hazards, including flood and drought. No alerts or community dissemination.
Food Security Response and Resilience Project (FSRRP) in Yemen.	UNDP	World Bank	Prevention	Agriculture	Climate-resilient irrigation and water management practices, updating of water infrastructure, cash-for-work for participating in climate smart agricultural updates.
WMO Global Multi-hazard Alert Systems (GMAS)	WMO	Various, including Korea Meteorological Administration and FCDO	Early Warning	Unclear	Training on use of GMAS and Common Alerting Protocol, unclear on who was trained or how this is used in Yemen.

Table A2. Drought early action plans (EAPs) posted on Anticipation Hub.

Country EAP	Lead time	Trigger Mechanism	Early Actions
Eswatini	3 months	Trigger 1 = Below average to normal seasonal rainfall forecast (in September); 2 = Composite Drought Index (CDI) above 30th percentile (in January)	Trigger 1: Install water tanks in priority areas, distribute treated water for domestic use; Unconditional MPCA; Conditional cash for garden fencing, fertilizer, and pesticides; Trigger 2: Distribution of hay bales; Scaled-up distribution of treated water for domestic use; Unconditional MPCA and conditional cash for vegetable seeds and animal care kits
Guatemala	3 months	1.) The occurrence of an El Niño event in area 3.4 for the next 3 months with a 70% probability, based on the IRI forecast; 2.) INSIVUMEH, issues a seasonal precipitation forecast starting in June with 50% probability below the first tercile (33rd percentile) for the next 3 months.	MPCA; WASH: Water storage tanks and accessories, water system restoration; disaster risk reduction (DRR) training
Somalia	3 months	In the next 90 days, ICPAC issues an SPI-12 forecast of less than -1 for a district AND the FEWSNET food insecurity projection reaches at least 0.7 in its derived population-weighted index in the same district.	Provide households with information on timely destocking (considering market prices), drought management and water conservation/harvesting practices; Rehabilitating water points to enable optimal water capture and storage; Unconditional MPCA for vulnerable people (HHs relying on farming/herding)
Ethiopia	1 month	More than 50% of the geographic area in Shebelle zone and East Bale zone showed drought forecast with a probability of ≥45%	Promote systematic livestock destocking; temporary slaughterhouses so communities can make dry meat; Promote systematic migration with portions of livestock to other pastures; Vaccination of livestock; Provide short maturing forage seed/planting for livestock foraging; Provide Cash/in kind for animal feed; Promoting area closure (rangeland management); Conflict resolution or negotiation of resource sharing; Promote awareness for waterborne diseases and water conservation techniques; Trainings on identifying signs of malnutrition; Promotion of alternative foods and food saving techniques

El Salvador	3 or 4 months	Trigger 1: When the General Directorate of Threat Observatory and Natural Resources (DGOA) communicates an El Niño event for the upcoming 3 or 4 months with a 60% probability, based on the official IRI-CPC forecast until April of year (0) or even earlier in year (-1); Trigger 2: When the DGOA has issued a quarterly precipitation forecast indicating that accumulated rainfall during May, June, and July will be below normal (33rd percentile). Early action is activated when Trigger 2 is met.	Conditional cash transfers for agriculture kits (including drought resistant crop seeds); unconditional MPCA; Awareness campaign on water conservation and sanitation measures; Installation of storage tanks important community spaces (such as health centers and schools); Treated water distribution in points across the community; Distribution of water purification and hygiene kits to MPCA recipients
Colombia	3 months	When the Instituto de Hidrología, Meteorología y Estudios Ambientales (IDEAM) reports a precipitation forecast (three months) with a probability of 50% that rainfall will be below normal AND the SPI forecast indicates a moderate drought with values equal or below -1.4, for the same forecasted months, in the departments of the Caribbean and Andean region.	Delivery of hydro-retainers and nutritional blocks and training of agricultural and livestock producers on how to use of inputs; unconditional MPCA; Diagnostics water quality testing of community water sources; Delivery of family kits for water treatment and storage; Mobilization and operation of a water treatment plant with up a capacity of up to 900,000 L/ day; Sensitization and training of communities in WASH (management and maintenance of filters, treatment and safe storage of HH water)
Lesotho	4 months	In July, a weather forecast predicting normal to below normal rainfall for a period of October, November, and December	Unconditional MPCA; Early warning message dissemination through public gatherings, radio, TV, social media platforms, bulk messaging
Kenya	7 months	The 3-month SPI for October to December (OND) at -0.98 forecasted with at least 33% probability in at least 3 of the 23 counties indicates an imminent drought at national level. The trigger must be met in more than one county and with up to a sufficient lead-time (7 weeks) to start early actions implementation before the end of October to December season	Promote improved post-harvest crop management to reduce post-harvest losses; Promote crop diversification; Distribute drought tolerant seeds; Promote the expansion and protection of fallback grazing areas; Promote pasture management - fodder preservation / packaging; Distribute fodder; Repair and rehabilitate water facilities; Desilt water pans; Repair earthen dams; Activation of water committees with refresher trainings; conditional cash for WASH items; Dissemination of early warning messages to communities via radio

Table A3. Flood early action plans (EAPs) posted on Anticipation Hub.

Country EAP	Lead time	Trigger Mechanism	Early Actions
Chad	7 days	Weekly Extreme Forecast Index (EFI) forecasts from the ECMWF model > 0.8 AND Météo Tchad (ANAM) extreme rain forecast.	Distribution of agricultural equipment (300 wheelbarrows, 600 shovels, 600 pickaxes, 600 rakes); Distribution of 20,000 empty bags for local action groups to protect homes; Distribute NFI Kits; Raising awareness on the prevention of water- and hygiene-related diseases
Bangladesh	5 to 10 days	Multiple triggers informing an early action matrix that links the various forecast scenarios with a set of actions is triggered at different pre-determined scenarios. Triggers based on river gauge level forecasts that use rainfall forecasts to predict river water levels. The model produces 5- and 10-day forecasts, depending on the gauge station.	Shelter preparation/repairing; Minor repair of embankments and evacuation routes; Formation of volunteer and medical teams; Prepare evacuation boats; Form area-based flood monitoring teams; Conduct rescue drills; Distribute water purification tables, disinfectant and anti-venom; Vaccinate livestock
Yemen	3 to 7 days	Readiness Trigger: When the median ensemble member of the ECMWF forecast indicates that 24-hour rainfall totals will be 20mm or above, looking at a time window of 7 days ahead across western Yemen (including Hajjah Governorate). Activation Trigger: When the median ensemble member of the ECMWF forecast indicates that 24-hour rainfall totals will be 20 mm or above, looking at a time window within 3 days (72 hours) over the northwestern part of the country (including Hajjah Governorate).	Cleaning of drainage system inside and surroundings of the camps/sites; Provision to communities and IDP site sandbags; Distribution of emergency shelter/repair kits; Distribution of MPCA; First aid training for community committees and local authorities/civil defense; Procurement of 30 first aid kit and stretchers
Burundi	3 to 7 days	Trigger A: When IGAD Climate Prediction and Applications Centre (ICPAC) forecasts indicate that the 99th percentile of daily precipitation totals will be exceeded with a probability $\geq 60\%$ seven days before impact; OR Trigger B: When Burundi Geographic Institute (IGEBU) forecasts indicate that the historical	MPCA distribution; Awareness campaign on flood risks, good practices in water management and use, hygiene and sanitation. 2. Distribution of water treatment products and water storage equipment; Deployment of volunteers in targeted areas to raise flood awareness and coordinate communities to take early action.

		threshold of 25 mm in 24 hours will be exceeded and ICPAC forecasts indicate that the 99th percentile of daily precipitation totals will be exceeded with a probability of 60% or more within the next three days.	2. Train provincial and communal response teams to support early action and prepare for rapid intervention; Activate a flood response information hotline for community members
Nepal (Western Terai)	2 to 5 days	Trigger A: When the Global Flood Awareness System (GLOFAS) predicts more than 2-year return period flow in next 3 to 5 days with a probability of 50% or more at Chisapani, Chepang and Kusum stations, OR Trigger B: When the numerical weather prediction (NWP) from DHM/RIMES or any special weather advisories/bulletin from DHM predicts extreme and widespread rainfall for next three days across Babai and West Rapti basin areas and districts, if these rivers are already flowing 2m below danger level, OR Trigger C: When the DHM flood forecast bulletin or regional flood outlook from ICIMOD or any special flood advisories from DHM predict the water level of Karnali to rise 1m above the existing danger level in the next 48 hours, OR Trigger D: When the DHM flood forecast bulletin or regional flood outlook from ICIMOD or any special flood advisories from DHM predict water levels of Babai and West Rapti to rise to their existing danger levels in Chepang and Kusum station respectively in next 48 hours.	Management of existing evacuation sites; Construction of temporary shelters and livestock sheds; Distribute waterproof bags to store important documents; Mobilize volunteers to assist the early evacuation of vulnerable populations (persons with disabilities, senior citizens, pregnant and lactating mothers, children) and their livestock; Distribute WASH relief items and water testing and treatment; Distribute hygiene kit and jerry cans; Distribution of dignity kits to women and adolescent girls of reproductive age; Disseminate awareness messages on SGBV and child protection; Disseminate early warning messages via multi-hazard sirens, hand-mikes, short mobile messages services (SMS) and home visits
Mozambique	3 days	Trigger A.) If GloFAS indicates, within 7 days lead-time, that there is >50% likelihood of 1 in 5-year flooding for Licungo at Mocuba Ponte; Trigger B.) If GloFAS indicates, within 7 days lead-time, that there is >50% likelihood of 1 in 20-year flooding for Buzi at Estaquinha	Disseminate information on the prevention of waterborne diseases on community radios; Distribute mosquito nets to HHs and demonstrate their use; Distribute and demonstrate the use of first aid kits; Disseminate information on how to prevent against waterborne diseases on community radios; Distribute and demonstrate the use of water purifiers/Certeza, buckets, jerrycans and mugs

Honduras	3 days	Trigger 1.) Centro Nacional de Estudios Oceanográficos y de los Océanos y la Atmósfera (CENAOs) or NOAA issues a forecast with a 60% probability of a tropical storm (34 knots) or greater reaching the warning area with a lead time of between 3 to 5 days; Trigger 2.) When the GEOGLOWS/GloFAS forecast exceeds 50% probability for a 10-year return period in high flood hazard areas with a 3-day lead time.	Distribute MPCA; Distribute household water purification kits
Uganda	5 days	When GloFAS issues a forecast of at least 70% probability of a 5-year return period flood occurring in high priority flood prone districts, and 10-year return period in lower priority flood prone districts, which will be anticipated to affect more than 1,000 HHs. The EAP will be triggered with a lead time of 5 days and in locations where the false alarm rate is not more than 0.5.	Disseminate targeted early warning information via radio messages, social media; Rapid community mapping of designated evacuation centers, evacuation routes and holding places and installation of signposts; Engage 50 volunteers to disseminate targeted early warning information/messages through local and traditional leaders, churches, schools and other stakeholders
Ethiopia	7 days	When the Global Floods awareness system (GLOFAS) forecast indicates a level of river discharge greater or equal to a level of 10 years return period with a probability of at least 75% forecast uncertainty within 7 days lead time.	Disseminate early warning information with focus on crop and livestock; Map flood zone, evacuation routes, temporary shelters, and drinking water sources; Provide maintenance of drainage channels for 50 ha crop lands through community mobilization and CVA support; Evacuate domestic animals to a temporary shelter; Provision of fodder and water for livestock; Provide maintenance of drainage lines around 250 homesteads; Distribute sandbags to HHs; Protect 3 drinking water points through minor maintenance; Provide water treatment (chemicals, tablets) HHs; Clearing drainage lines contributing to sanitation; Promote the use of temporary latrines; Disseminate information on potential health risks from WASH related diseases; Install a hand washing facility; Distribute soaps, sanitizers and facemasks

Philippines	3 days	When GloFAS predicts, with more than 70% probability and 3 days before the flood, the occurrence of a 1 in 5 years flood (at least) in any of the 4 targeted river basins. Then the corresponding flood extent will be overlayed on the rice crop map to estimate the flood impact in the concerned river basin, allowing the selection of the municipalities where to focus the anticipatory actions (where for instance the predicted impact is more than 50% of crops possibly affected, or between 30-50%).	Cash for work for the early harvesting of crops and fishes; Cash for work for the livestock and asset evacuation; Cash for work for the temporary relocation of small businesses
Niger	4 days	When the flood prediction model forecasts a flood 72 hours before the flooding with a margin of error $\approx 0.05\%$. Based on a flood prediction model developed by the Niger Basin Authority (NBA) through the SATH-ORIO project (http://www.sath.abn.ne/Hydrology_FR.html#). This model gives a 6-day forecast and provides three types of alerts: yellow, orange and red.	Set up emergency shelters and facilitate evacuation to host sites; Distribute shelter kits

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