# Update on the Central America and the Caribbean Flash Flood Guidance System (FFGS) & Early Warning System for Floods (EWS-F)

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**World Meteorological Organization**

# Outline

- Brief Introduction to Flash Flood Guidance System (FFGS) Fundamentals

- Early Warning System for Flood (EWS-F) and link with other WMO activities (ie HydroSOS, FFGS, CREWS, EW4All)

# Brief Introduction to Flash Flood Guidance System (FFGS) Fundamentals

Hydrological and Water Resources Services (HWR) Division
*Hydrology Water and Cryosphere (HWC) Branch*

WMO Office for North America, Central America and the Caribbean
*Member Services and Development Department*

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# Flash Flood

Flash flood is a flood of **short duration** with a relatively **high peak** discharge in which the time interval between the observable causative event and the flood is **less than six hours.**

# Flash Flood

- Flash floods differ from river floods in their short time scales and occurrence on small spatial scales, which makes flash flood forecasting a different challenge from large-river flood forecasting.
- In flash floods forecasting, we are concerned mostly with the forecast of occurrence, and focus on two causative events:
  - intense rainfall; and
  - rainfall on saturated soils.

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# Flash Flood

- Flash floods occur throughout the world, and the development times vary across regions from minutes to several hours depending on the land surface, geomorphological and hydrometeorological characteristics of the region.
- However, for the majority of these areas, there exists no formal process or capacity for developing flash flood warnings.


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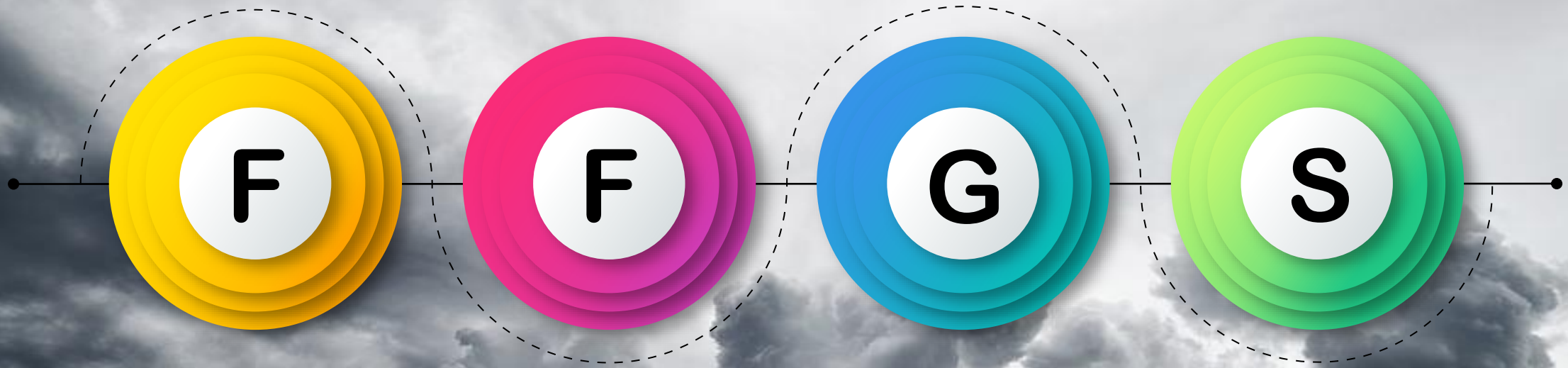
**Flash Flood Guidance System (FFGS)!**

# What is FFGS?

FFGS is a **forecaster tool** designed to provide hydrometeorologists with readily and accessible observed and forecast data, and other information **to produce** timely and accurate **flash flood warnings**.




Since the implementation of the **FFGS**, **50% of the countries** have, for the first time, access to products that enable them **to issue flash flood warnings**, providing the response agencies the **ability to rapidly mobilize**.

# FFGS


- **FFGS** provides operational forecasters and disaster management agencies with real-time informational guidance products pertaining to the threat of small-scale flash flooding.
- **FFGS** is a robust system designed to provide the products needed to support the development of flash flood warnings from rainfall events using remote-sensed precipitation (that is, radar and satellite-based rainfall estimates) and hydrological models.
- To assess the threat of a local flash flood, **FFGS** allows product adjustments based on the forecaster's experience with local conditions; incorporation of information, such as Numerical Weather Prediction outputs; and any last-minute local observations, including non-traditional rain gauge data or local observer reports.

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# Now and future

**FFGS serves more than 3 billion people in the world and will serve more than 5 billion people by 2027**

# By 2030, early warnings on floods to be available for all

- Early warnings about floods and droughts will be available for people everywhere on the planet by 2030, according to the ‘Water Declaration’ endorsed at the Cg-Ext(2021).
- It follows and contributes to the **Sustainability Strategy for strengthening the FFGS/WGC** approved at the Cg-Ext(2021).
- The endorsements at the Congress are significant as more than half of the world’s population will be living under water-stressed conditions by 2030 according to the WMO and will be more vulnerable to water-related disasters especially cyclones and floods.

# Objectives

1. Enhance NMHSs capacity to issue flash flood warnings/alerts
2. Mitigate adverse impacts of flash floods and related hazards
3. Enhance collaboration between NMHSs and DMAs
4. Generate FF EW products by using state-of-the-art hydromet forecasting models
5. Provide extensive training to forecasters
6. Foster national and regional developments and collaboration
7. Builds public confidence through provision of services
8. Foster verification of (flash flood) forecasts and warnings


Support the WMO Flood Forecasting Initiative

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# FFGS Partners and stakeholders

Funding agencies

Hydrologic Research Center: System developer: Non-Profit research Corporation, San Diego (USA)

National Oceanic and Atmospheric Administration: provider of satellite data

Implementing the project and coordinating with WMO Members

# FFGS System Architecture
# Technical background

**FFGS Input**

- Precipitation (Satellite (NOAA), Radar, Gauge)
- Temperature, Evapotranspiration
- GIS Data, Land Use, Soils
- Rainfall forecast

**FFGS Modelling Components**

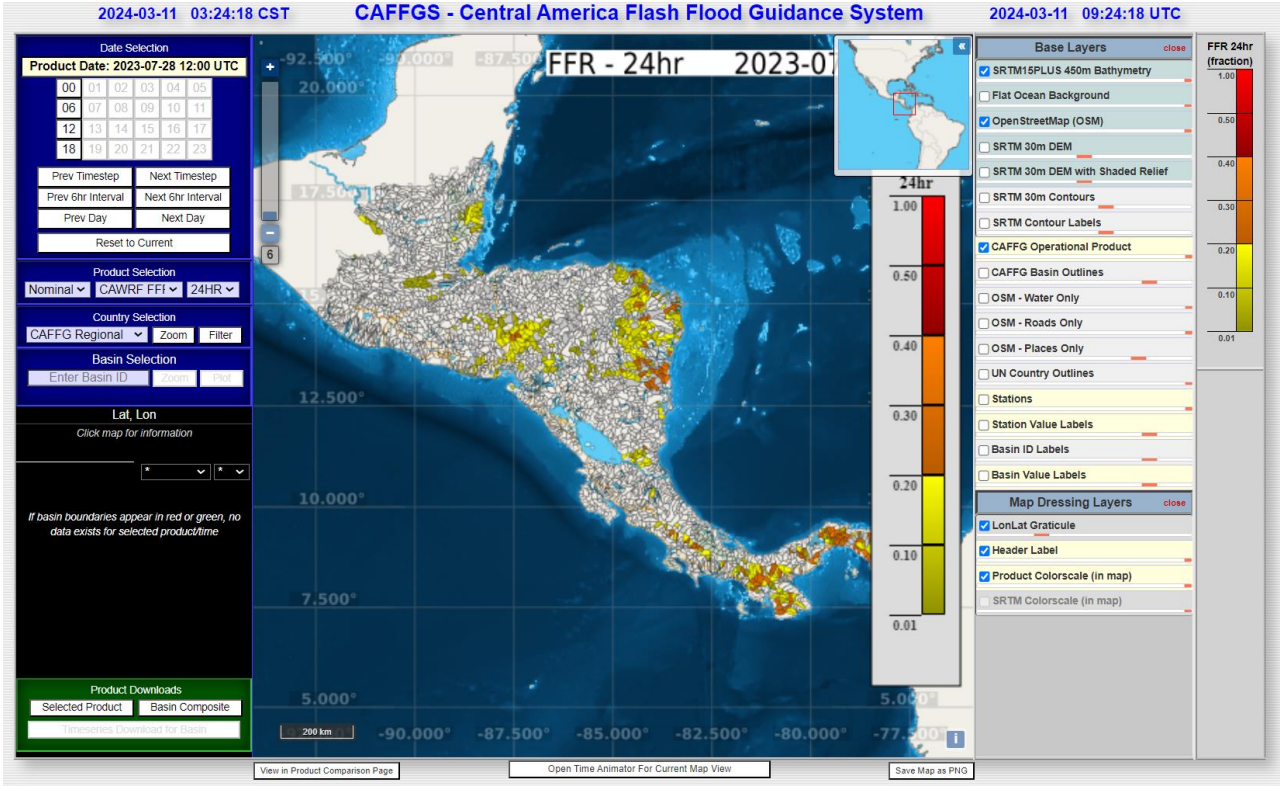
- Soil moisture model
- Threshold runoff model
- FFGS model

**FFGS Land-Surface Products**

- Soil Moisture
- Landslide Threat (only in selected regions)

**FFGS Threat Products & Warnings**

- Flash Flood Guidance
- Flash Flood Threat




**Forecaster's input**

# FFGS Training Plan

## Step 1

- Introductory National Workshop

## Step 2

- E-learning

## Step 3

- Specialized training
- **HRC Certification**

## Step 4

- National Operations Training Workshop
- **WMO Certification**

## Step 5

- Operations Sustainability Workshop **(WMO Certified Trainers)**

## IT training

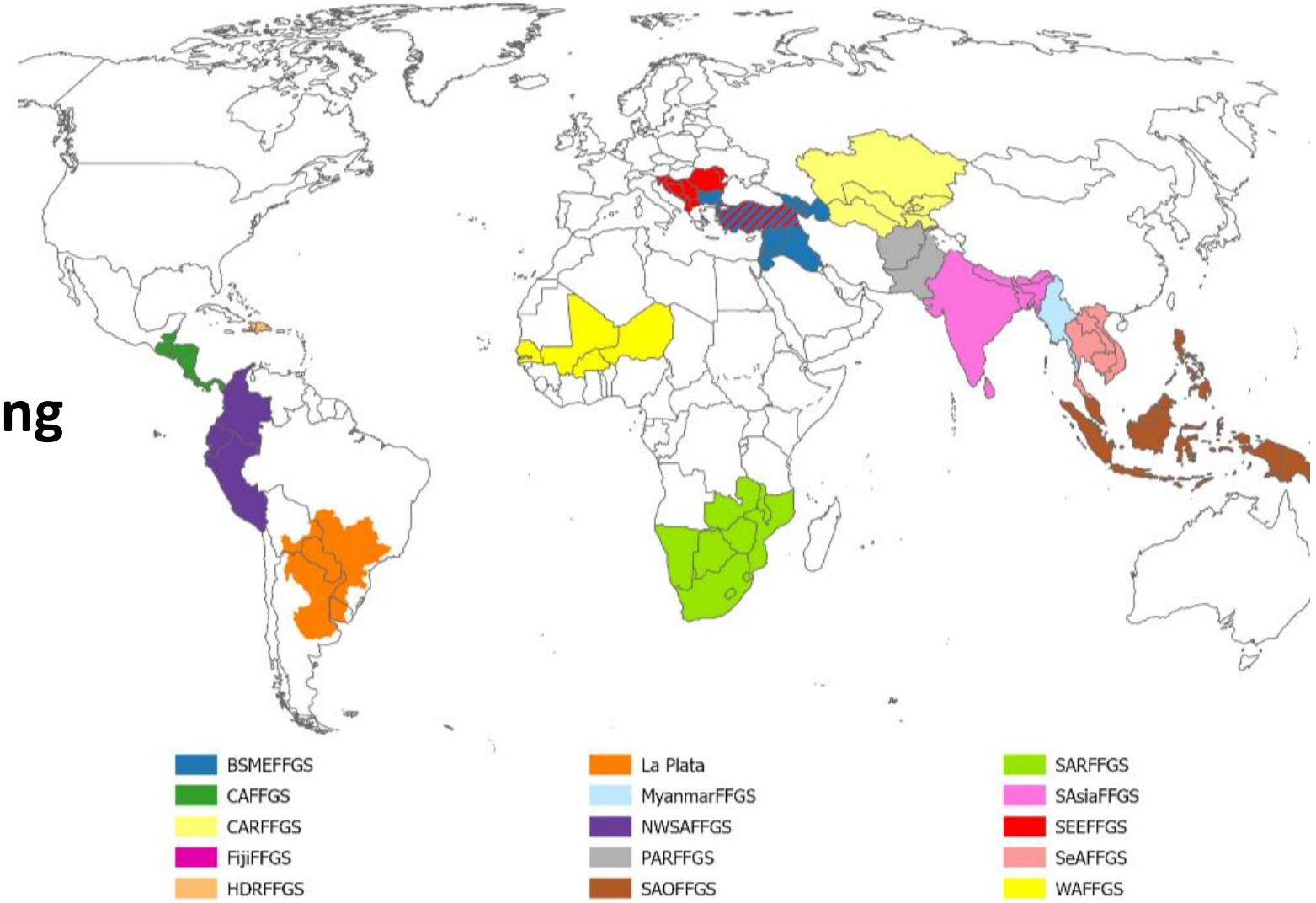
## Radar training

*The current steps might be subject to changes, based on the new training plan being developed, following the recommendations of the FFGS Sustainability Strategy*

# FFGS Global Coverage

## Status as of 2024

- **73 Countries**
- **15 Regional FFGS Projects**
- **2 National Projects**
- **Regional Centers are providing**
  - Flash flood guidance
  - Risk products
  - Operational support

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USAID FROM THE AMERICAN PEOPLE

Environment and Climate Change Canada
Environnement et Changement climatique Canada

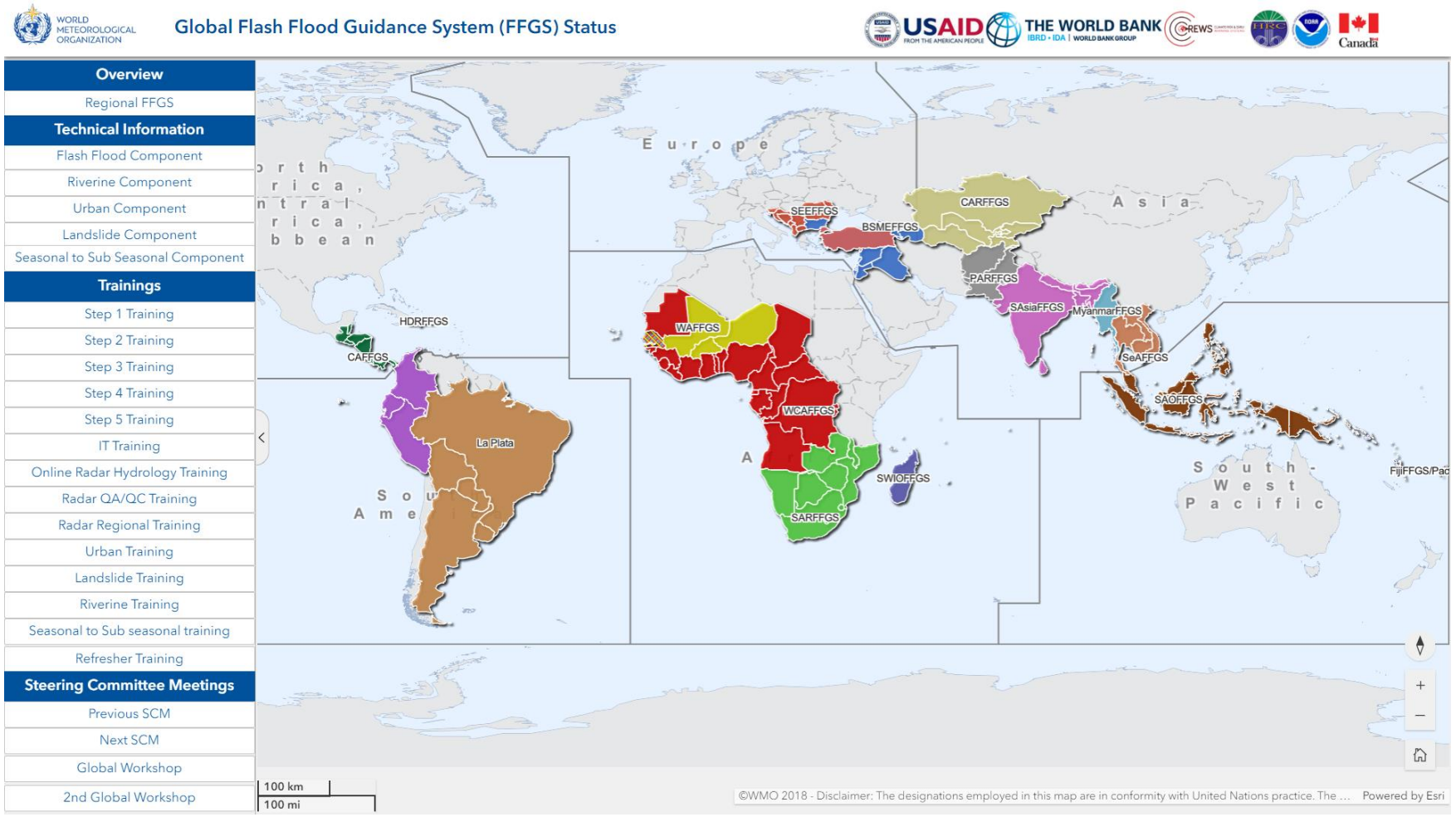
CREWS

https://public.wmo.int/en/projects/ffgs

# Phase IV (2024-2026) - Expansion

## Goal to 2027

- 30+ new countries
- Full EW4All Coverage
- 5Billion+ People covered with FF warnings
- Sustainability
- Global Centres
- RSHCs




Global FFGS Status Map

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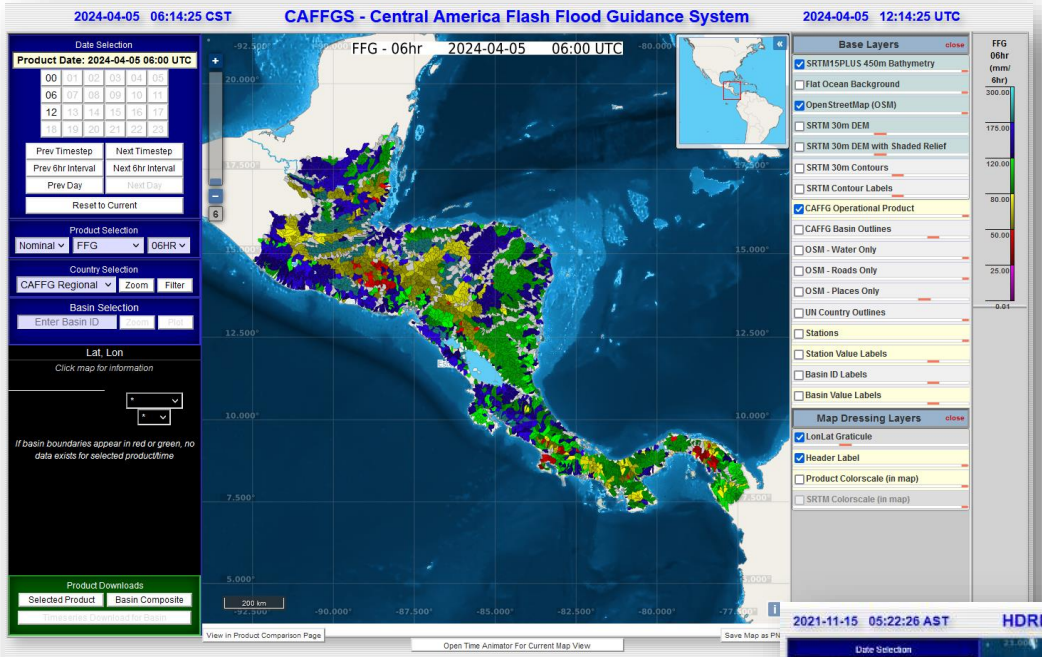
# FFGS in RA IV

## CAFFGS

Costa Rica (RC), El Salvador (Back up RC), Belize, Guatemala, Honduras, Nicaragua, Panama

- **Established in 2004**
- Enhanced to include the ingestion of limited area model **(WRF) in 2011**
- Landslide component available
- Upgraded with the addition of **150 observation gauges in 2016**

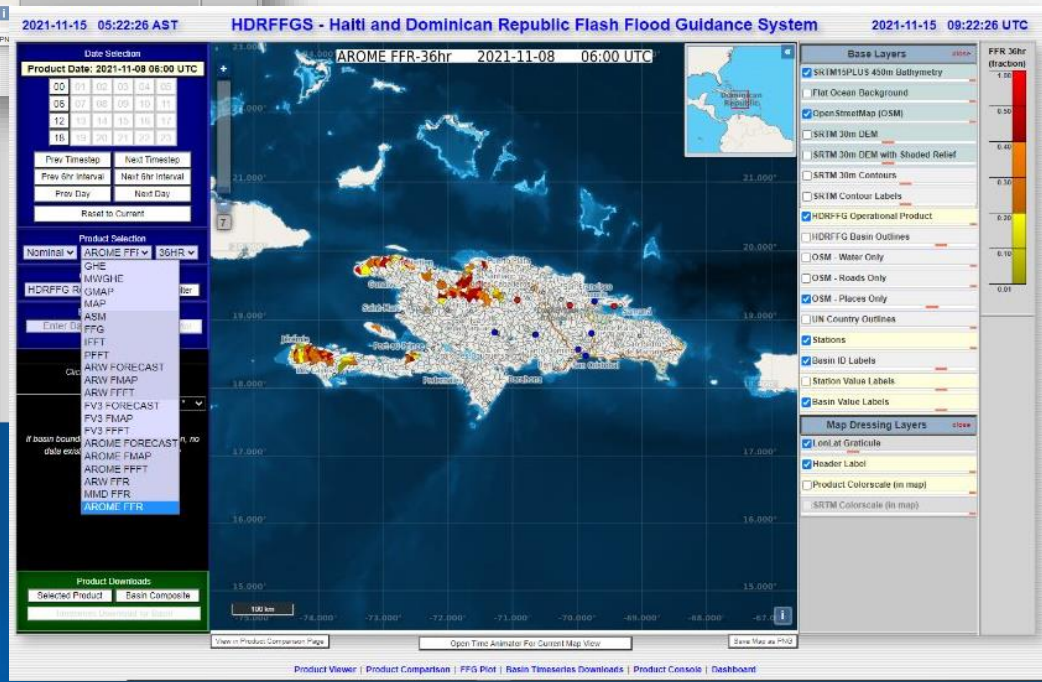



Source: SCM and Step 5/refresher, Panama, April 2023

## HDRFFGS

Haiti and Dominican Republic (RC)

- **Established in 2016**
- Has 3 NWP models (WRF, AROME)
- Integrated data from 59 stations.

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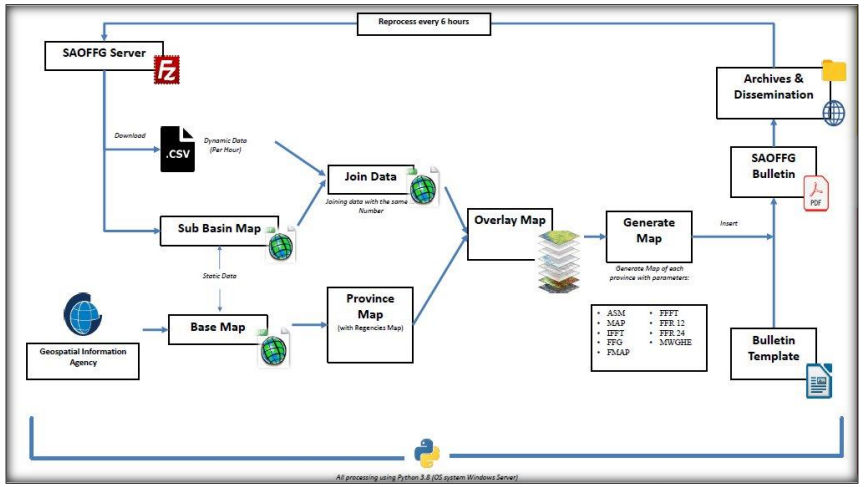
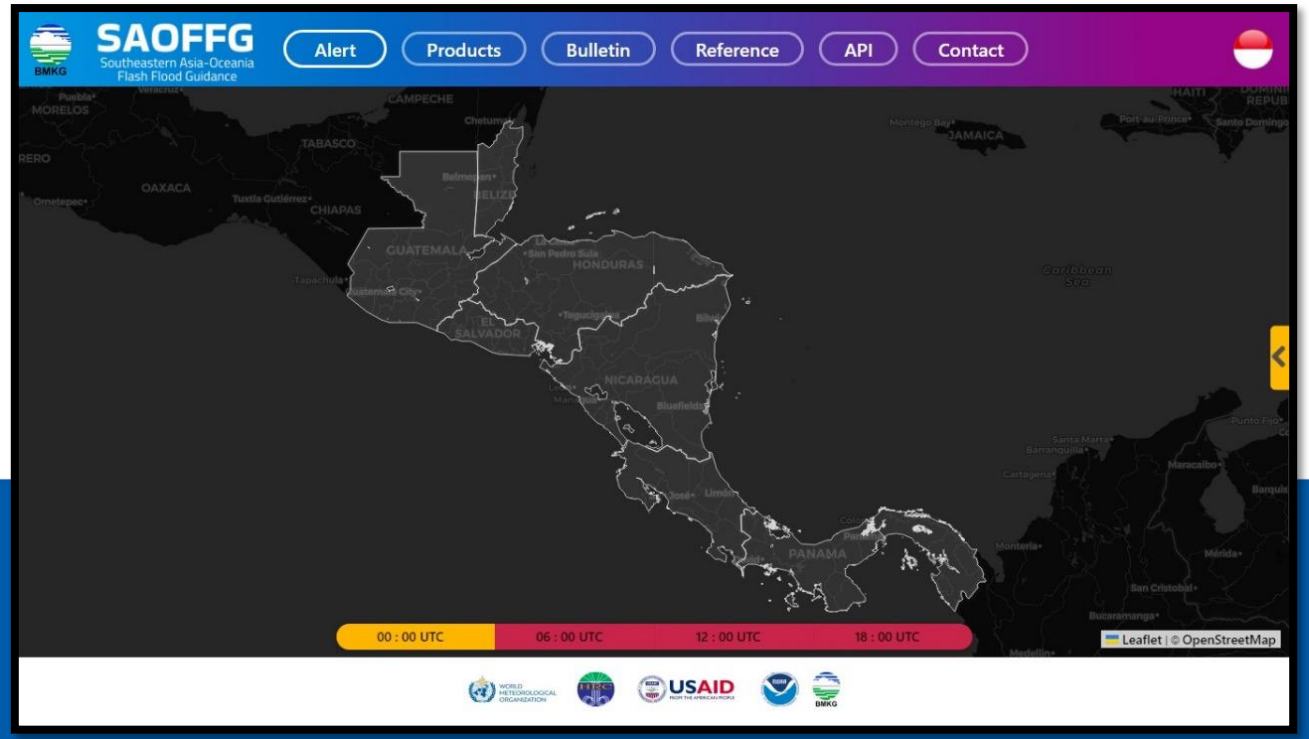
# Member-2-member Innovation 4 Operations

- The Python-based software processes products every six hours. Areas with potential flash floods are automatically identified in accordance with predefined alert criteria. The bulletin and web service development are now complete. An **introductory online webinar covering these topics will be held on 20 May 2024 (Global Call).**




August 2023, Costa Rica, Regional bulletin verification workshop

# Members ownership

**First FFGS Global Workshop**, Antalya, Turkey in November 2019. **160 experts**, including meteorologists, hydrologists, disaster managers, and representatives from **59 countries**.


**2nd FFGS Global Workshop**, Skopje, Republic of North Macedonia in June 2023. **203 participants from 64 countries**

*The main aim of these workshops was to **establish ownership** and consider the needs of the members to develop a clear roadmap and governance structure. This will guide the future of the FFGS and ensure it is shaped by its members.*

# Overview of the Early Warning System for Floods project (EWS-F) for CA&C

Hydrological and Water Resources Services (HWR) Division
*Hydrology Water and Cryosphere (HWC) Branch*

WMO Office for North America, Central America and the Caribbean
*Member Services and Development Department*

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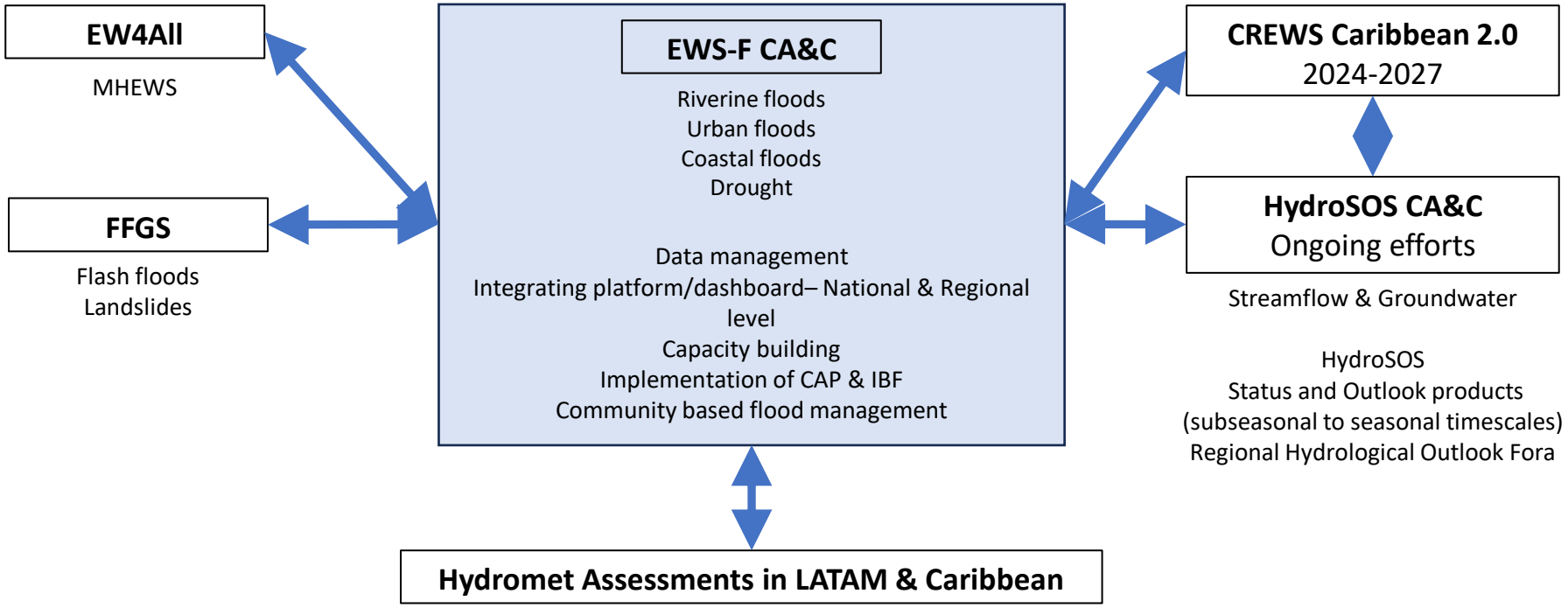
# Linkages to WMO projects and initiatives




Synergies with resources/ initiatives + regional support to be considered

# Systematic Observations Financing Facility (SOFF) – Readiness Phase

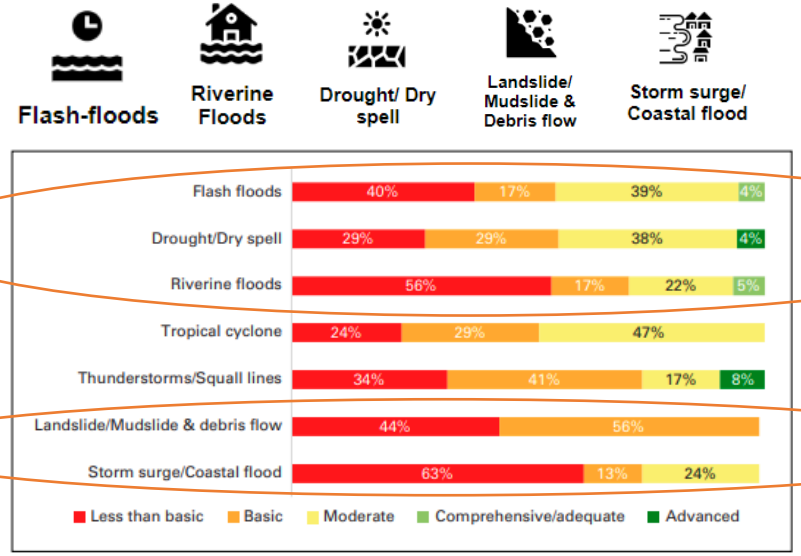
## Ongoing / planned support

| Country | Peer adviser | Funding request budget | National GBON Gap Analysis | National GBON Contribution Plan | Country Hydromet Diagnostic |
|---|---|---|---|---|---|
| Antigua & Barbuda | UK | USD 182,970.00 | DELAYED | Exp. 31 Mar 2024 | Exp. 31 Mar 2024 |
| Barbados | Finland | USD 129,943.00 | SUBMITTED | Exp. 30 Apr 2024 | Exp. 30 Apr 2024 |
| Guatemala | Spain | PENDING | - | - | - |
| Haiti | Switzerland | USD 145,000.00 | Expected 31 AUG 2024 | Exp. 31 Jan 2025 | Exp. 31 Oct 2024 |

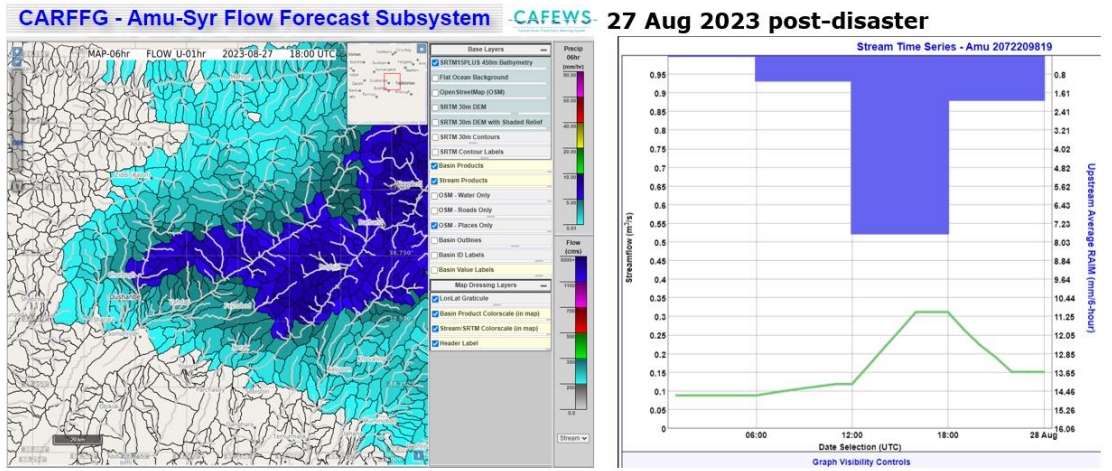
# Targeted Project Support

- **80% of the EW4All** initial countries reported flash floods as the priority disaster (highest priority)
- The projected increase in the intensity of **extreme precipitation** translates to an increase in the frequency and magnitude of pluvial floods – **surface water and flash floods** – (high confidence)

Systematically Targeting:



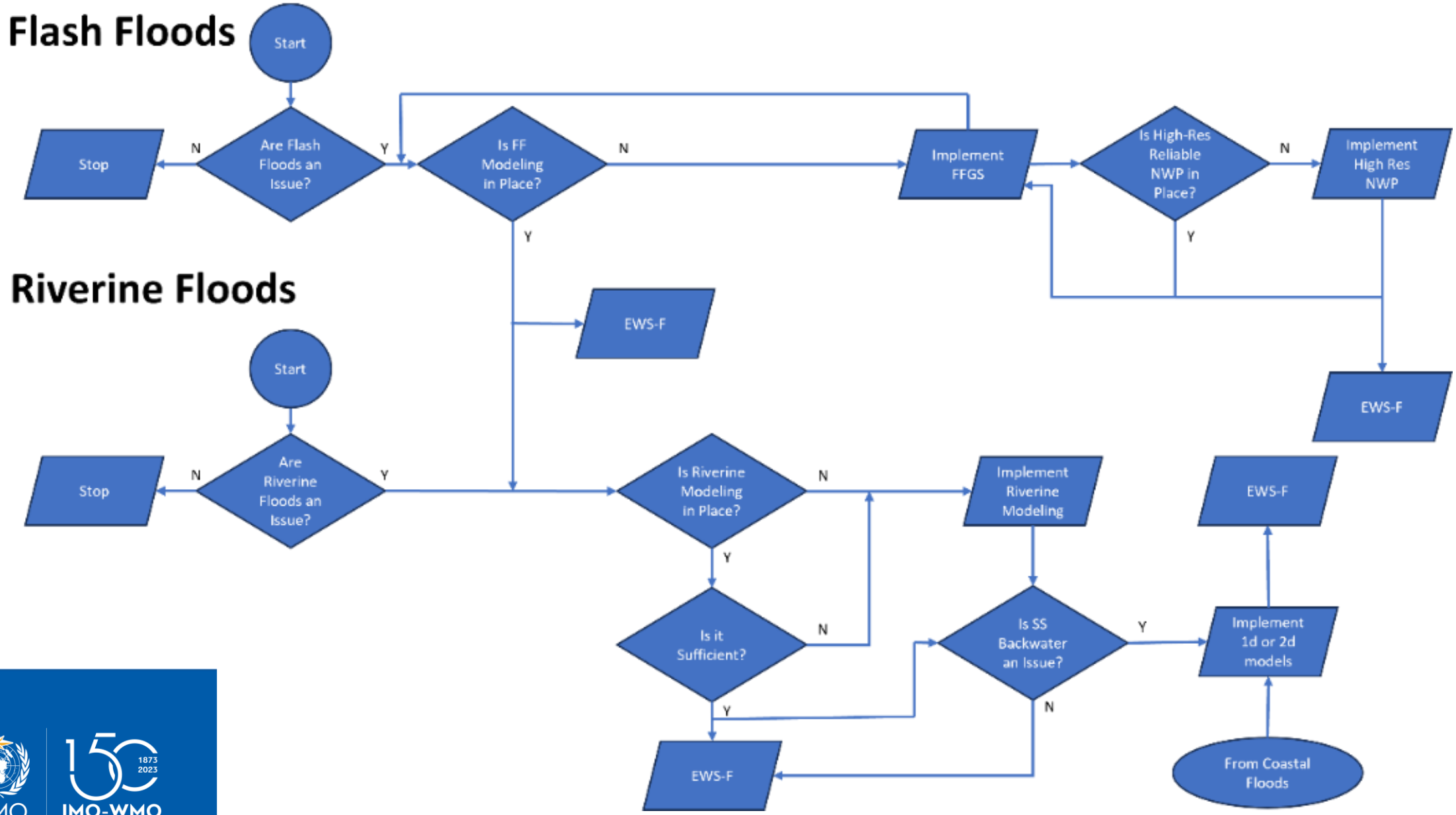

Source:Results of the EW4All Rapid Assessment, Priority Hazards and Vulnerabilities, WMO Monitoring System




*total amount of rain plus melt (RAIM)

Source: Central Asia Flood EWS and Reuters; Flash Floods and Mudslides in Tajikistan 26 Aug 2023

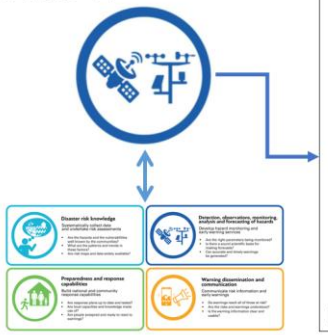
# Targeting the assistance




WMO IMO-WMO 1873 2023

# Flash Flood Guidance System (FFGS)
# Early Warning Systems for Floods (EWS-F)

**Pillar-2**



**Empower countries to monitor and forecast priority hazards** as well as generate, disseminate and use **impact-based, actionable early warnings** to save lives, protect property and livelihoods

## Global, Regional, National and Basin Scales

**EWS-F:**

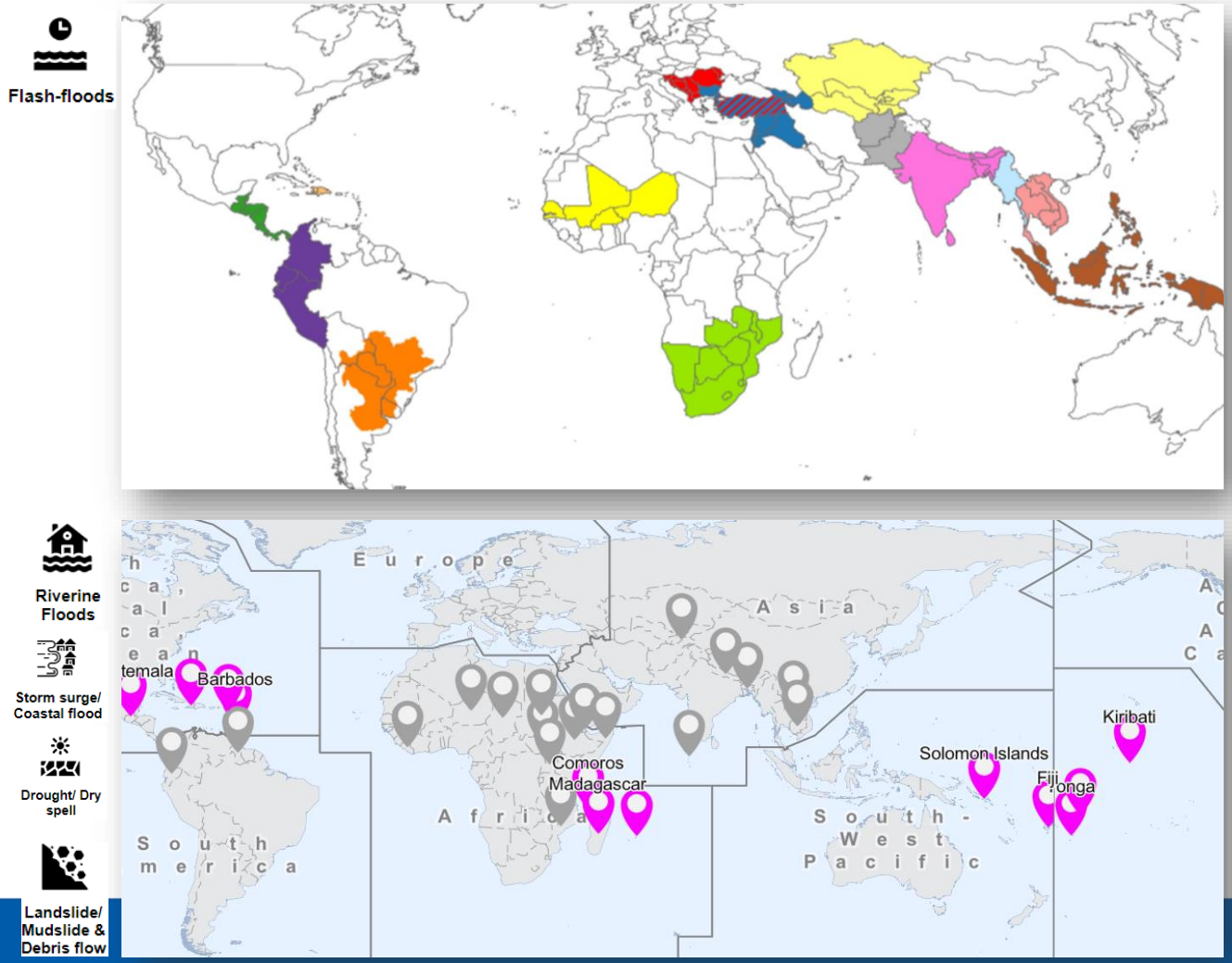
- Floods, Droughts, Landslides
- 12/30 (SIDS)

**FFGS:**

- **73 operational countries**
- 31 countries underway (2023-26)
- Full EW4All Coverage

Financing: **USD 25M** (USAID/BHA, CREWS, WBG)

Partners (FFGS): **USAID/BHA, NOAA, HRC**




| Expansion LDCs SIDs | EW4All Coverage | Capacity Building | Member 2 Member Innovation 4 Operation | Sustainability | Interoperability | CONOPS |
|---|---|---|---|---|---|---|

# Thank you!