INTRODUCTION TO HAZARDS OUTLOOKS AT NOAA-CPC INTERNATIONAL DESKS

Zewdu Segele, Li Xu, Wassila Thiaw, Endalkachew Bekele, Miliaritiana Robjhon
NOAA/NCEP/CPC/International Desks

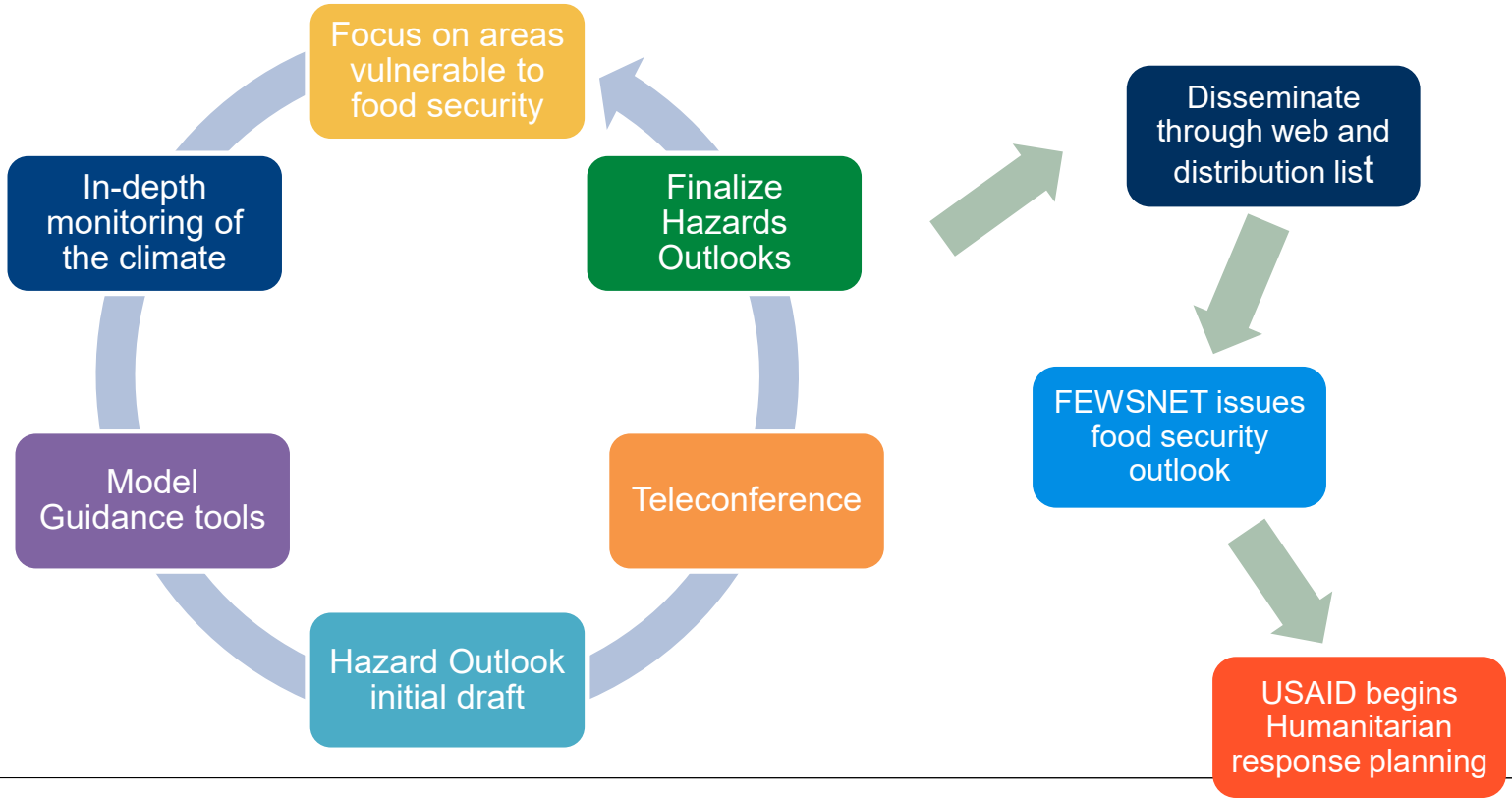
PREPARE Drought and Flood Early Warning for for the Pacific Small Islands Developing States

Fiji, Nadi, 22-23 July 2024

Hydrometeorological hazards

- National, regional and global centers contribute to the four phases of Early Warning Systems (WMO, 1999)
  - Climatological and hydrological analysis and knowledge for risk assessment – **contributes to disaster mitigation or prevention**
  - Forecasting and early warning services of severe weather and extremes including droughts & floods – **contributing to preparedness**
  - Updated warnings, forecasts and observations, and **consultation** with emergency and and relief agencies – **contributing to the Response phase**
  - Special forecasts and other advice during operations – **to assist recovery operations**

FEWS NET regional hazards outlook process



Hydrometeorological hazards

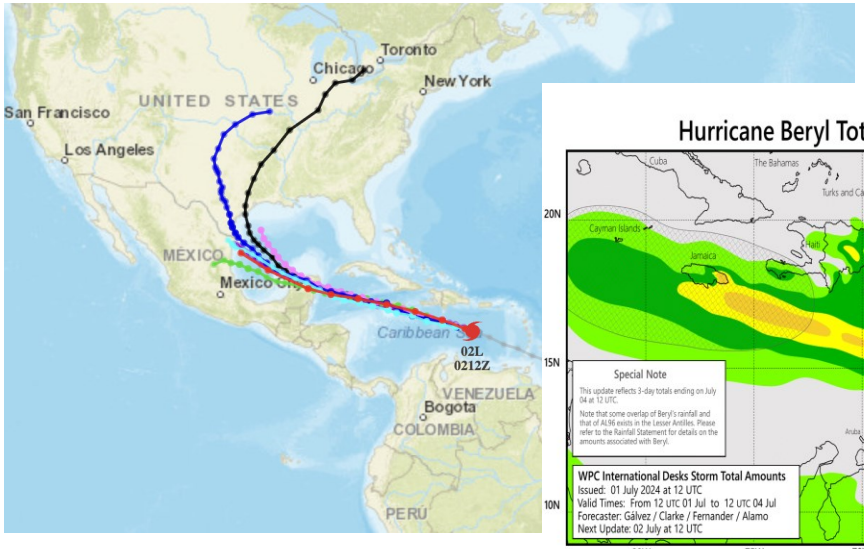
- The International Desks at the NOAA/NCEP-CPC focusses on the following hazards:
  - Tropical cyclones
  - Flood/Extreme rainfall
  - Drought
  - Abnormal heat
  - Abnormal cold
  - Heavy snow
  - Locust outbreaks

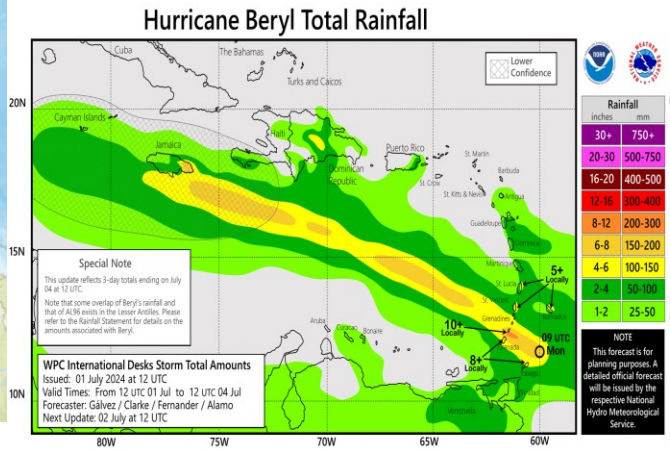
Tropical Cyclone

- Tropical Cyclone (TC) hazards are identified based on the National Hurricane Center and the Joint Typhoon Warning Center (JTWC)

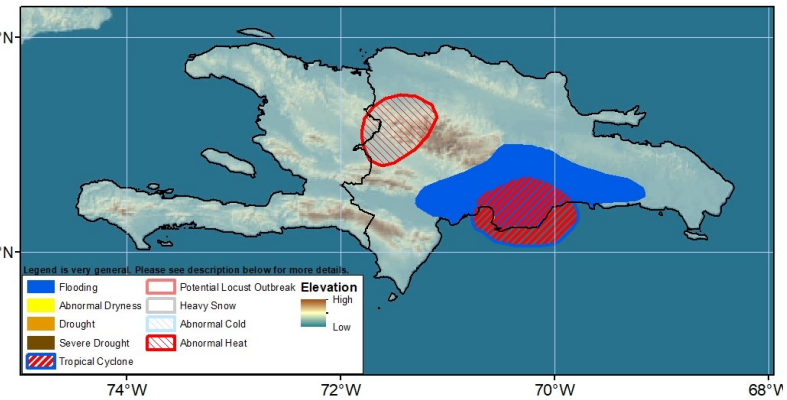
- Hazard polygon is drawn when TC is observed, or the area is under a tropical cyclone watch or warning

NHC Hurricane Forecast in early July 2024

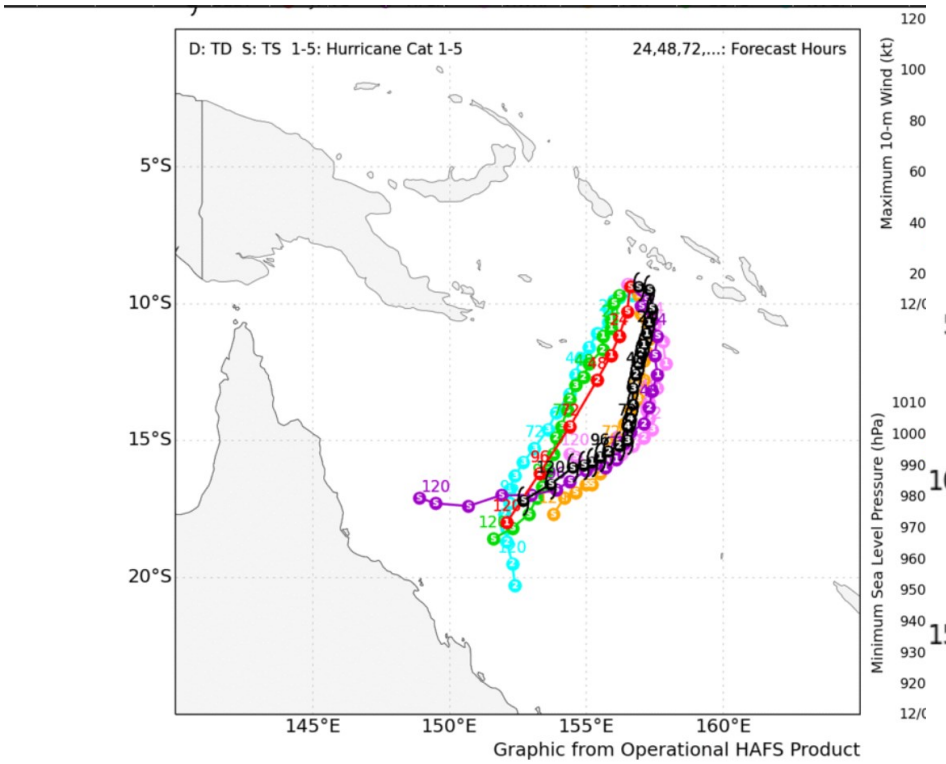




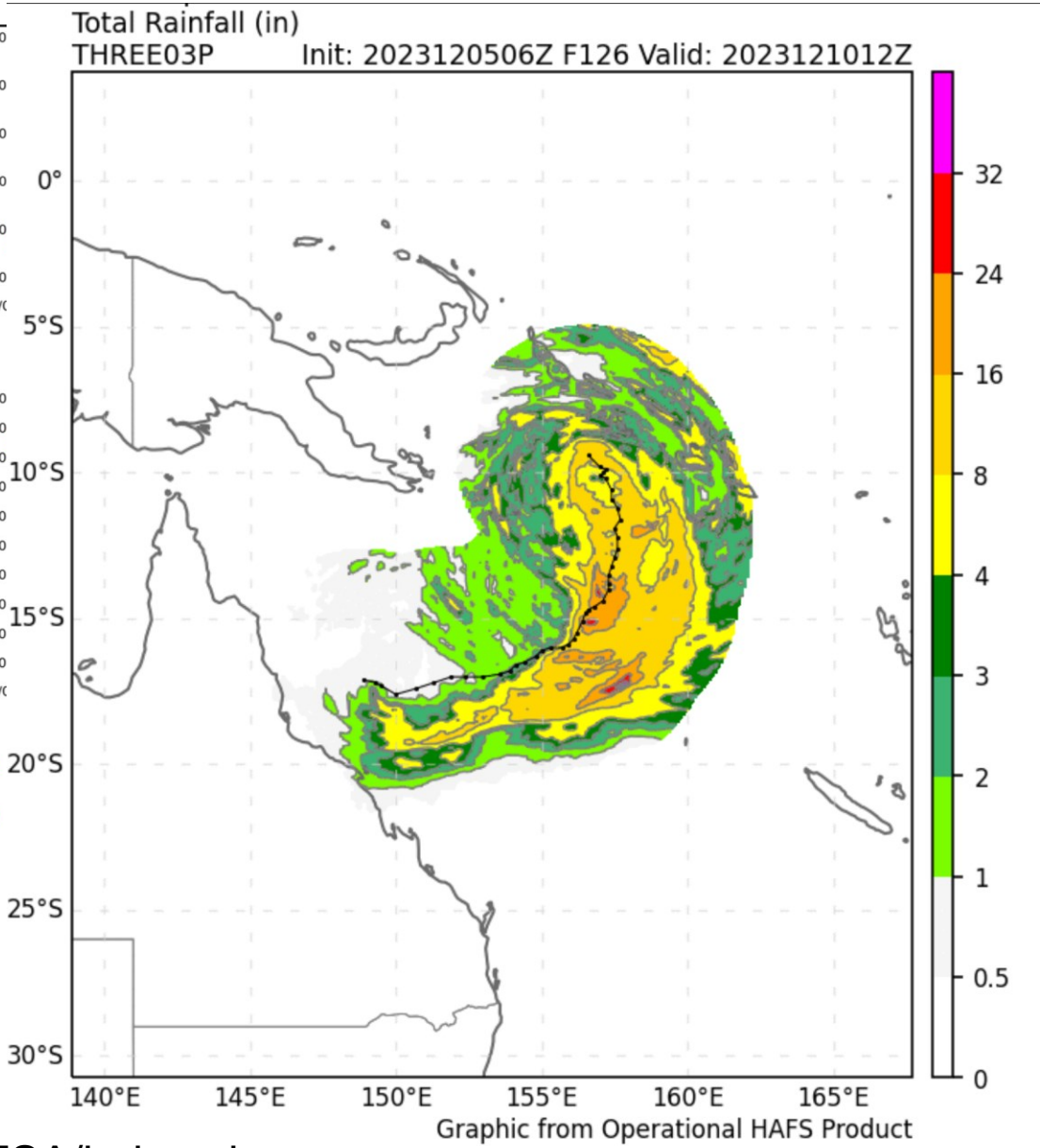
Tropical Cyclone hazards outlook for Hispaniola for 4-10 July 2024: Heavy rainfall and strong winds expected in association with tropical cyclone BERYL.



Hurricane Analysis and Forecast System (HAFS):
A Collaborative Project in UFS Framework



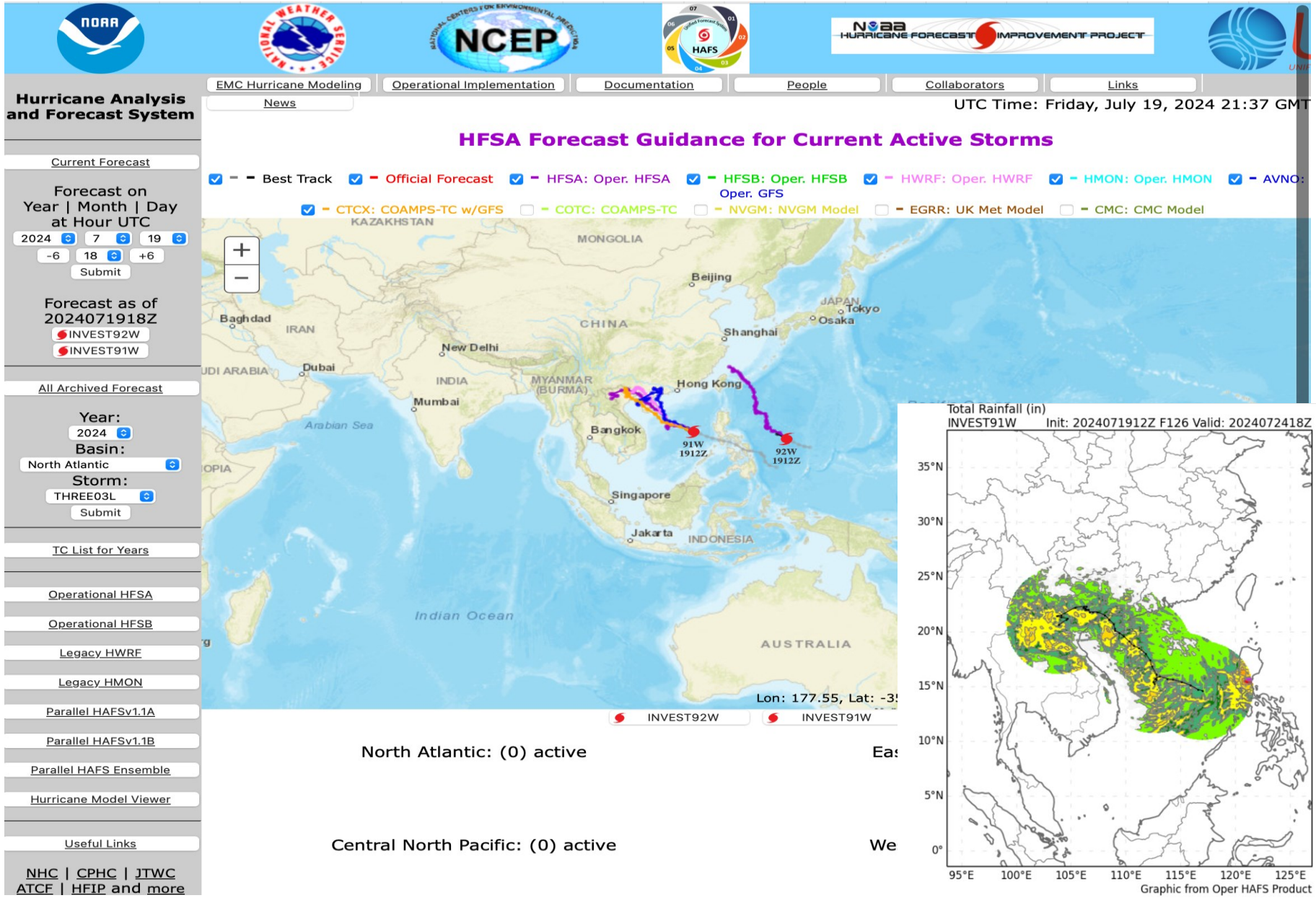
- **BEST: Best Track**
- **OFCL/JTWC: Official Fcst.**
- **HFSA: Oper. HAFS-A**
- **Oper. HMON**
- **AVNO: Oper. GFS**
- **CTCX: COAMPS-TC w/GFS**
- **COTC: COAMPS-TC**



https://www.emc.ncep.noaa.gov/hurricane/HFSA/index.php

Hurricane Analysis and Forecast System (HAFS):

A Collaborative Project in UFS Framework

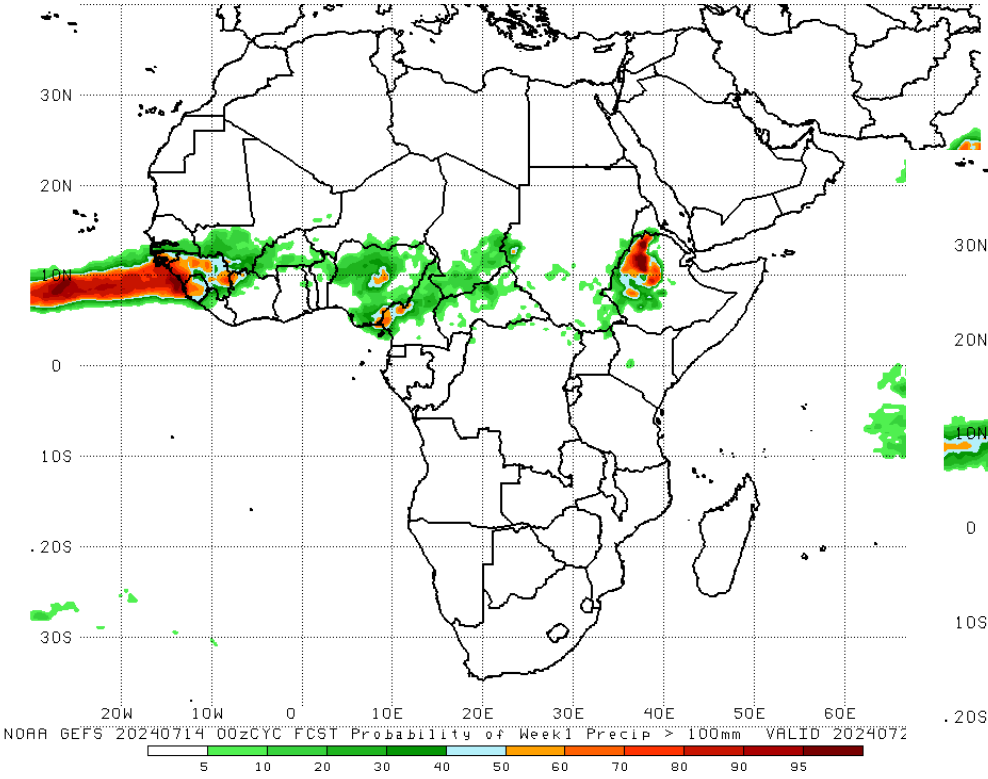


Flood Hazards

- A flooding polygon is drawn when one of the following conditions is satisfied:
  - Extremely heavy rainfall led to flooding; high potential for crop impacts;
  - Moderate to heavy rainfall that saturated soil moisture leading to gradual flooding; high potential for crop impacts;
  - High chance for extremely heavy rainfall in the next few days; high potential for crop impacts
  - High chance for substantial rainfall leading to soil saturation and gradual flooding; high potential for crop impacts;
  - Poor drainage systems, elevated river levels, and/or increased dam discharges, are predicted to result in flooding, or are known to have caused flooding;

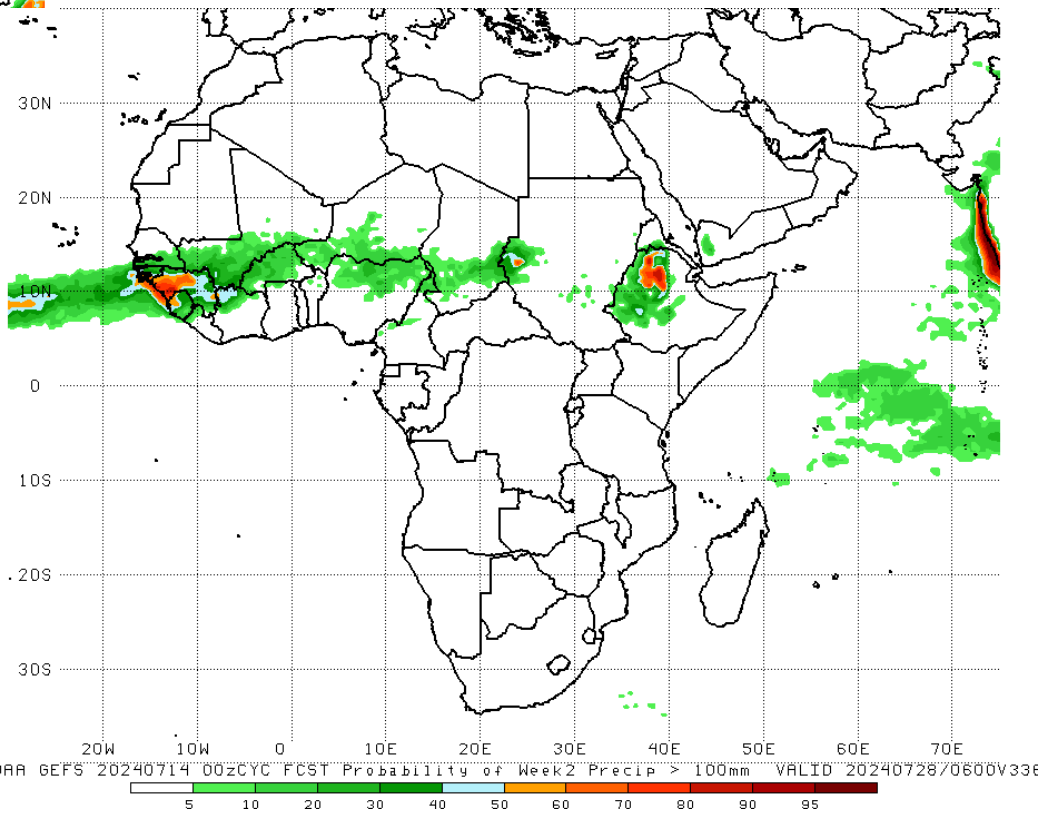
Flood Hazards (Cont'd)

- Probabilities of extreme rainfall assessed based on Qualitative/Quantitative precipitation Forecast guidance



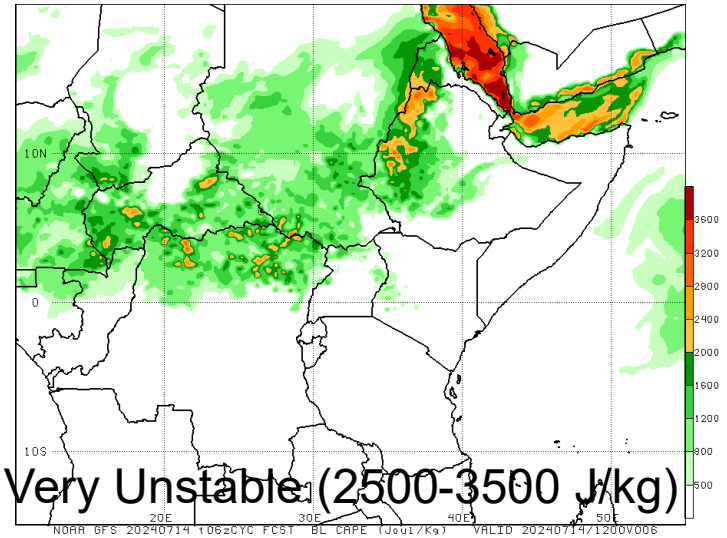
High probability for heavy rainfall in Week 1; flooding likely at places

High probability for heavy rainfall in Week 2; flooding likely at places



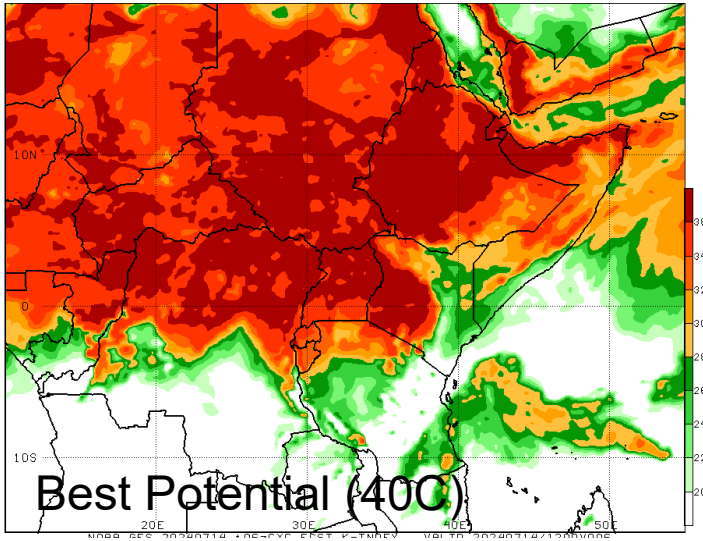
Severe Weather: Useful tools for severe **weather forecasting**

CAPE



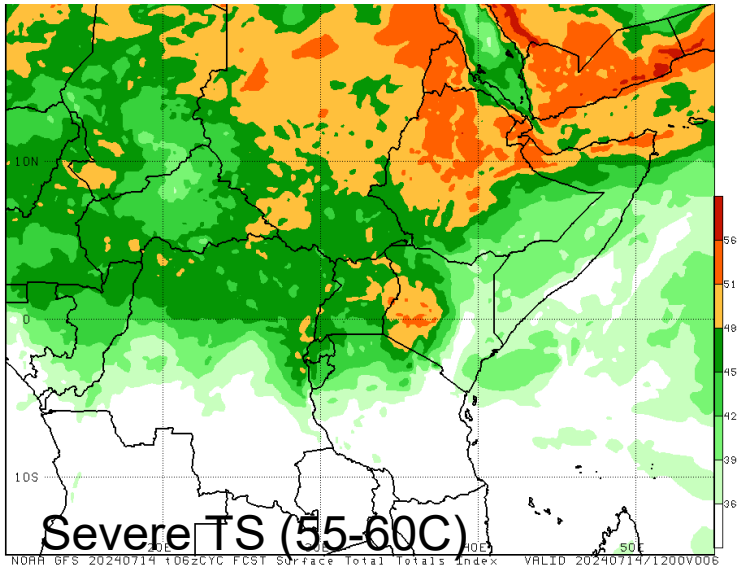
Very Unstable (2500-3500 J/kg)

K-Index

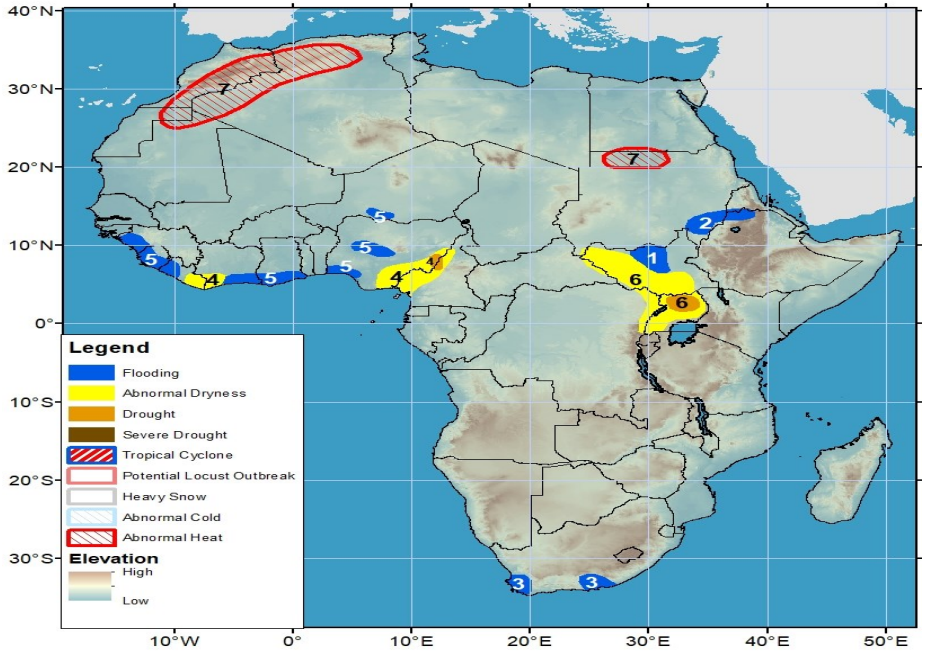


Best Potential (40C)

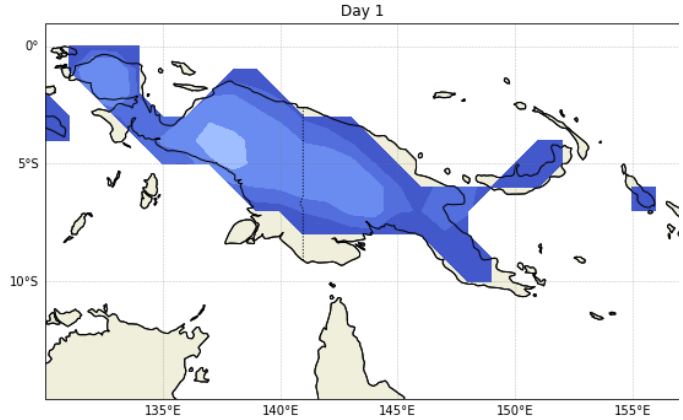
Total Totals Index

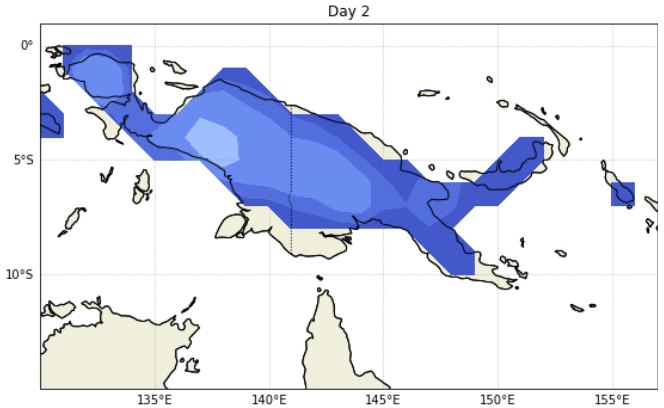


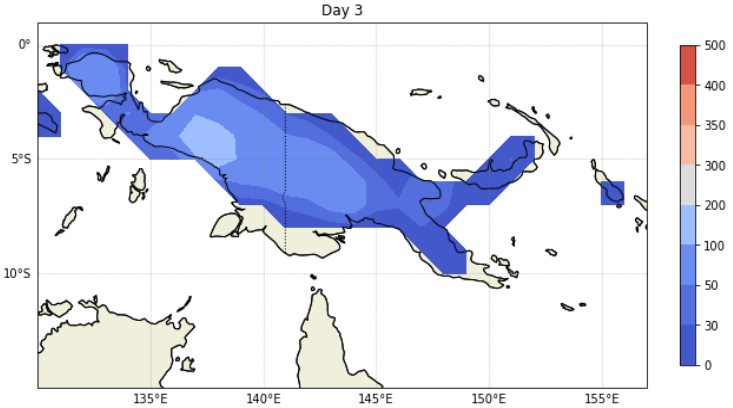
Severe TS (55-60C)

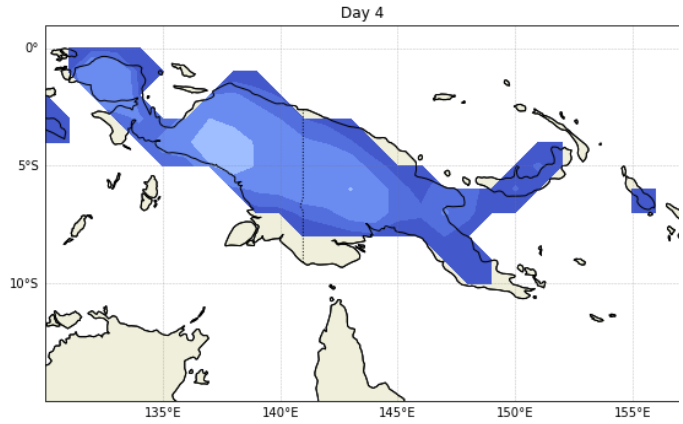


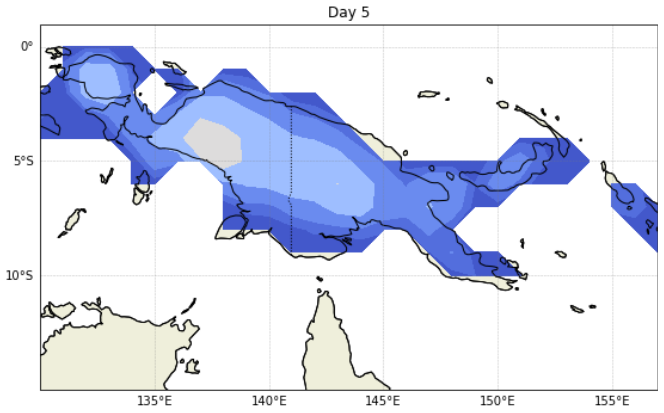
AI-BASED RUNOFF FORECASTING (EXPERIMENTAL)

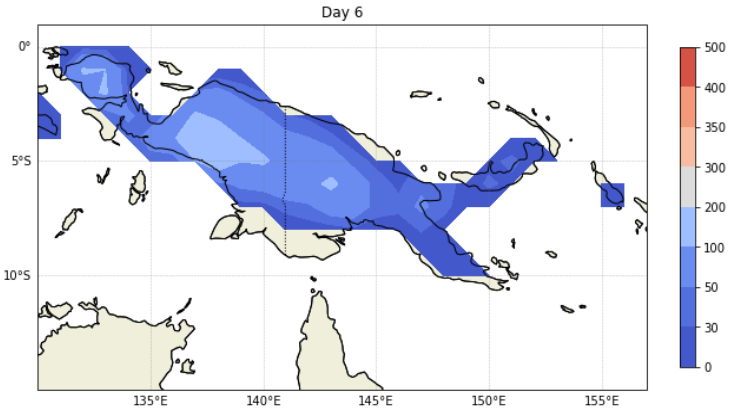


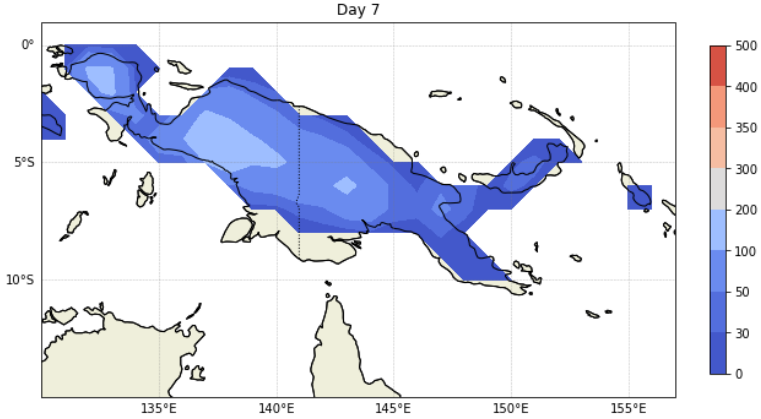












REAL-TIME FORECAST OF RUNOFF FOR JULY 19-25, 2024

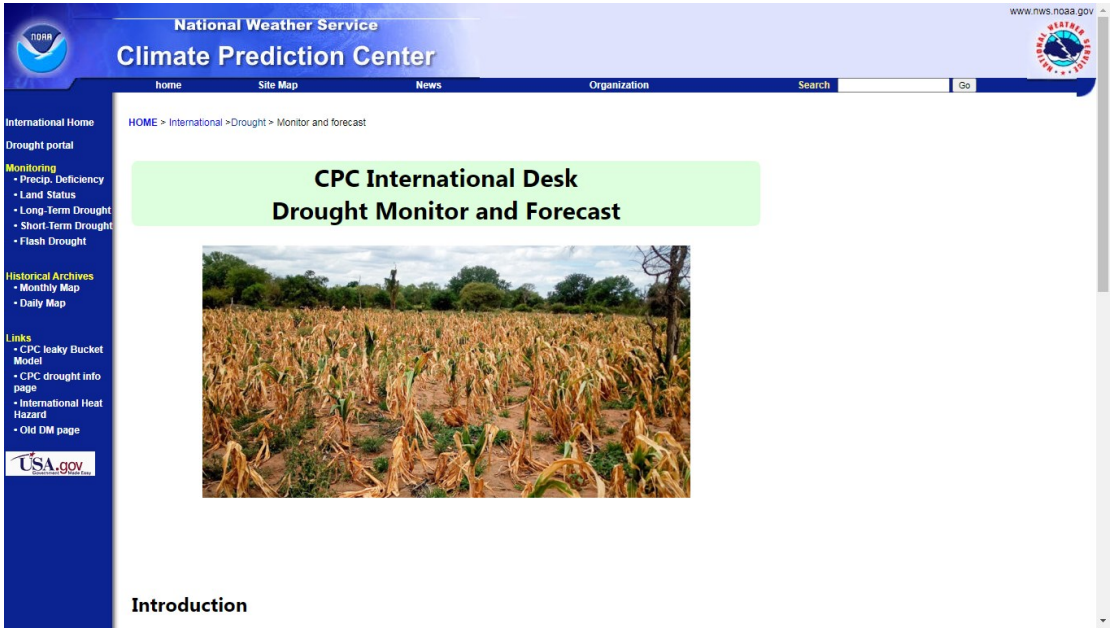
Drought hazards

- Drought is a slow onset natural hazard with far-reaching impacts that range from economic losses to loss of agriculture and livelihoods (http://www.drought.gov).

- NOAA-CPC provides advanced drought warnings for integration with livelihood data to predict food security through co-production and to reduce risks associated with drought including famine.

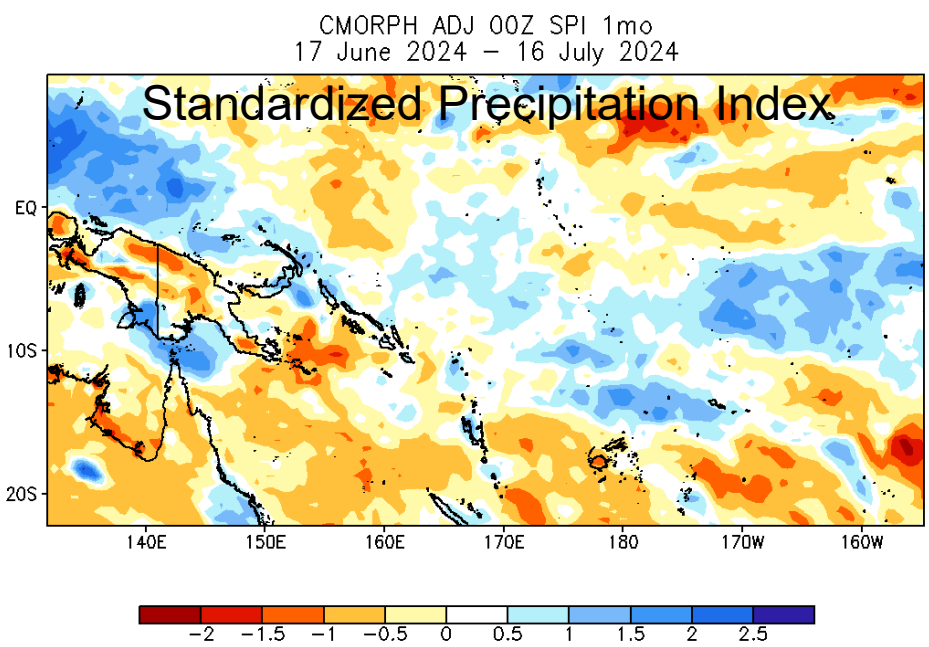
- Drought is divided into 3 parts: **Abnormal dryness**, **Drought**, and **Severe Drought**. All require convergence of evidence from analysis of:
  - Precipitation, especially Standardized Precipitation Index (SPI)
  - Soil moisture
  - Normalized difference vegetation index (NDVI)
  - Vegetation health index (VHI)
  - Hydrological data
  - Field observations

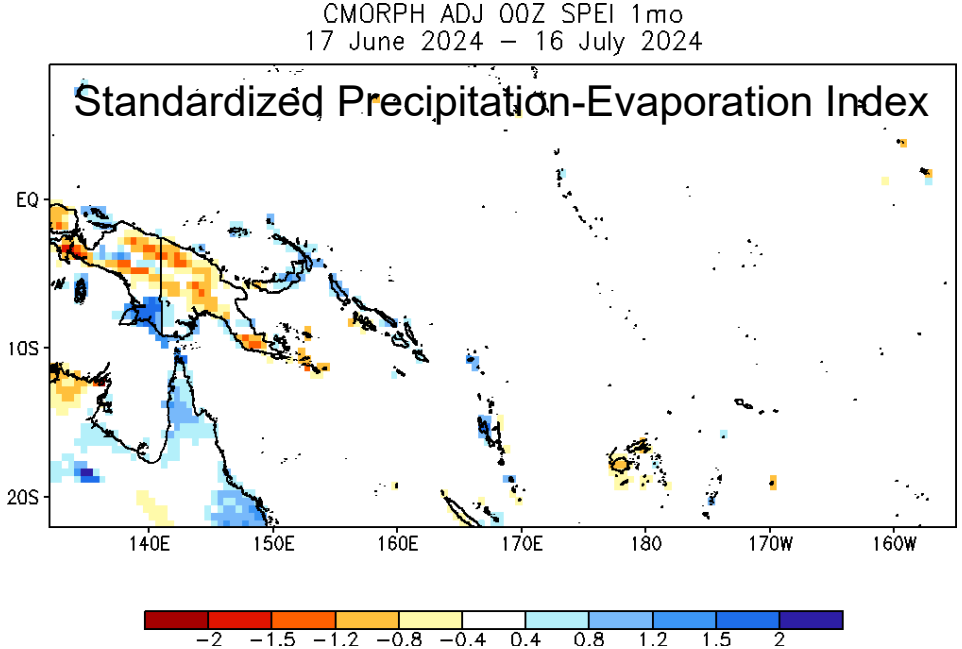
NOAA-CPC International Desks Drought Monitoring and Forecasting Webpage

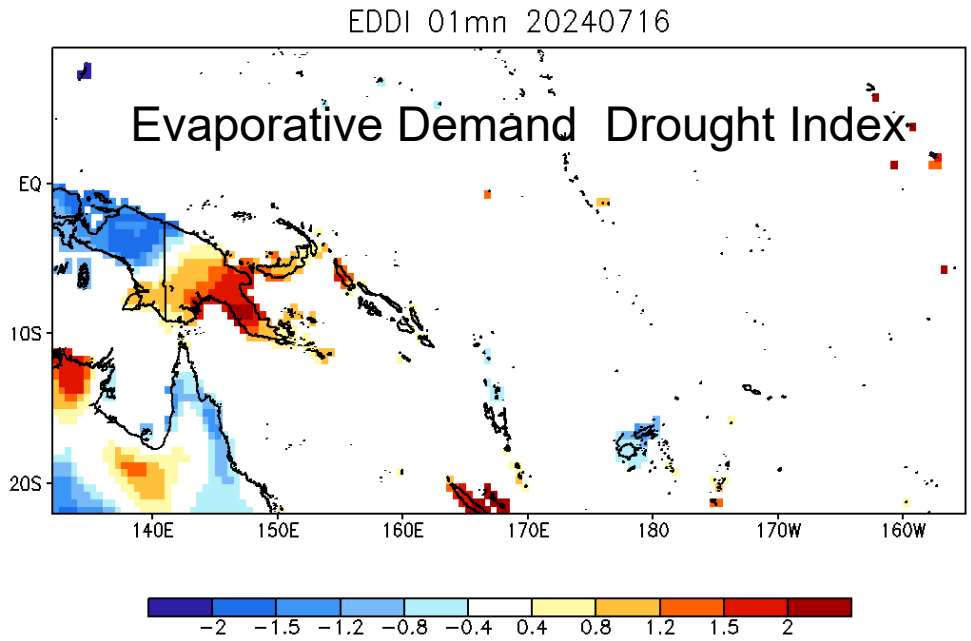


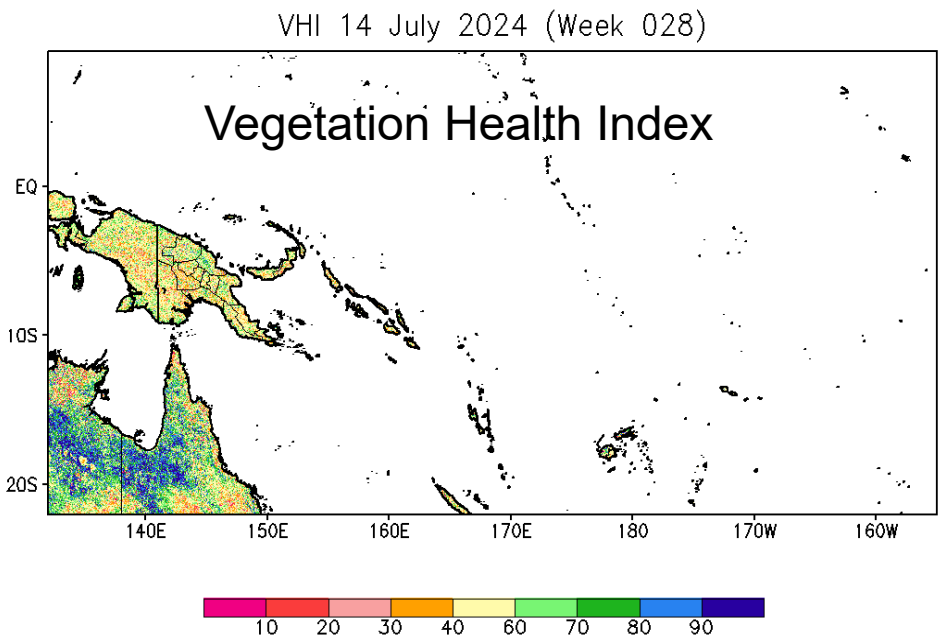
https://www.cpc.ncep.noaa.gov/products/international/drought/

Drought hazards -- Monitoring

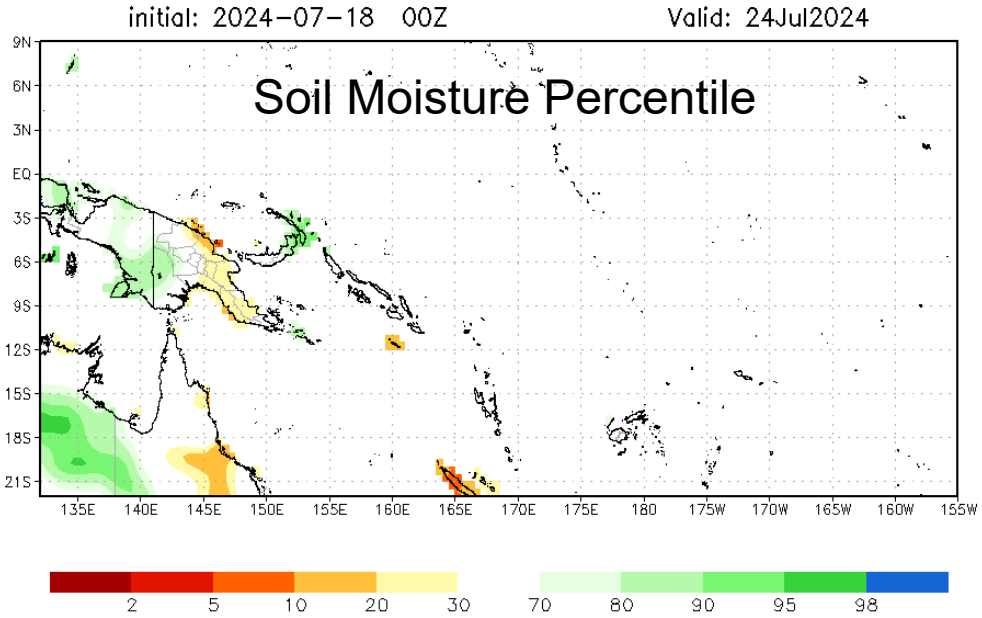


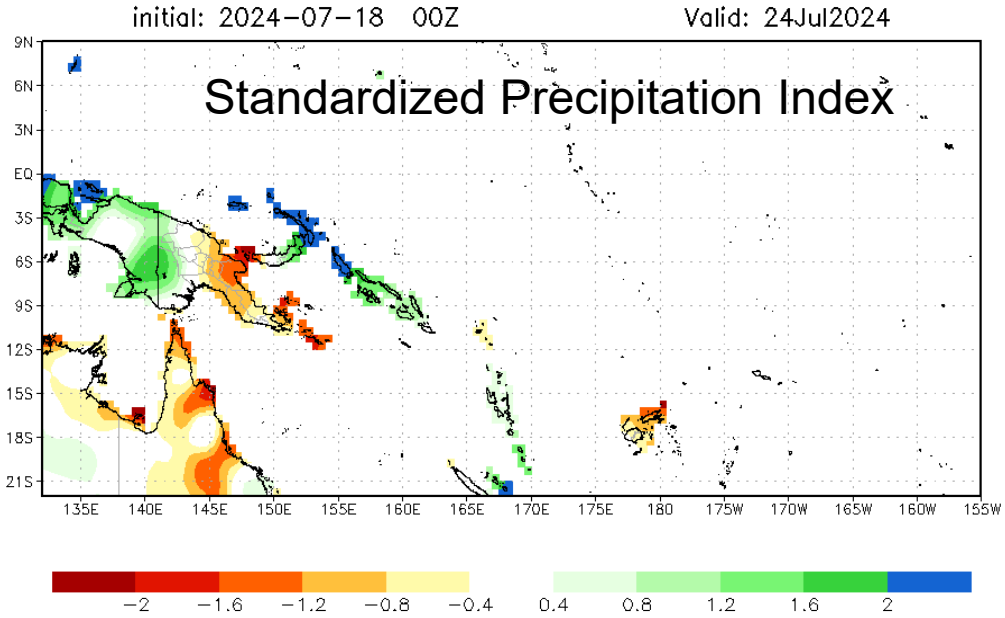


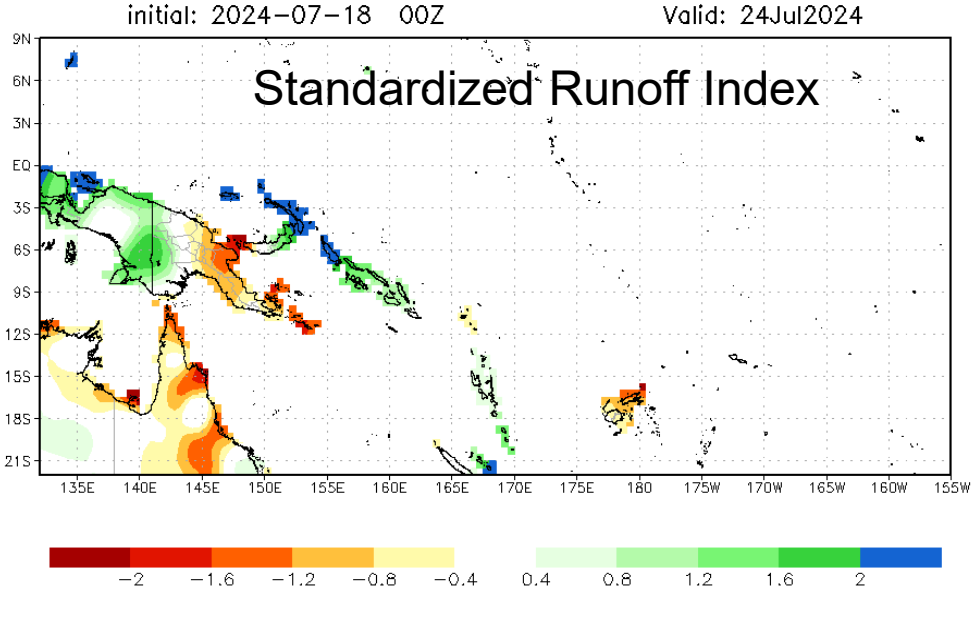


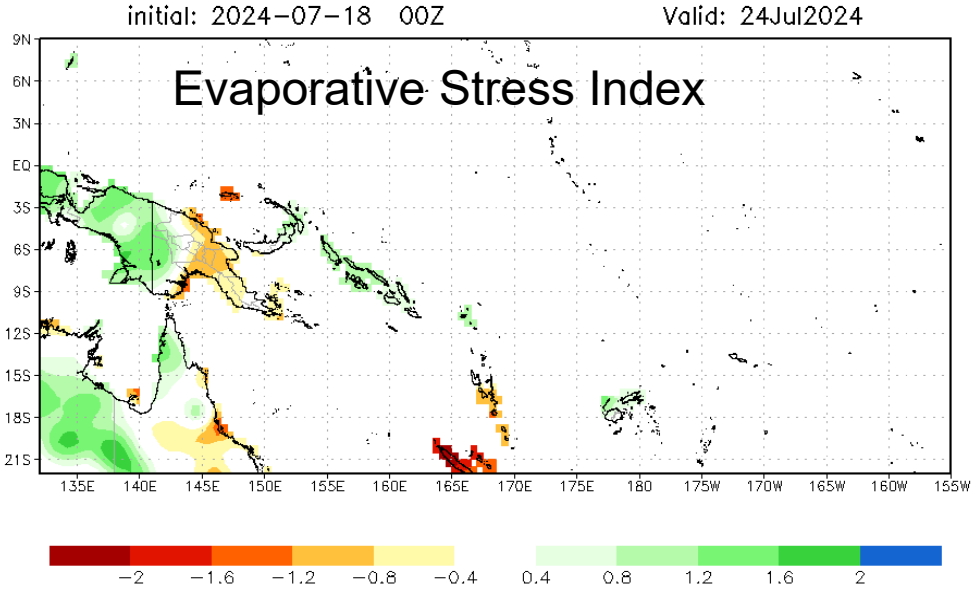


Drought hazards -- Outlook



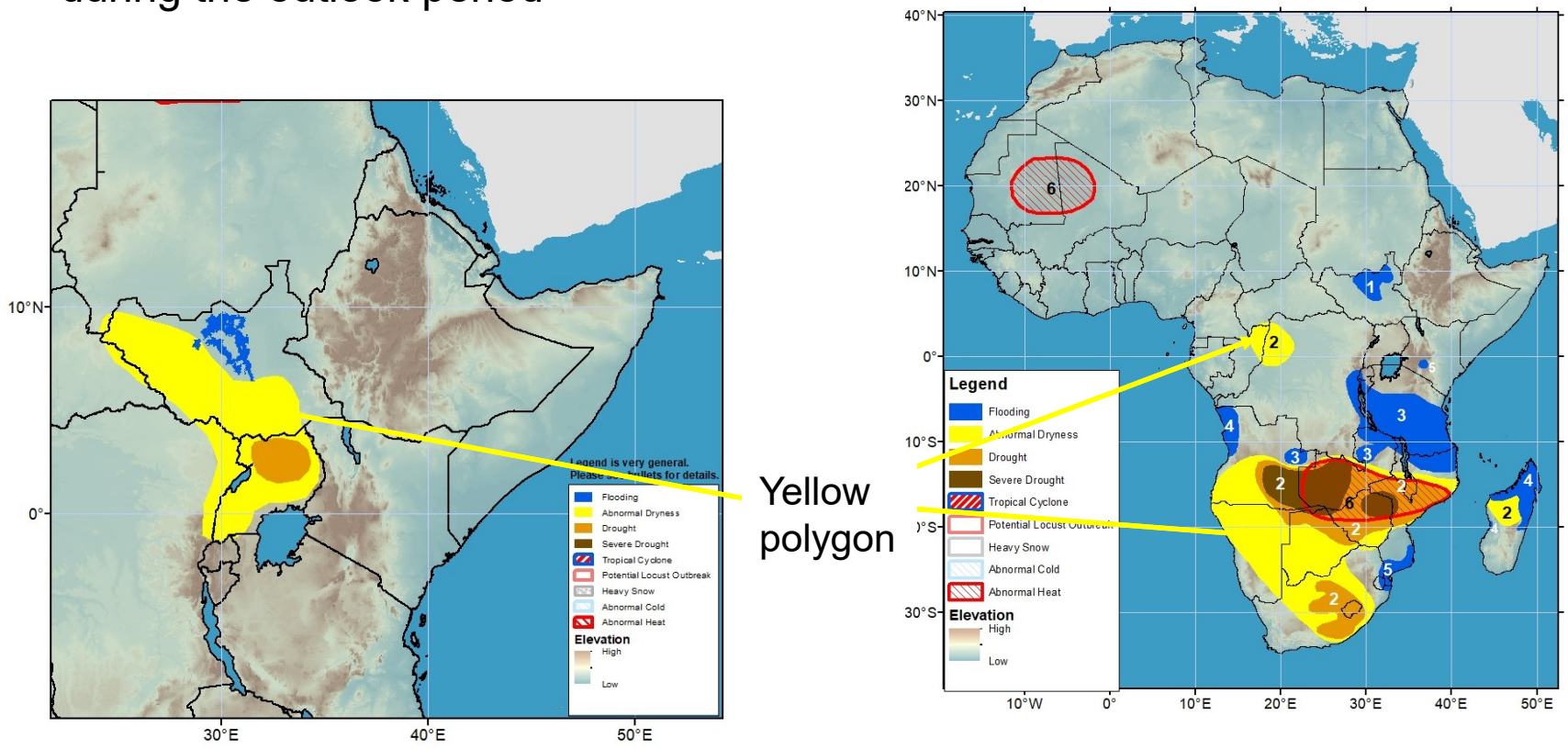






Drought hazards

- **Abnormal Dryness**:
  - Defined during active rainfall season
  - Area has registered cumulative 4-week precipitation and soil moisture ranking less than the 30th percentile, with an SPI of 0.4 standard deviation below the mean
  - Area is expected to receive below-average precipitation (less than 80% of normal) during the outlook period

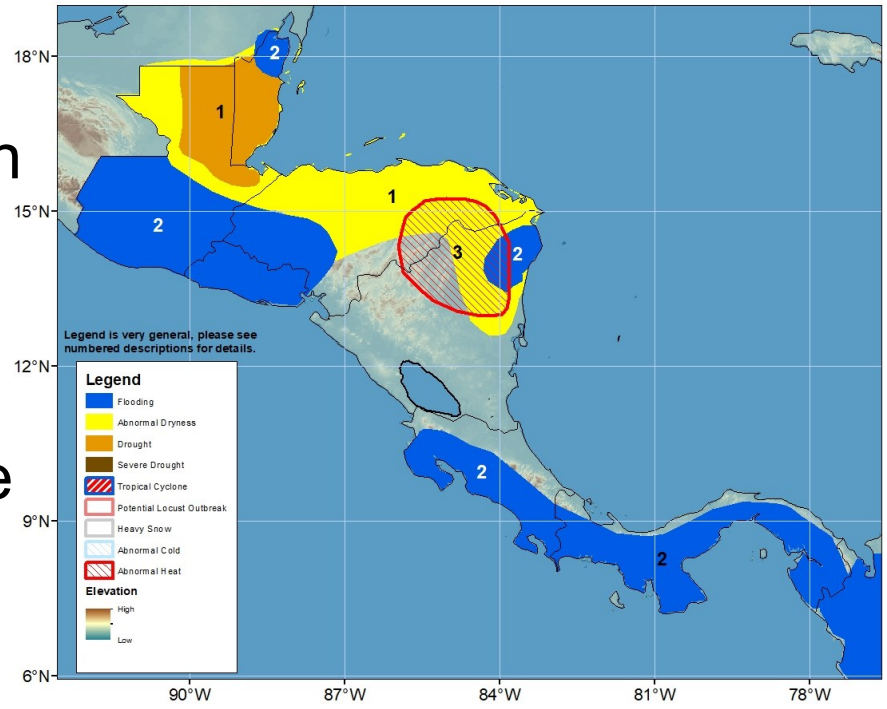


Drought hazards (Cont'd)

- **Drought**: Area must be under Abnormal Dryness

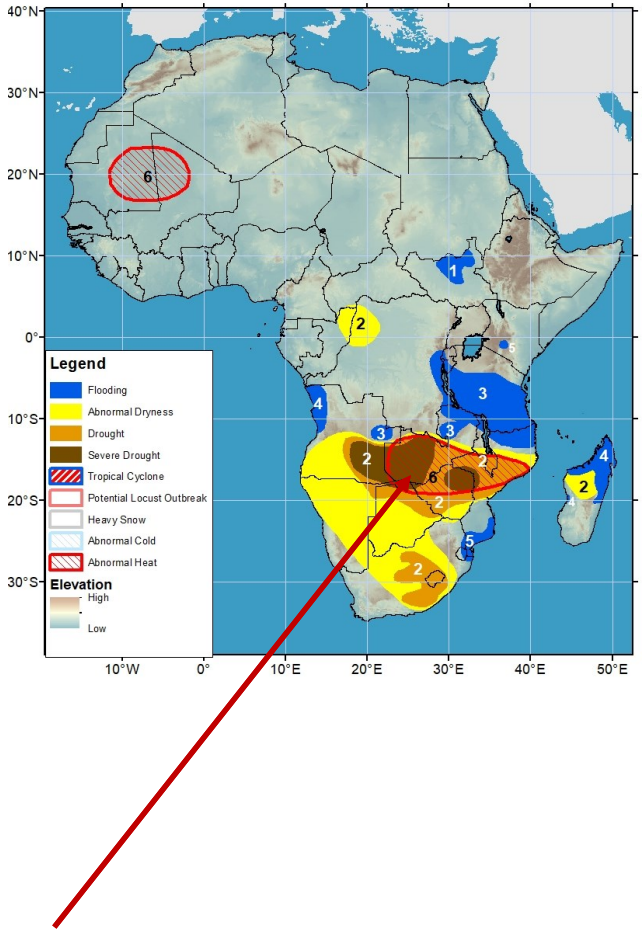
- Area has continued to register seasonal precipitation and soil moisture deficits that have resulted in since the beginning of the rainfall season an eight-week cumulative precipitation, soil moisture, and runoff below the 20th percentile rank, and an SPI of 0.8 standard deviation below the mean

- Developing drought conditions must be supported by field observations, including impacts of moisture shortages on crops and water resources.

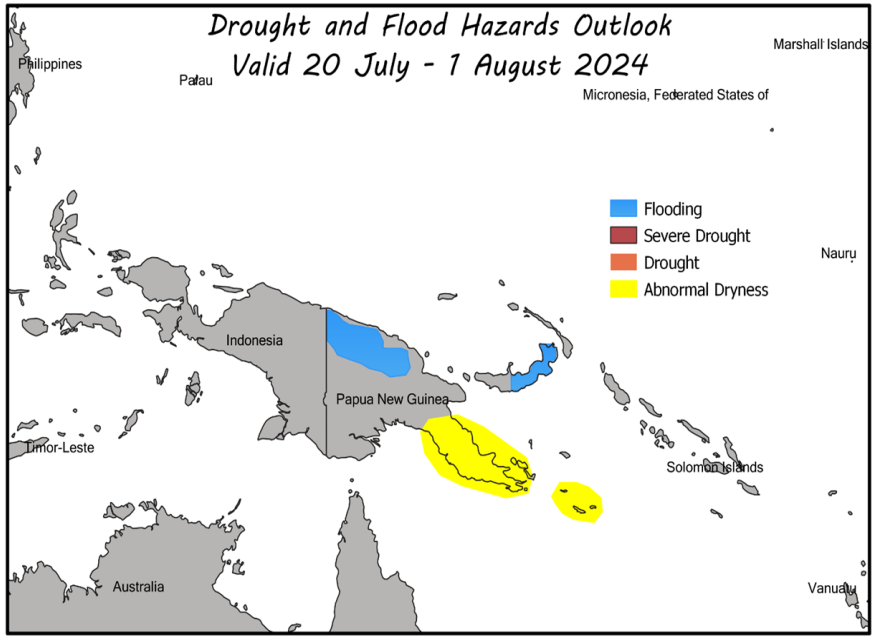


Drought hazards (Cont'd)

- **Severe Drought**:
  - Area must have previously been defined as "Drought"
  - Area has continued to register seasonal precipitation and soil moisture deficits that have resulted since the beginning of the rainfall season; a twelve-week cumulative precipitation, soil moisture, and runoff below the 10th percentile rank and an SPI of 1.2 standard deviation below the mean
  - Severe drought conditions must be supported by field observations, including impacts of moisture shortages on crops and water resources.



Drought and Floods in Central Pacific



- Tropical Cyclone, floods and droughts are the major hazards in the Central Pacific

- Numerous drought/flood forecasting tools at the NOAA-CPC International Desks