



Climate Information and Services to Mitigate Water Loss in the Caribbean

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Caribbean Meteorological Organization (CMO)

Celebrating 50th Anniversary of



&



Water at Centre of Climate Crisis



Non-Revenue Water impacts aggravated by climate change & water scarcity

4 days ago, IPCC released Synthesis Report

Increasing weather & climate extremes have exposed millions of people to reduced water security

Largest adverse impacts observed in many locations and communities in Small Islands, including the Caribbean

AR6 Synthesis Report: Climate Change 2023

The IPCC finalized the Synthesis Report for the Sixth Assessment Report during the Panel's 58th Session held in Interlaken, Switzerland from 13 - 19 March 2023.

Impacts of climate change felt through water:

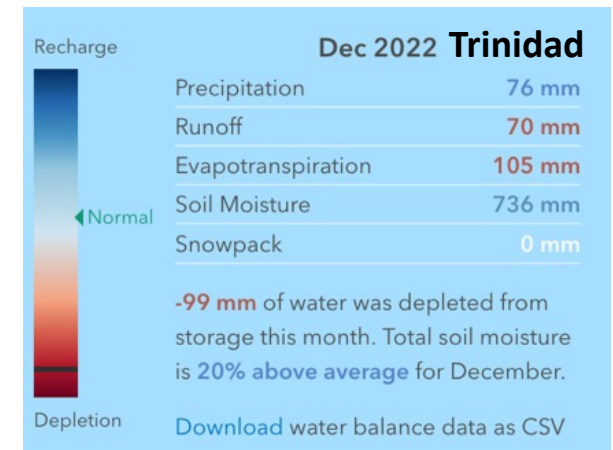
- more intense and frequent droughts
- more extreme flooding
- more erratic seasonal rainfall

Cascading impacts on water availability, economies, ecosystems - all aspects of our daily lives

Why do you need meteorologists & hydrologists?



- We help you know how much freshwater is available
 - *So you can know how much is lost*
- We help you know when and where to expect too much or too little precipitation
 - *So you can better plan how to manage freshwater resources*
- We help you know about sunshine, wind velocity, waves, and stream flow
 - *So you can access renewable energy for freshwater production & distribution*

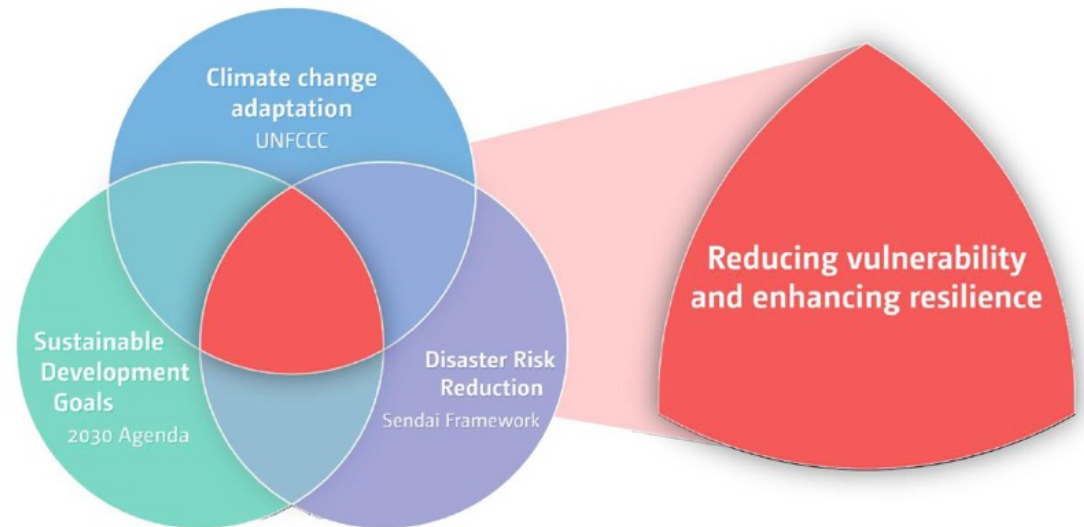


<https://livingatlas.arcgis.com/waterbalance/>

Weather, Water, & Climate Services Reduce Loss



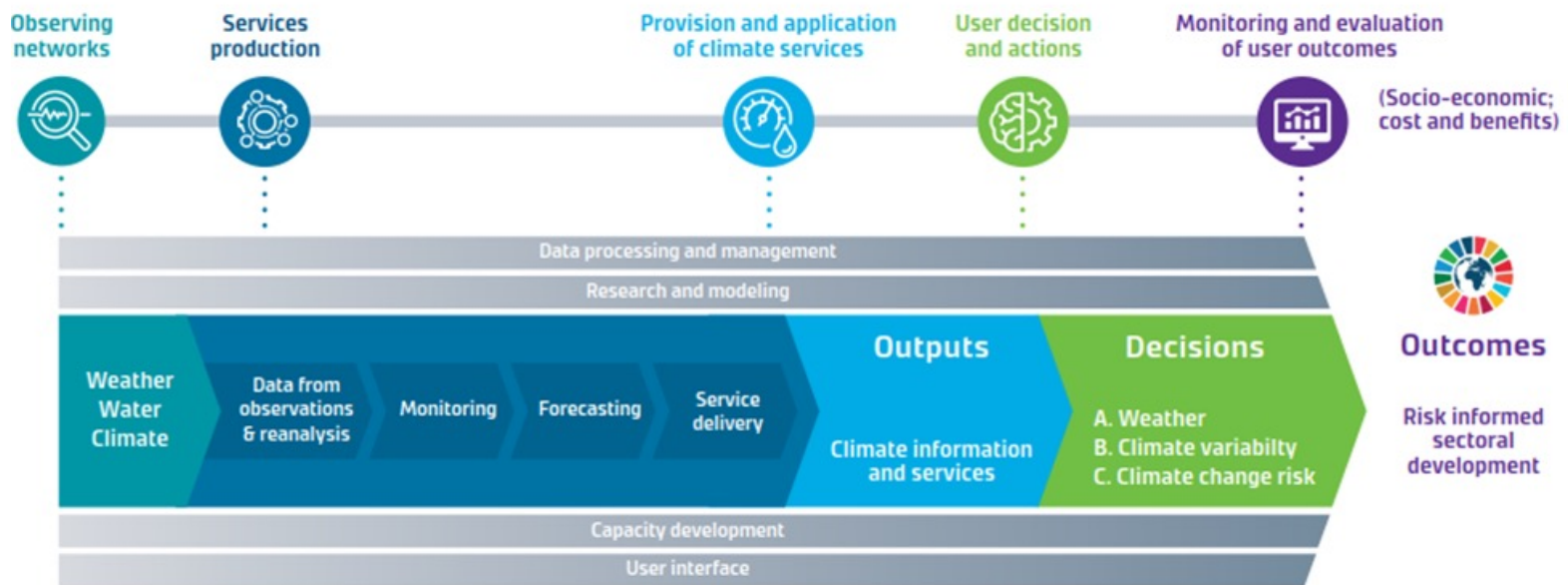
- Freshwater management is a top adaptation priority for combating climate change impacts on water security and sustainability
- Tailored products & services from National Meteorological and Hydrological Services (NMHSs) can **reduce risk and economic losses due to drought and floods, water disruption, and scarcity**



WMO, 2022



Global Arrangements: Weather, Water, & Climate Services



WMO & Global Partners in Weather, Climate, & Water

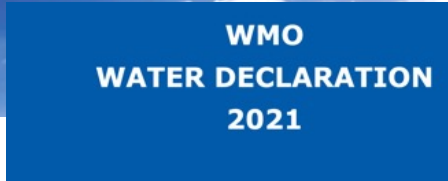


- WMO – authoritative voice of the United Nations on weather, climate and water
- Water and Climate Coalition (WMO, UNESCO-IHP, UNDP, GWP-C, ...)
- Global Hydrological Status & Outlook System (HydroSOS)



Water and Climate Coalition

HOME ABOUT LEADERS MEMBERS YOUTH NEWS AND EVENTS



Founding Members of the Water and Climate Coalition





Regional Arrangements & Support for Weather, Climate, Water Services

Framework for Weather, Water, & Climate Services

Caribbean Meteorological Organization (CMO)



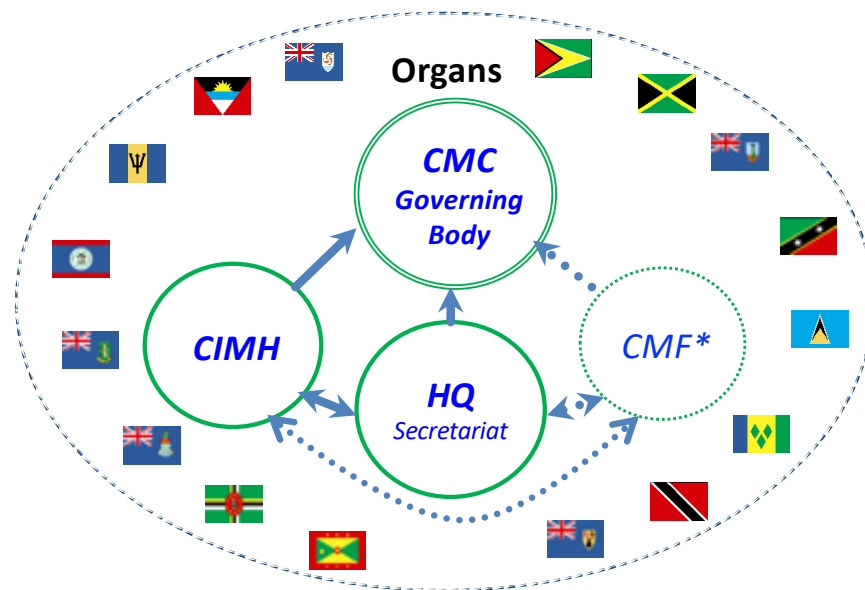
- Origin – British Caribbean Meteorological Service, established **1951**
- Caribbean Met. Council (**1962**), Caribbean Met. Service (**1963**) established Caribbean Met. Institute (**1967**)
- Caribbean Community (CARICOM) established – **August 1973**
- **CMO** established as umbrella of Ministerial Council, Caribbean Met Service & Institute – **October 1973**

Coordinates joint scientific and technical activities in weather, climate and water

Organs of CMO

- Caribbean Meteorological Council (**CMC**) –
Ministerial-level, Governing body
- Caribbean Institute for Meteorology & Hydrology (**CIMH**)
- CMO Headquarters Unit (**CMO-HQ**)
- Caribbean Meteorological Foundation (CMF)*

*non-functioning



Caribbean Weather, Climate, & Water Prediction

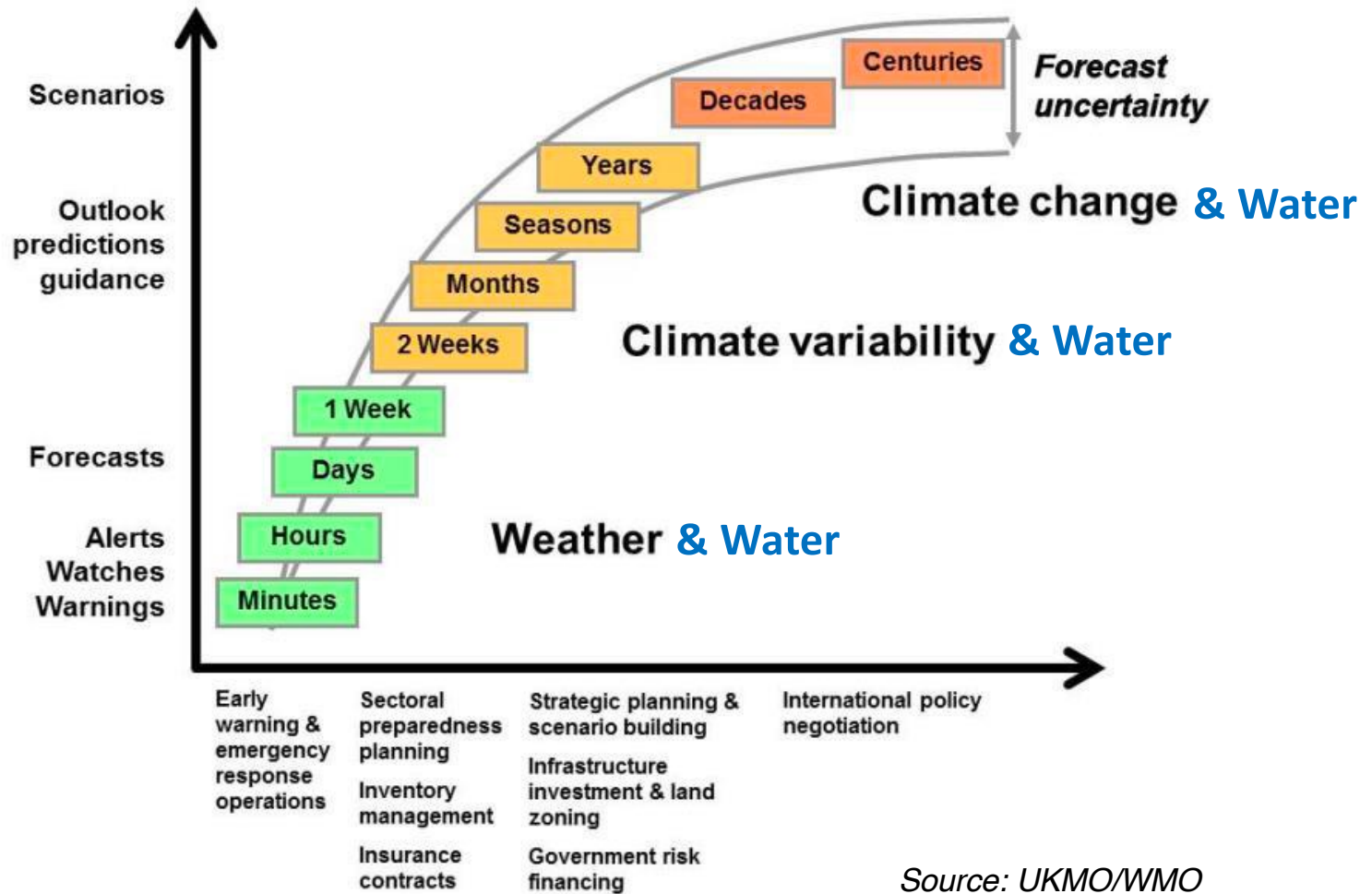


UWI CSGM/
CCCCC

CIMH/
CariCOF

NMHS

(CMO HQ
coordinates
agreements,
international
compliance,
projects ...)



Framework for Weather, Water, Climate Services



- Facilitate and strengthen **stakeholder collaboration** (water, disaster risk reduction, agriculture & food security, energy, public health, + tourism in Caribbean)
- Needs of water sector are understood
- Co-create, co-deliver products & services with stakeholders
- Global Framework for Climate Services** - implemented regionally by WMO Regional Climate Centre at CIMH
- Strategic Plans & National Frameworks for Weather, Water, and Climate** for CMO Member States - implementation by CMO HQ



Funded by Climate Risk and Early Warning Systems (CREWS), Environment and Climate Change Canada

CMO HQ – Supporting Hydro-Met Governance



- In 2021, developed eight (8) **Strategic Plans, including National Frameworks for Weather, Water, and Climate Services**
- Developed **Model Hydro-Meteorological Bill and Policy**
- Drafted **national legislation** for Anguilla, Antigua and Barbuda, Belize, Grenada, Jamaica, Saint Lucia, St Kitts & Nevis, St Vincent & the Grenadines
- Developing Strategic Plans for Turks & Caicos Islands, Cayman Islands
- Drafting Legislation and related Policy for Barbados



Caribbean Precipitation Monitoring by Radar



Caribbean Weather Radar Network

- In 2009, network of Doppler weather radars implemented by CMO, designed by CMO HQ and WMO, funded by the EU, for 13-million Euro. In 2013, CMO HQ implemented dual-polarized Doppler radar in Grand Cayman
- *Météo-France* Martinique developed first Caribbean reflectivity mosaic. *Barbados Met Service* developed expanded mosaic
- Radar Archive – valuable for **climate analysis, trends in rainfall variability** & severe weather



Composite of base reflectivity
Courtesy, Barbados Meteorological Service

Caribbean Multi-Sensor Precipitation Grid



- Merged radar, satellite-precipitation estimates with gauges (500m grid, 30-min)
- Prototype developed in 2022 by CIMA Foundation, centred on Barbados radar
- <https://misp.cimh.edu.bb/#/home>
- CMO HQ – led coordination; CIMH – technical lead and host of platform, Barbados (radar & gauges), gauges in Saint Lucia, St Vincent & the Grenadines, Grenada
- Funded by World Bank through CREWS

MSPG - Multi Sensor Precipitation Grid: dissemination

Dewetra Caribbean portal:



Portal developed for realtime monitoring and past case study application where the availability of observation, forecast and static layer allow users not only to query, visualize, explore, analyze data but also assess the risk connected, evaluate emergency plan and action to face the event

Courtesy, CIMA Research Foundation



National Climate Services for Water

May not be receiving the necessary attention, uptake and appropriate integration into water resource management

May be “Best Kept Secrets”

May be Blind Spots” in water resource management



Products & Services for Water Sector: Guyana

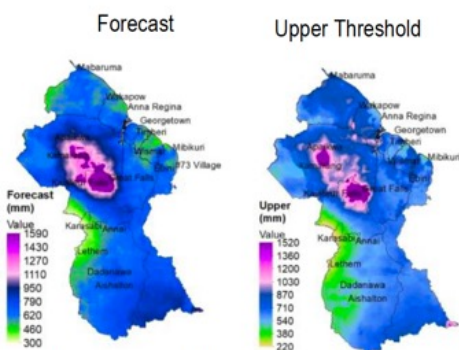


Hydrometeorological Service
Ministry of Agriculture
Guyana



Fully integrated meteorological & hydrological services, including water quality

Seasonal Rainfall Forecast Values for March-April-May (MAM) 2023



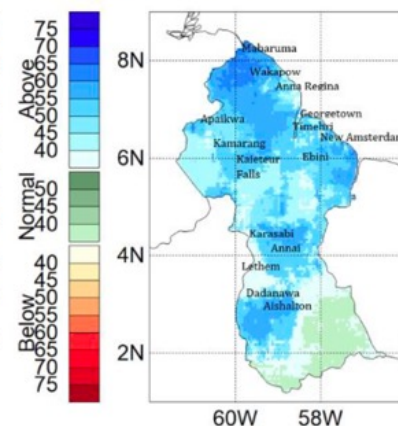
Similar to the MAM Normal Rainfall Pattern map, the highest amount of rainfall can be expected in Regions 7, northern 8, extreme southern 6 and 9, with slight concerns in Region 3.

The Forecast and Upper Threshold maps above indicate the amount of rainfall that can be expected over the coming MAM season.

While the Forecast map indicates the possible amount of rainfall over the season, the Upper Threshold map indicates how high values can be expected.

Seasonal Rainfall Outlook March-April-May (MAM)2023

From March to mid-April, dry as usual conditions with slight chance for above-normal rainfall can be expected across the country. The probability of above-normal and normal rainfall can be seen in the map to the right. Blue indicates higher chance for wetter than usual conditions while green suggests dry as normal.



Water level in conservancies, reservoirs and inland rivers across all Regions are expected to decrease towards early April. The potential of flooding as a result of rain is low during March to mid-April.

The Outlook implies:

- No significantly higher than usual number of wet days
- Decrease in surface wetness during the first half of the season
- Water Harvesting should be practised where livelihoods depend on rainfall
- Reasonably better conditions than the previous months for outdoor activities
- Higher occurrence in number of dry days

Products & Services for Water Sector: Trinidad & Tobago



Trinidad & Tobago
Meteorological Service

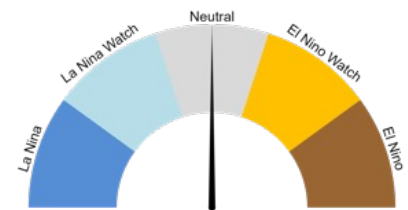
Rainfall and Temperature Outlook for
Trinidad and Tobago

Page 1 of 3

Seamless Precipitation Forecasting

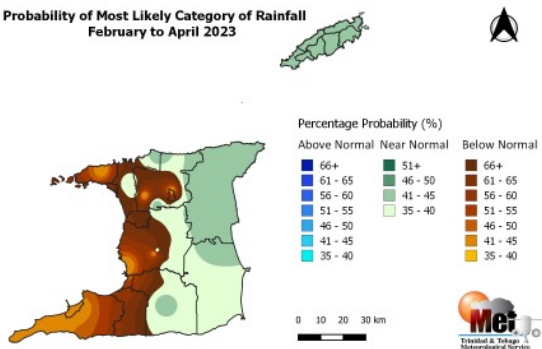
ENSO Monitor Update

ISSUED AT: 12:06 PM
Date: Friday 10th of March 2023

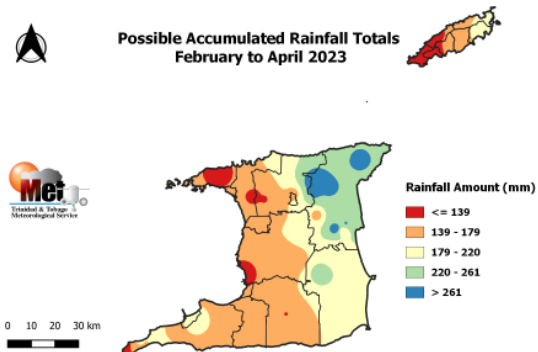


Seasonal Rainfall Outlook

Probability of Most Likely Category of Rainfall
February to April 2023

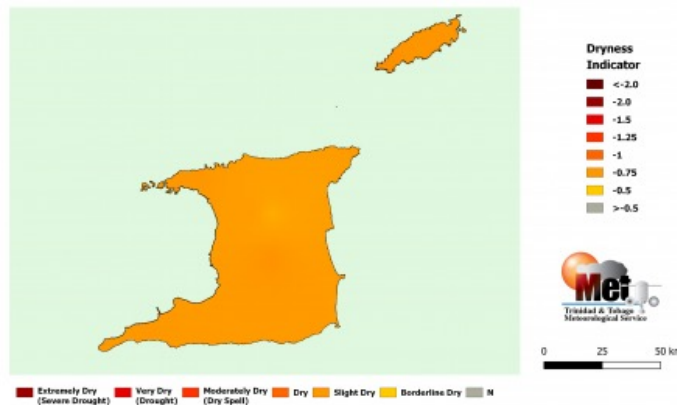


Possible Accumulated Rainfall Totals
February to April 2023

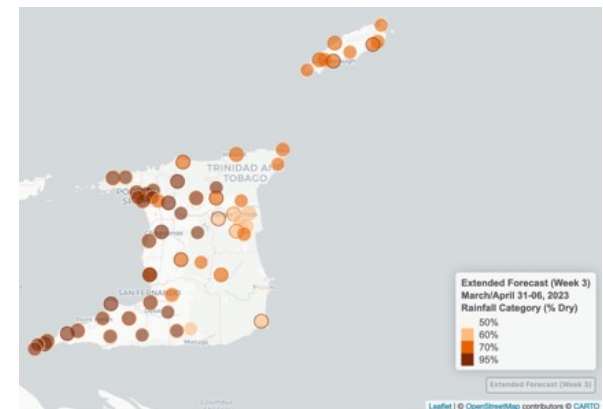


Dryness/Drought Indicator Outlook

Dryness/Drought Indicator Outlook
February to April 2023



Extended Precipitation Forecast for week 3 ahead



03/2023

Laing/CMO, Caribbean Water Loss Conference

Products & Services for Water Sector: Barbados



DROUGHT OUTLOOK

OUTLOOK NEWSLETTER
Issue No.37

Given that Charnocks and southern parishes has been recording below-normal rainfall for the last six months and the current rainfall projections for the remainder of the dry season, **agricultural drought warnings have been issued for Southern Parishes**. Given the reported state of the wells, **a hydrological drought watch has been issued**. Below is a table of the alert levels based on the rainfall accumulation predictions from BMS experimental high-resolution WRF climate model (Figure 4).

Table 3: Drought Outlooks March to July 2023

MONTH	AGRICULTURAL	HYDROLOGICAL
MARCH 2023	Drought Warning	Drought Watch
APRIL 2023	Drought Warning	Drought Watch
MAY 2023	Drought Watch	Drought Warning
JUNE 2023	Recovery Possible	Drought Warning
JULY 2023	Recovery Possible	Drought Warning

Hydrological Drought Watch

Responses to the predicted Drought Alert Level.

Key Messages:

- Protect Resources and conserve water
- Implement Management Plans
- Response training
- Monitor and Repair Infrastructure
- ✓ Continue to monitor for updates from the Barbados Water Authority.
- ✓ Continue to monitor the BMS Climate Outlook for monthly updates.

March to July 2023

What do these forecasts mean for Barbados?

- Employ rainwater harvesting techniques for rain feed crops.
- There is inadequate soil moisture for certain crops
- It is recommended to have an irrigation plan and systems in place to ensure the best crop yield.
- A reduction in the reservoir/aquifer levels is increasingly likely as the dry season progresses.
- Conserve water.
- Cooler temperatures as compared to the warmer months and more "comfortable nights".

Products & Services for Water Sector: Jamaica



January 2023

Volume:5 Issue:1 | January 2023



HIGHLIGHTS FOR JANUARY

- Twelve (12) of thirteen (13) parishes received below-normal rainfall during January.
- Eleven (11) parishes recorded meteorological drought conditions.
- Near-normal rainfall is forecast for March to May 2023.
- Near-normal to above-normal temperatures are expected for March to May 2023.

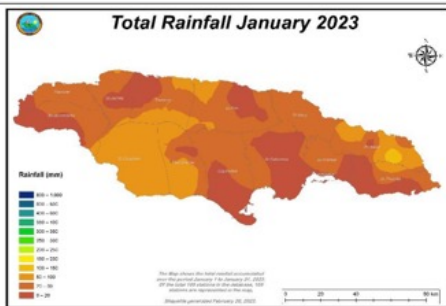


Fig.1. Distribution of Jamaica's Rainfall for January 2023

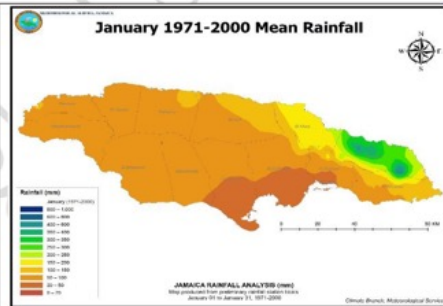
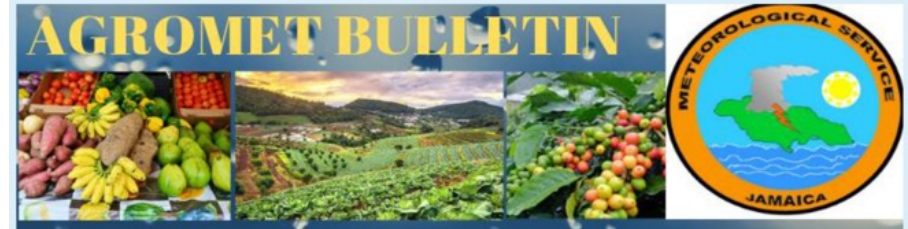


Fig.2. Mean Island Rainfall for January

January 2022

Volume: 10 Issue: 1 | January 2022



HIGHLIGHTS FOR JANUARY

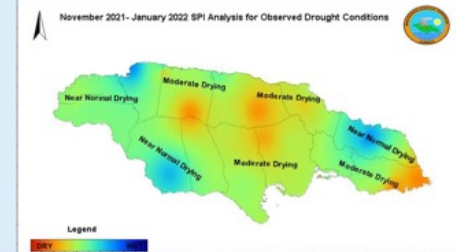
- Stations in all thirteen (13) parishes received below-normal rainfall.
- No parish experienced meteorological drought conditions.
- Near-normal to above-normal rainfall is forecast for February to April 2022.
- Near-normal temperatures are expected for the next three months.

What Happened: November 2021 – January 2022

Based on analysis (image to the right) very dry conditions were noted in sections of Trelawny, St. Ann, St. Mary, St. Thomas, St. Catherine and Clarendon. Sections of St. James, St. Elizabeth and Portland were experiencing mild levels of wetness.

The below-normal rainfall received across the island, during the early months the dry season (December, January) has resulted in continued dry conditions in many farming communities especially in central parishes.

Wet and Dry Conditions, November 2021 – January 2022



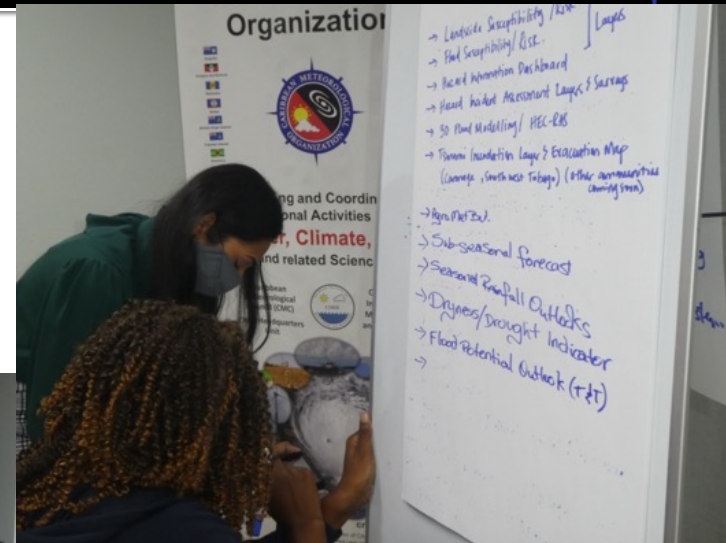
Capacity Development & Tools to support Water & Integrated Services



Geospatial tools & remote sensing for Hydro-Met



SERVIR-Amazonia and **CMO Headquarters** partnership -
Training on use of satellite data and geospatial tools to
better understand extreme hydro-meteorological events
in Trinidad & Tobago



SERVIR  **AMAZONIA**



7 Feb 2023

Laing/CMO, UNDRR Visit to CMO

Urban & Health Services & Water Distribution



CARIBBEAN RECORD HEAT 2020

Caribbean Climate Outlook Forum (CariCOF), CIMH

3. Did you apply heat early warning information this year?

- Nevis: The water sector had to conserve water by practicing water distribution to different areas of our country or by parishes. Of course people would get frustrated or lack information on how to better prepare for the hazard. So our Communications Unit would usually campaign on hazards and in terms of Excessive Heat we put out PSA's and Tips to our social media platforms to educate people on how to adapt to these situations

BEAT THE HEAT: Extreme Heat
Heat related deaths are preventable

WHAT:
Extreme heat or heat waves occur when the temperature reaches extremely high levels or when the combination of heat and humidity causes the air to become oppressive.

WHO:
Children, Older adults, More males than females are affected, Outside workers, People with disabilities

WHERE:
Houses with little to no AC, Construction worksites, Cars

HOW to AVOID:
Stay hydrated with water, Stay cool in an air conditioned area, avoid sugary beverages, Wear light-weight, light colored, loose fitting clothes



Laing/CMO, Caribbean Water Loss Conference

Water Supply Impacts

May 2020

- Saint Lucia Declares **Water Emergency** (<https://stluciatimes.com/saint-lucia-declares-water-emergency/>),
- SVG CWSA **extended water rationing**, worst drought in years (<https://searchlight.vc/searchlight/press-release/2020/05/29/131997/>)

June 2020

- SVG Water Authority Urging Consumers To **Pray For Rain** (<http://pridenews.ca/2020/06/04/st-vincents-water-authority-urging-consumers-pray-rain/>)

July 2020

- **Worsening Water Crisis** in Eastern Caribbean (<https://eos.org/articles/worsening-water-crisis-in-the-eastern-caribbean>)

August 2020

- Saint Lucia **Water Emergency Revoked** (<https://stluciatimes.com/saint-lucia-water-emergency-revoked/>)

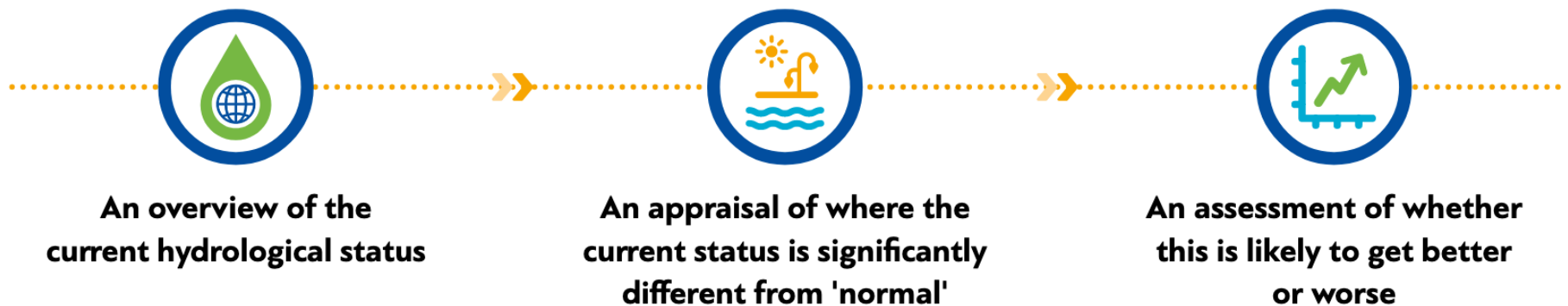
- **Water quantity and quality reduced –** Evapotranspiration, algae bloom
- **Consumption increase –** likely increase in homes, hotels, power utilities

WMO Hydrological Status & Outlook (HydroSOS)



- **HydroSOS** – monitoring and predicting global freshwater hydrological conditions, from and for National Hydrological Services (NHS), in collaboration with River Basin Organisations and global modelling centres

What will HydroSOS provide?



<http://bit.ly/WMO-HydroSOS>

WMO HydroSOS: Beneficial Outcomes



Beneficial Outcomes for sectors

Energy



Supporting decisions related to environmental flows, storage and power demand

Public Water Supply



Enabling decision making and planning for consistent public water supply and demand

Agriculture



Assisting assessments of water prospects for irrigation, planting, harvesting, and grazing for both rain-fed and irrigated agriculture

Disaster Risk Reduction



Enabling the identification of areas at risk of extreme hydrological conditions, informing the preparation of risk reduction and timely deployment of aid.

- **Need for improved national capability to assess current hydrological status**, to produce outlooks
- HydroSOS global team – multidisciplinary, multi-cultural group of experts from NMHSs, academia and research institutions
- Current experts represent NMHS, from 20 countries, research/scientific institutions, international organizations, WMO Regional Hydrological Advisers - Inputs since inception in 2017

<http://bit.ly/WMO-HydroSOS>

Concluding Remarks



Strengthened weather, water, & climate services for water loss mitigation involves:

- Better observing systems,
- Data exchange and integration (including real-time) and data management,
- Strengthening of National Meteorological & Hydrological Services,
- Co-creation of tailored products with stakeholders,
- Leading to improved forecasts, outlooks, and projections for better water management & socio-economic development

If you know CMO, you know ...



KNOW CMO 
KNOW AVIATION

KNOW CMO 
KNOW DISASTER EARLY WARNING 

KNOW CMO 
KNOW CLIMATE ACTION

KNOW CMO 
KNOW WATER MANAGEMENT

KNOW CMO 
KNOW ECONOMIC DEVELOPMENT

KNOW CMO 
KNOW AGRICULTURE

KNOW CMO 
KNOW RENEWABLE ENERGY

KNOW CMO 
KNOW Maritime Safety

KNOW CMO 
KNOW HAZARD RISK MANAGEMENT

KNOW CMO 
KNOW AIR QUALITY ALERTS



Thanks for your time & attention

CMO Headquarters Unit, www.cmo.org.tt

CIMH, www.cimh.edu.bb

Celebrating 50th Anniversary of CMO