



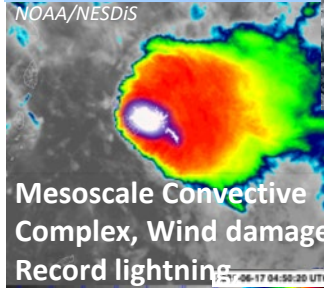
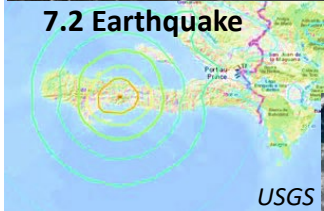
# MHEWS Initiatives in the Anglophone Caribbean

**Arlene Laing, PhD**

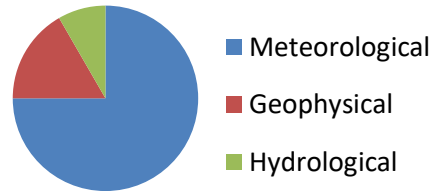
**Caribbean Meteorological Organization (CMO)**



# The Caribbean, A Multi-hazard Zone



## Caribbean Natural Disasters, 2021 (EM-DAT)



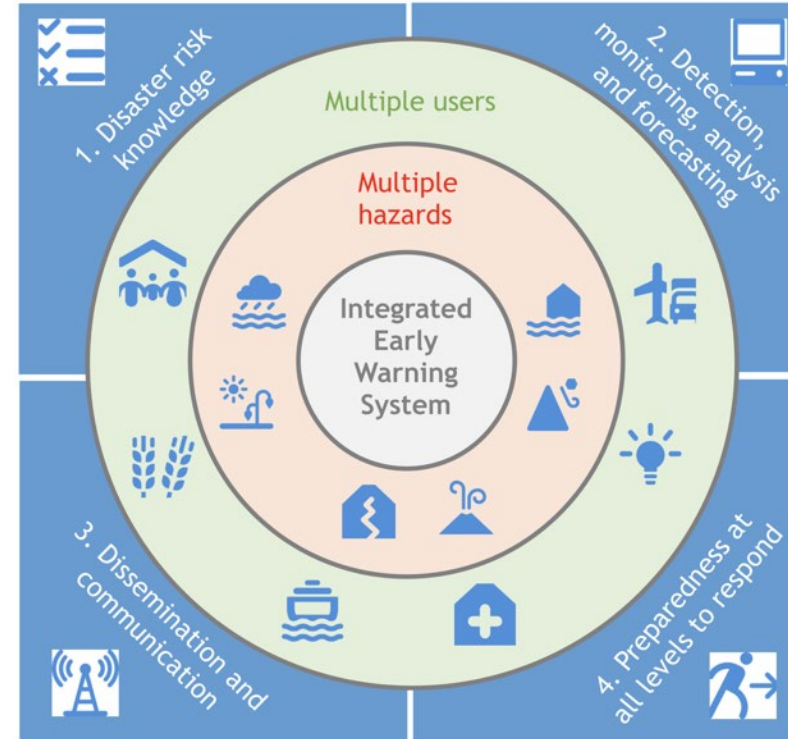
## Epitomized by 2021

- Eastern Caribbean (volcanic eruption, heavy rain, severe thunderstorms, flash floods, record flooding, tropical cyclones)
- Western Caribbean (tropical cyclones, severe thunderstorms, heavy rain, hail, floods, earthquake)
- Also Saharan Dust outbreaks
- COVID-19 pandemic
- **MHEWS requires - Cooperation & collaboration across disciplines, countries, sectors**

# Outline



- Background on Caribbean Meteorological Organization
- EWS Overarching Component – *Governance*
- Initiatives and contribution to components of MHEWS
- National Examples



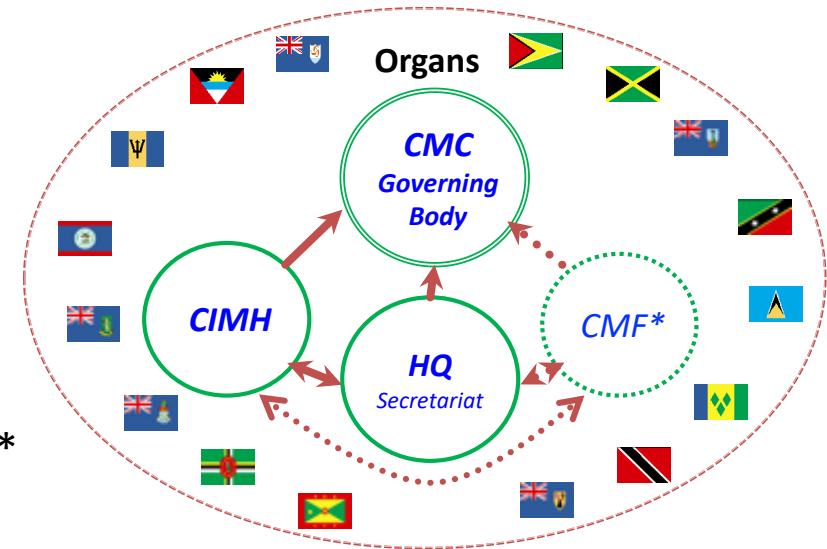
# Caribbean Meteorological Organization (CMO)



- Origin – British Caribbean Meteorological Service, established **1951**
- Caribbean Community (CARICOM) established – **August 1973**
- **CMO** established as umbrella of Ministerial Council, Met Service, & Institute, CMC as Governing Body – **October 1973**

## 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

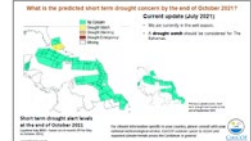


# Caribbean Weather, Water, Climate Prediction



CariCOF Drought Alert Maps

Map of short-term drought by the end of October 2021



Hazardous Seas Alert/YELLOW Level in effect until Friday



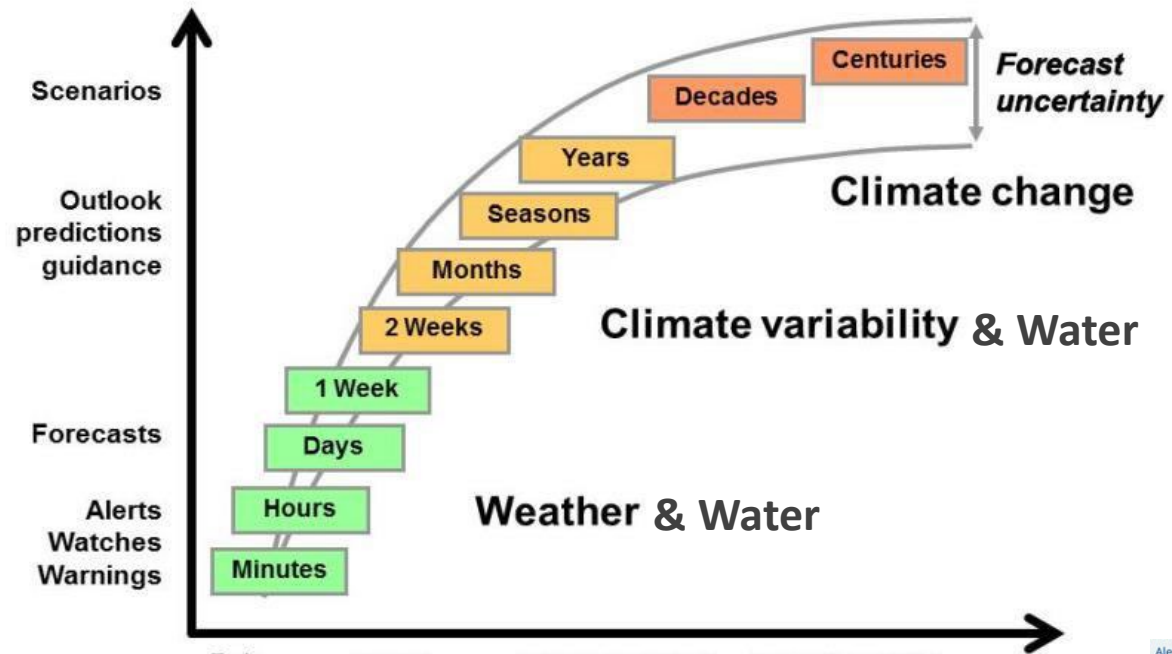
Alert summary	A HIGH WIND WARNING IS IN EFFECT FOR BARBADOS.
Effective	01:38:07 2021-06-17
Expires	06:00:00 2021-06-17

UWI CSGM/  
CCCCC

CIMH/  
CariCOF

NMHS

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



- Early warning & emergency response operations
- Sectoral preparedness planning
- Strategic planning & scenario building
- International policy negotiation
- Inventory management
- Infrastructure investment & land zoning
- Insurance contracts
- Government risk financing

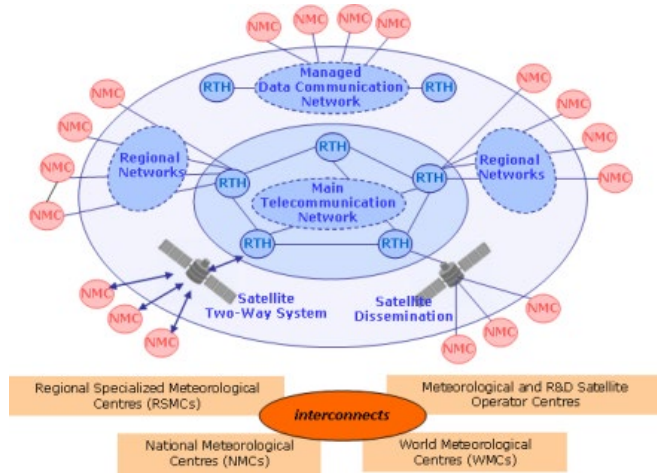
Source: UKMO/WMO



# CMO: 24/7 Service to Society



## Regional Meteorological Telecom Network (24/7)

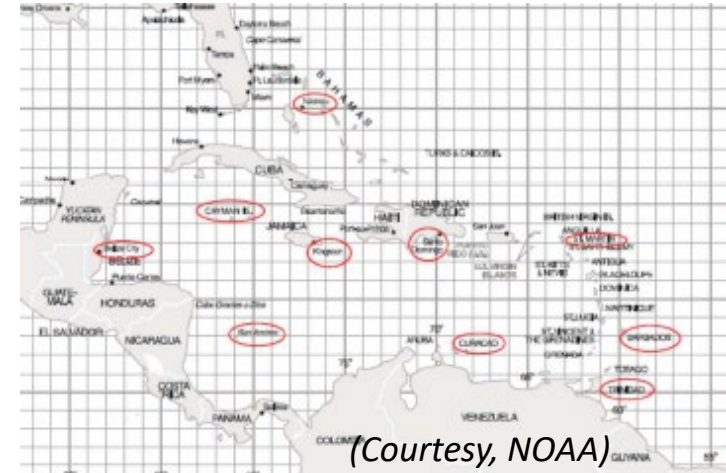


Free exchange of atmospheric, terrestrial and ocean observations; forecasts; & climatic products globally.

*Supports multi-hazard, multipurpose early warning systems (e.g., tsunami monitors in NMHS Centres)*

## CMO in Caribbean Upper-Air Network

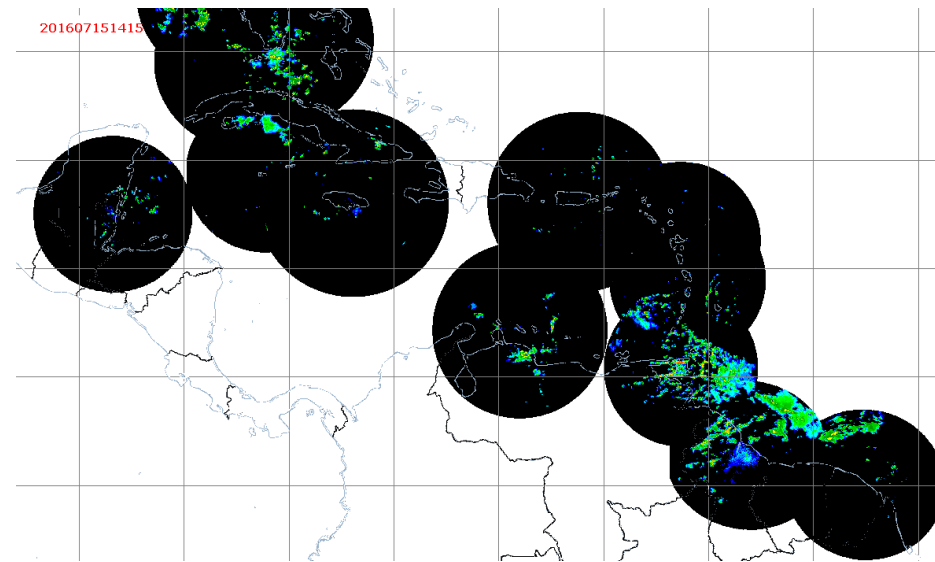
### Cooperative Hurricane Upper Air Stations (CHUAS)



Vital to Weather forecasts, Climate services, Aviation, Air Quality/Dispersion

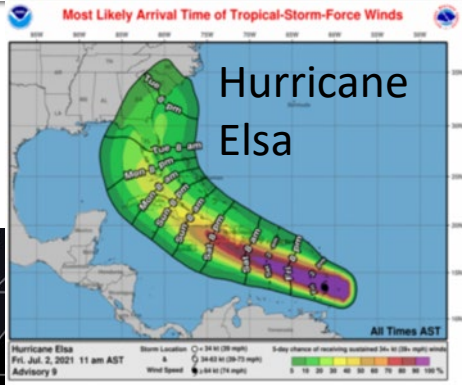
## Caribbean Weather Radar Network

- 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* expanded mosaic
- Radar Archive – valuable for climate analysis, trends in rainfall variability & severe weather



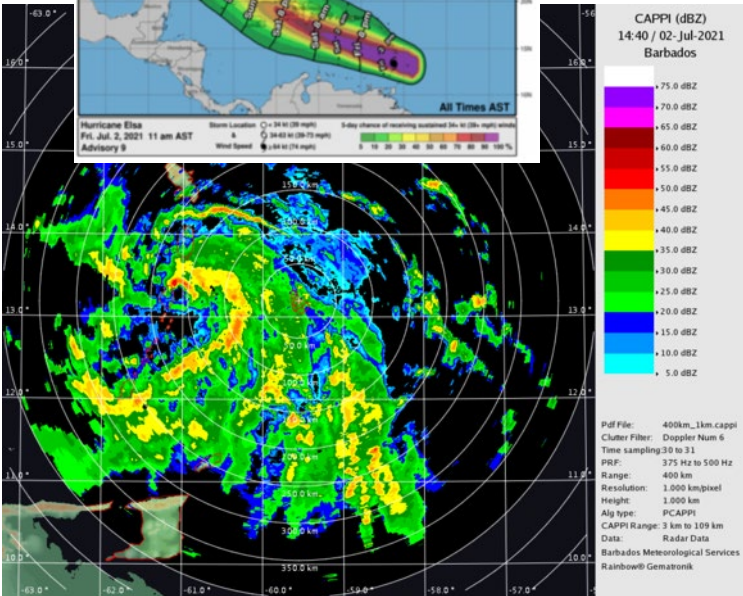
Composite of base reflectivity  
Courtesy, Barbados Meteorological Service

# CMO: Early Warning for Hurricanes



## Regional Hurricane Warning System

- CMO *National Met Services* collaborate closely in operating early-warning system for tropical storms, hurricanes, and related severe weather
- Back-up arrangement between regional National Met Services. Part of *Hurricane Committee* coordinated by *WMO* and led by US *National Hurricane Center*
- 1<sup>st</sup> CMO Coordinating Director, Mr Cyril Berridge, strong advocate for Hurricane Committee



Credit: Barbados Met Service



# CMO: Other Severe Weather Early Warning

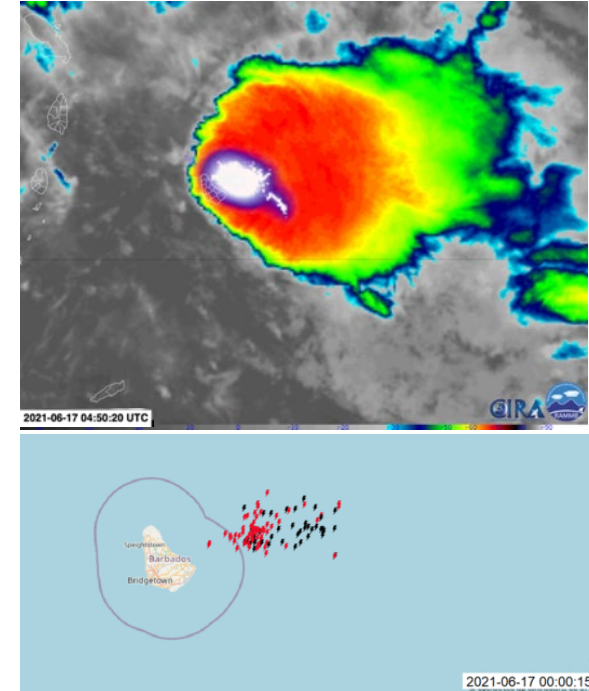


## WMO Severe Weather Forecasting Programme - Eastern Caribbean

*Any Time of Year: Heavy Rain, Strong Winds, Swells/Rough Seas*

- Improve collaboration among Caribbean Met. Services for **non-tropical cyclone severe weather**
- Seed funding from Canada through Climate Risk and Early Warning Systems (CREWS) Project
- Co-chaired by **Météo-France Martinique** and **CMO HQ**; supported by **CIMH**

<http://cmo.org.tt/project.html>



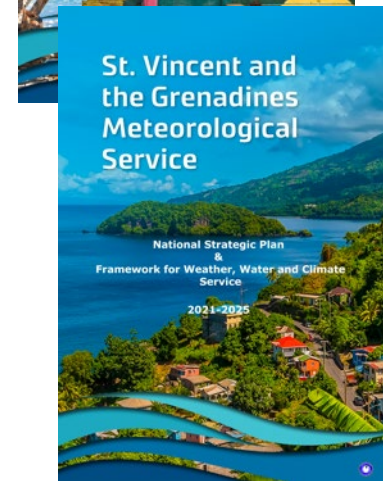
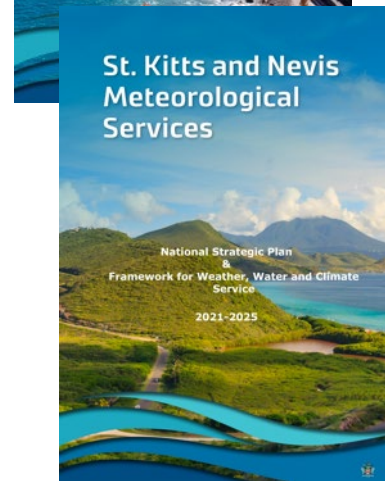
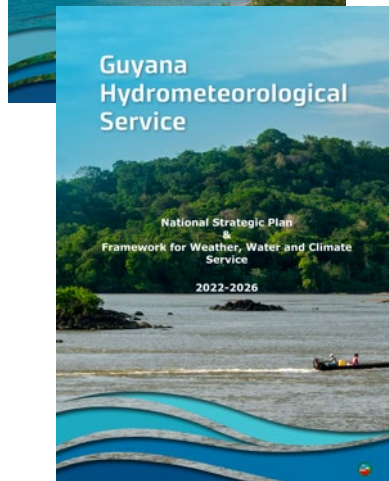
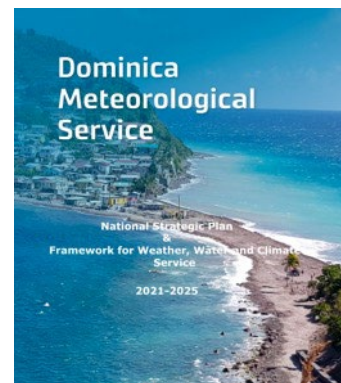
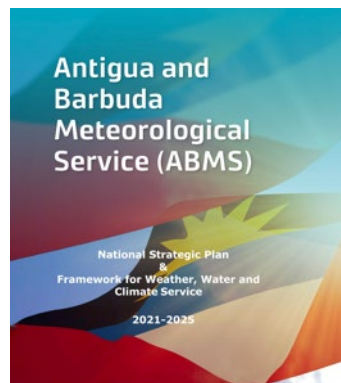
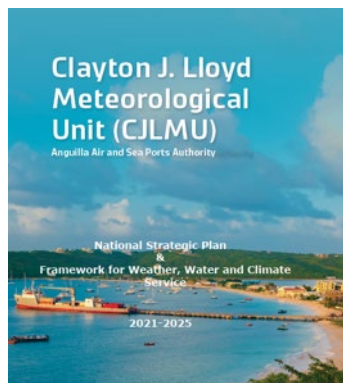
Chris Vagasky, Vaisala

# EWS Governance: CMO Initiatives



- With funding from CREWS & ECCC – Developed Strategic Plans, including National Frameworks for Weather, Water, and Climate Services for Anguilla, Antigua and Barbuda, Dominica, Grenada, Guyana, Jamaica, St Kitts and Nevis, St Vincent and the Grenadines
- Developed Model Hydro-Meteorological Bill and Policy
- Drafted national legislation for Anguilla, Antigua and Barbuda, Belize, Grenada, Jamaica, Saint Lucia, St Kitts and Nevis, St Vincent and the Grenadines
- With CREWS funds – Developing Strategic Plans for Turks & Caicos Islands and Cayman Islands
- Drafting Legislation for Meteorological Services in Barbados

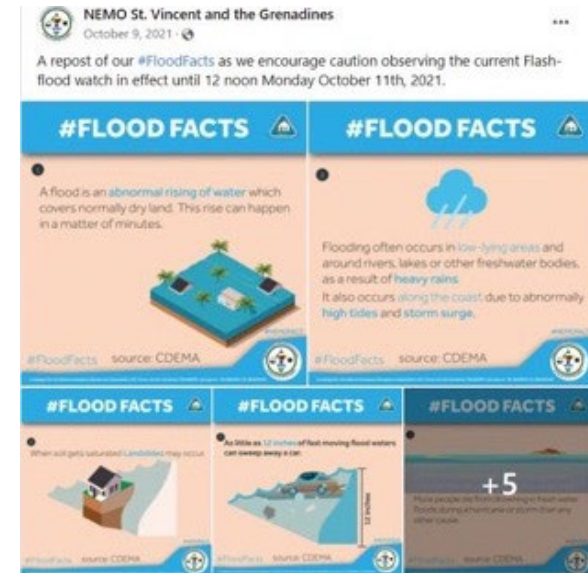
# Strategic Plans, National Frameworks for Weather, Water, and Climate Services, & Action Plans



# EWS Pillar 1- Disaster Risk Knowledge



- Strategic Planning & National Frameworks for Weather, Water, and Climate Services
- Severe Weather Forecasting Programme Eastern Caribbean (for non-tropical cyclone severe weather)
- Regional Roadmap for Strengthening and Streamlining MHEWS and Priority Activities (funded by CREWS, led by World Bank )
- SERVIR-AmaZonia – use of satellite data and geospatial tools to better understand hydro-meteorological events
- CMO Radar Network, CMO Operational Radar Group (Techs & IT)



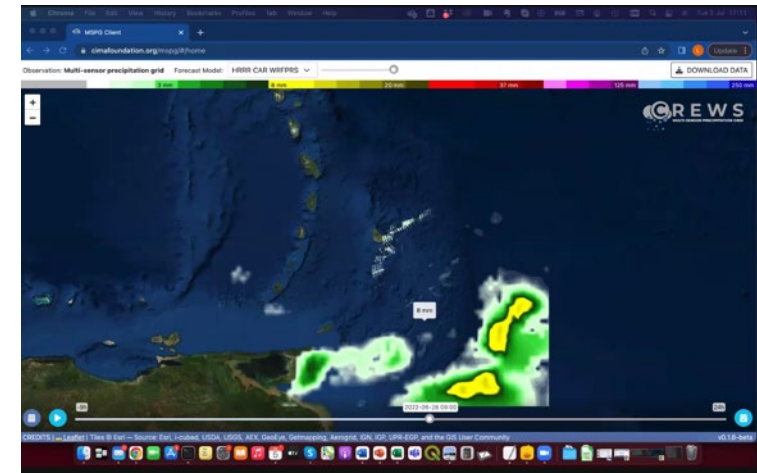
Courtesy, NEMO, St Vincent & Grenadines (SVG)



# EWS Pillar 2: - Detection, Monitoring, Forecasting & Analysis of hazards



- National Frameworks for Weather, Water, and Climate Services (co-develop products)
- SWFP Eastern Caribbean – Draft Severe Weather Operational Plan developed
- Regional Roadmap for Strengthening and Streamlining MHEWS and Priority Activities (funded by World Bank CREWS)
  - Precipitation Grid, Impact-based Forecasting Webinars, Integrated Flood Forecasting System
- SERVIR-Amazonia – use of satellite data and geospatial tools to better understand extreme hydro-meteorological events
- Upgrade CMO Radars – Technical Study funded by World Bank through CREWS. Developing Proposal (with Caribbean Development Bank)



*Precipitation Grid prototype, CIMA Foundation*



# EWS Pillar 3: Communication & Dissemination of Actionable Warnings



- National Frameworks for Weather, Water, and Climate Services (co-design, co-deliver products)
- SWFP Eastern Caribbean Draft Operational Plan – Standard procedures for warnings
- Regional Roadmap for Strengthening and Streamlining MHEWS and Priority Activities
  - Impact-based Forecasting Webinars, Integrated Flood Forecasting System, Study of Regional Alert System
- Facilitating training of forecasters and emergency personnel on CAP, organizing workshop on CAP
- CMO Radars – Visual aid for displaying severe weather and heavy rainfall, volcanic ash
- Engagement with Caribbean Broadcasting Union and UNDRR on “Media Saving Lives”



# EWS Pillar 3: Preparedness at all levels for response

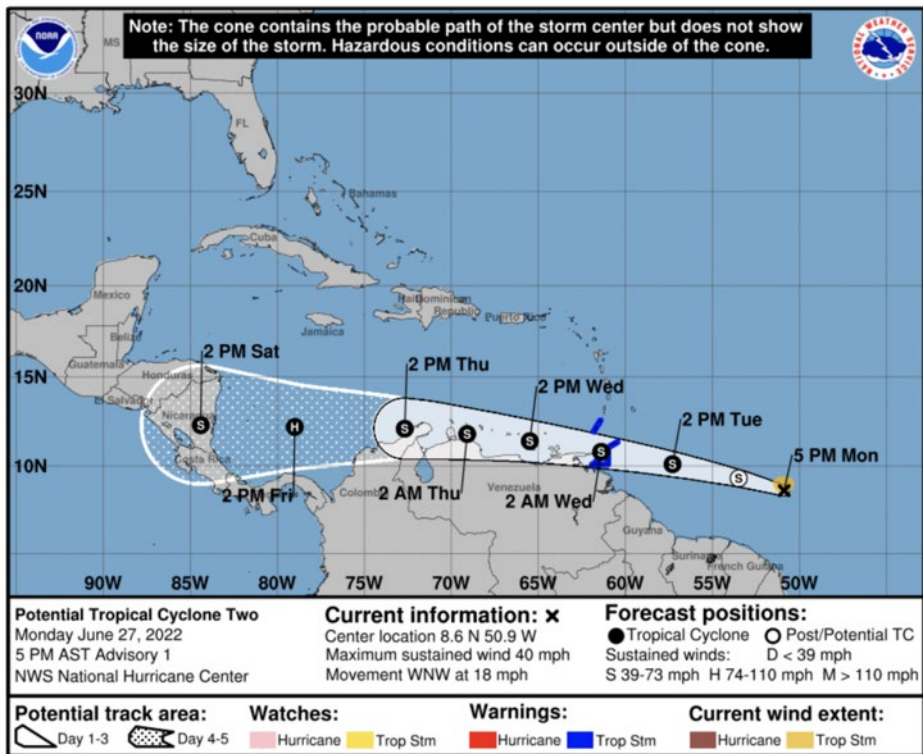


- Strategic Planning & National Frameworks for Weather, Water, and Climate Services
- Framework for Weather, Water, and Climate is mechanism for stakeholder partnerships (e.g., National Drought Outlooks, Hurricane Awareness week, National Disaster Council, ...)
- CMO – In ***Regional Early Warning System (REWS) Consortium*** led by **Caribbean Disaster and Emergency Management Agency (CDEMA)**
- *REWS* – focused on all hazards in the Caribbean

# Early Warnings in the Caribbean: Using the Potential Tropical Cyclone (PTC) Advisory



Advisory 1: Potential Tropical Cyclone Two - June 27, 2022



- Organs of CMO (Headquarters, CIMH) and NMHS contributed to new training module aimed at emergency management officers

NOAA



# St Vincent & Grenadines: MHEWS Volcanic Eruption, Floods, Hurricane, Pandemic

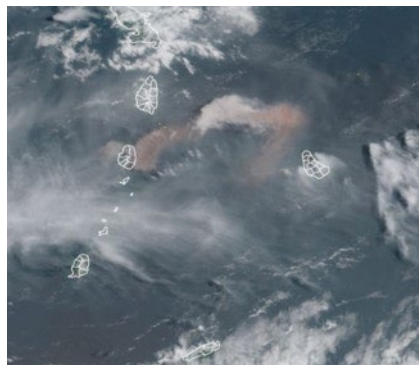


## Risk Knowledge

## Detection, Monitoring, Analysis and Prediction

## Warning Dissemination & Communication

## Preparedness, Response, Recovery



Land  
Marine

### Volcanic Ash + Heavy Rains

Report time: 11:57 noon

Present Conditions:	Overcast with Light rain
Winds:	North at 17 km/h or 10 mph
Temperature:	22.5 °C
Relative Humidity:	94 %
Barometric Pressure:	1015.5 mb
24-hour rainfall:	146.6 mm
Yesterday's Maximum:	30.1 °C
Last night's Minimum:	21.5 °C

**Forecast Period:** 12:00 noon Thursday, 22<sup>nd</sup> April 2022 to 6:00 pm Thursday, 23<sup>rd</sup> April 2022

**Synopsis:** Unstable conditions are across the islands.

**Forecast:** Cloudy to overcast with moderate to heavy showers, periods of rain/thunderstorms

**Weather Advisory:** Residents and mariners are urged to exercise extreme caution in areas prone to flooding and landslides or near rivers and streams. Be alert also for possible impacts resulting from rain-soaked ash.

**Winds:** ENE - ESE at 10 - 30 km/h (6 - 19 mph)

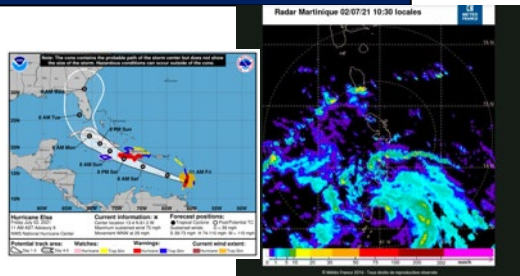
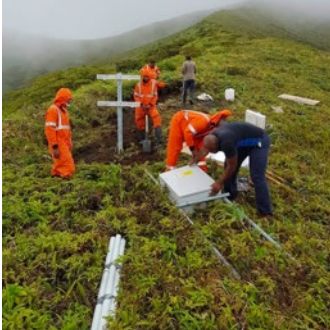
**Sea Conditions:** Slight to moderate in open water; swells from 1.0 to 1.5 m

**Marine Warning:** Small craft operators and other users of the sea should not venture along the coast in the red zone due to extremely poor visibility in volcanic ash

Upwelling High:	****	12:40 pm
Tides Low:	****	12:49 pm
Sunrise:	5:45 am	
Sunset:	6:13 pm	

- Health protocols for emergency shelters which were tested during 2020 Hurricane Season were enforced
- Very few COVID-19 cases at shelters
- National Council – coordinating response and recovery

## Hurricane Elsa, Heavy Rain, Lahars



MEMO St. Vincent and the Grenadines  
October 6, 2021

With the current weather conditions, there is an elevated chance of mudflow activity. Exercise caution.

**Lahar/Mudflow activity possible**  
The public is reminded that post volcanic eruption heavy rainfall can result in Lahars/Mudflows which are dangerous and life threatening.  
Residents of communities from Jibacca, northwards should exercise special caution due to the current weather conditions.

- CDEMA Regional Response Mechanism, UWI, CARICOM Secretariat, WMO & CMO Regional Forecasting Arrangements, NOAA/NESDIS Satellite Access, CIMH Modelling of Ash Dispersal, Regional Security Systems, etc..



# St Vincent & Grenadines: MHEWS



- MHEWS functioning well in general – UNDRR Evaluation, May 2022
- [National Emergency and Disaster Management Act 2006](#)
- **Met. Service has Strategic Plan 2021-2025 and draft National Bill**
- Challenges – Human Resource Capacity, not 24-hour operations
- Met Service recently designated as Tsunami-warning focal point.
- Not yet 24/7
- International Weather Ready Nations/Impact-based forecasting – Plan to start in January 2023, will take about 2 years
- Green Climate Fund Regional Proposal Development – Assessment of structure and adequacy of staffing and other resources for future operations

*Thanks to Mr Billy Jeffers, SVG Met Service, and Ms Michelle Forbes, NEMO SVG*



# Multi-hazard Early Warning Systems in Caribbean



## Integrated approach is key

- **Broad regional and national cooperation and coordination, data sharing and integration, & co-development of EWS** among National Meteorological and Hydrological Services; disaster risk and emergency management agencies; institutions in related geophysical sciences; hazard-sensitive sectors – public & private; academia; civil society and community organizations; social service organizations; social scientists, the media, and general public to fulfil:
  - Risk knowledge
  - Monitoring, analysis, detection, & prediction
  - Communicating and dissemination
  - Preparedness, response and recovery



- Thank you for your time and attention!

[www.cmo.org.tt](http://www.cmo.org.tt)