Weather Ready Nations Barbados: Impact-Based Forecast (IBF) Implementation

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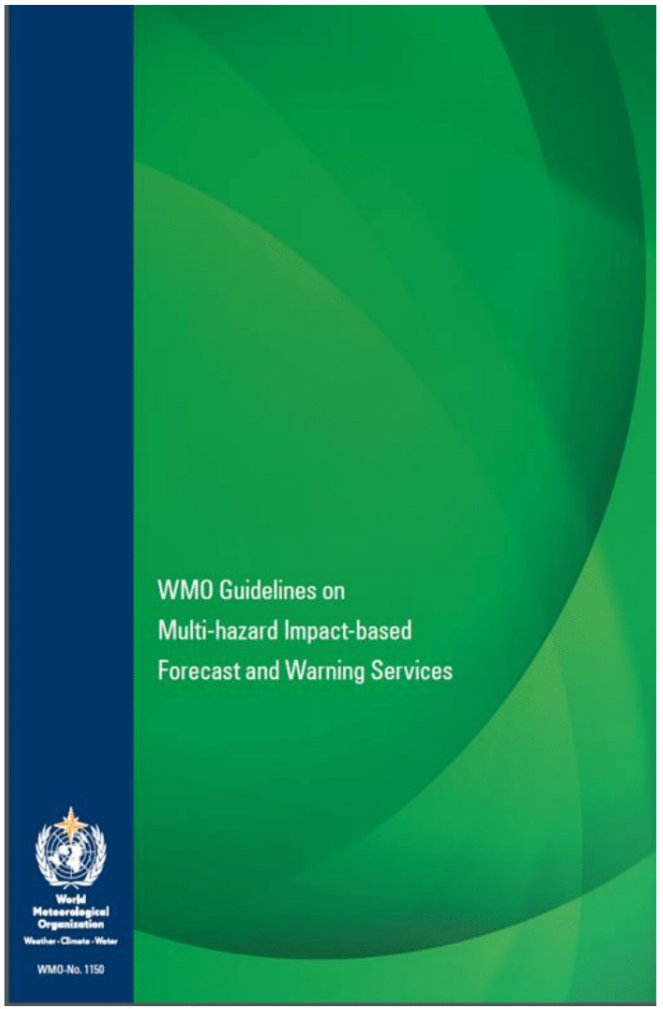
UCAR/COMET

9th WMO/Meteo-France RA I Tropical Cyclones Training Course

«WMO Guidelines on Multi-hazard Impact-Based Forecast and Warning Services»

WMO No. 1150: https://library.wmo.int/doc_num.php?explnum_id=7901

- PWSD Programme coordinated effort to produce the publication: WMO No. 1150
- It provides a road map to assist members develop impact-based warning services
- Defines the necessary steps and explains likely levels of complexity
- Publication highly recommended for use by Members



WMO OMM

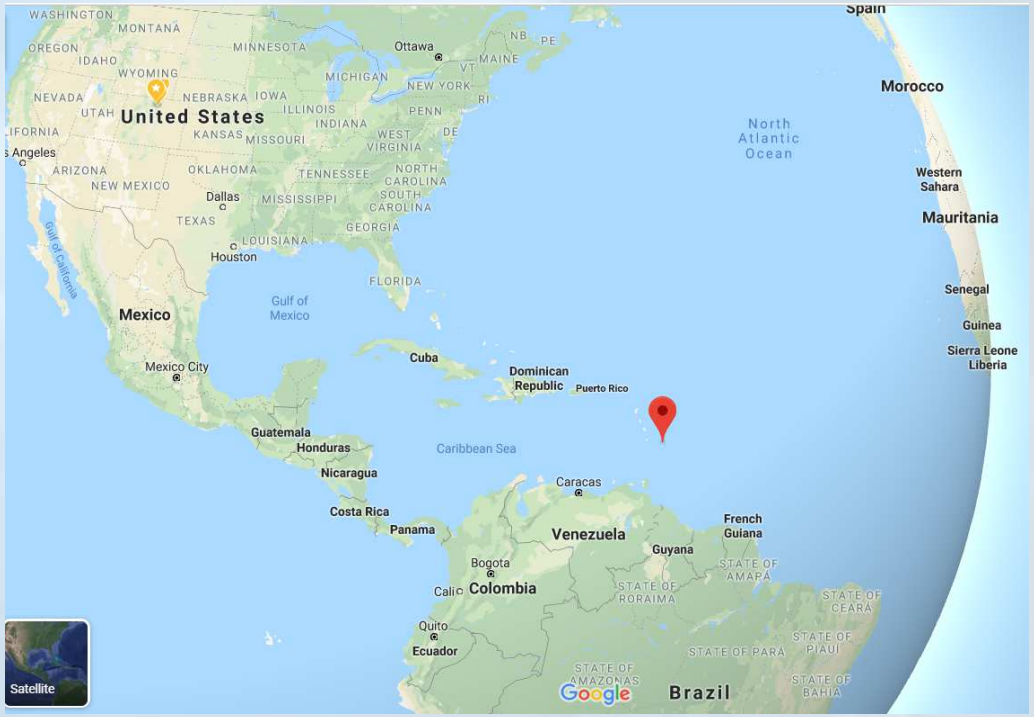
What does it mean to be weather ready?

WRNs:

- Evolve their weather forecasting to stress potential impacts
- Communicate impacts clearly to help people make smart decisions
- Engage community partners to spread the word

Barbados Weather Ready Nations Project

- **The island of Barbados is implementing an IBF system for high impact hazards:**
  - High winds
  - Severe convection
  - Heavy rainfall events
  - Tropical cyclones
  - Drought



Barbados Weather Ready Nations Project

- **Collaborative Effort: UCAR/COMET partnered with key stakeholders in Barbados:**
  - Barbados Meteorological Service (BMS)
  - Caribbean Institute for Meteorology and Hydrology (CIMH)
  - Barbados Department of Emergency Management (DEM)
  - Caribbean Disaster and Emergency Management Agency (CDEMA)
  - Coastal Zone Unit (CZU)

Barbados Hazards and Impacts

Primary	Secondary	Tertiary
High Winds	High Seas and Surf, Gale and Small Craft Impacts	Wind Shear and Flight Hazards hindering safe flight operations, Small Boats and high surf impact the health and safety of populations
Severe Convection	Heavy Rain, Lightning, Wind Gusts, Flooding and Flash Flooding	Health and Safety of the Populations, potential evacuations of persons needed
Heavy Rain Events	Flooding and Flash Flooding	Roads flooded, homes destroyed, evacuation of persons needed. Possible landslide hazards, crop failure. Health and Safety of Population
Tropical Cyclones	Strong Winds, Heavy Rains, Storm Surge, Flooding and Inundation	Structural damage, damaged infrastructure. Health and Safety of Population

Impact-based Forecast System Development

- **Impact tables define the different levels of impact**
- **Impact level depends on vulnerability of the region**
- **Disaster management agencies provide input to the tables**

General description of different impact levels

Minimal	Minor	Significant	Severe
Day to day activities not affected but some ***small scale*** impacts occur	Some ***local*** incidents, minor disruptions, 'business as usual' for emergency responders	Disruption to day to day routines and activities, mostly ***localised***. ***Short-term*** strain on emergency responder organisations	***Widespread,*** Prolonged disruption to day to day routines and activities ***Prolonged*** strain on emergency responder organisations

Impacts - Heavy Rainfall

	Minimal Impacts	Moderate Impacts	Significant Impacts	Severe Impacts
Transportation	Wet roads and higher likelihood of accidents Localized disruption to traffic Limited impact to traffic signals	Localized pooling and flooding of roads Occasional accidents and associated disruptions; increased travel times Occasional traffic signal outage/flashing and traffic congestion Minor public transportation disruptions	Localized flooding and damage of roads with significant delays and disruption to traffic Accidents and associated Disruptions; increased travel times Frequent traffic signal outage/flashing; significant traffic congestion Significant disruptions to public transportations	Widespread flooding and damage of roads with dangerous driving conditions Multiple accidents and associated disruptions; increased travel times Most traffic signal outage/flashing – major traffic delays, accidents at intersections Most publication transportation delayed or not operational
Schools	Minor disruption of school activities	Localized disruption of school activities	Regional closure of schools	All schools closed
Landslides	Isolated land slippage	Localized land slippage – limited debris flow on roads	Localized land slippage resulting in road closures and property damage – significant debris flow (rocks and trees)	Land slippage resulting in road closures and property damage and communities cut off

Response

Very Low Risk: No Action	Medium Risk: Be Prepared	Medium Risk: Be Prepared	High Risk: Take Action
Monitor for changing weather conditions	Stay out of flood waters Evaluate inventory of emergency supplies (food, water, medical supplies); prepare to restock supplies at the beginning of season Be aware of localized flooding of roads and properties in [...locations…]. Impacts include occasional accidents, associated disruptions, increased travel times, land slippages could block roads. Be aware for possible traffic delays due to signal outages Be aware for possible delays in public transportation Be aware for possible localized flooding water course over flood prone areas Be aware for prepare for possible school closure	Stay out of flood waters Check emergency supplies, purchase additional supplies if needed, fill gas tanks, etc. Be prepared for localized flooding of roads and properties in [...locations…]. Impacts include accidents, associated disruptions, increased travel times, land slippages could block roads. Prepare for traffic delays due to signal outages Prepare for possible delays or cancellation of public transportation routes Prepare for localized flooding in low-lying, flood prone areas Prepare for localized land slippage, debris flow and possible road closures Ensure drains are cleared.	Stay out of flood waters Prepare to use emergency supplies, acquire additional supplies if possible, fill gas tanks, preposition food and emergency supplies for post Event Avoid walking or driving through moving water Seek safer/higher ground if in [...locations…]. Monitor for changing weather conditions Call emergency services if Impacted. Stay off roads especially in flood prone areas, streets with traffic signals, or areas with frequent land slippage/landslides Plan to shelter in place in non-flood areas or take public

Barbados Example - Impact Matrix

Impact Matrix for emergency management: Winds			
Minimal Impact	**Minor Impacts**	**Significant Impacts**	**Severe Impacts**
Debris Localized loose debris blown around	Localized tumbling of unsecured objects (e.g.: inflatable structures, tents, garbage cans)	Tumbling and rolling of unsecured objects (e.g.: inflatable structures, tents, garbage cans) Injury and danger to life from flying debris	Lifting/airborne of unsecured objects (e.g.: inflatable structures, tents, garbage cans) Widespread danger to life from flying debris
Transportation Isolated transport routes affected	Regional transport routes affected by wind or falling tree limbs Some delays in journey times	Significant transport routes affected by wind and falling trees Significant impacts to first responder operations Significant delays, road closures and traffic congestion	Widespread transport routes and travel services affected for a prolonged periods Severe impacts to first responder operations Delays or cancellation of public transportation Major traffic congestion and stranded residents

Barbados Example - Response Matrix

Response Matrix: Wind			
Very Low - Business as usual	**Low - Be Aware**	**Medium - Be Prepared**	**High - Take Action**
Monitor for changing weather conditions	Be aware of tumbling of unsecured objects, falling limbs, sea spray, and choppy seas in [...locations…]. Beware Increased travel times Be aware of downed power lines and isolated power outages	Be prepared for tumbling and rolling of unsecured objects, falling limbs and trees, sea spray, choppy seas and large breaking waves in [...locations…]. Secure objects such as garbage cans Be prepared for traffic delays, road closures, and congestion at traffic signals Be prepared for downed power lines, power and utility outages. Prepare for to have extra water and non-perishable food.	Expect for tumbling and rolling of unsecured objects, falling limbs and trees, sea spray, choppy seas and large breaking waves in Secure large objects such as garbage cans if so to do so. Expect significant traffic delays, road closures, and congestion especially in areas with power outages, down trees, utility polls. Avoid driving if possible Expect downed power lines and long power outages. Stay away from impacted areas. Secure extra water, food, and fuel if possible

Barbados WRNs Implementation

- **Implemented over a three year period (February 2017 – March 2020) in seven phases:**
  - Phase 1: Collect data and develop hazard, risk and response matrices
  - Phase 2: Expand stakeholder participation
  - Phase 3: Develop forecaster and disaster management software
  - Phase 4: Develop standard operating procedures (SOPS)
  - Phase 5: Demonstration and training of IBF
  - Phase 6: Public awareness and outreach
  - Phase 7: Operational implementation