IFRC | CaDRiM

Community Early Warning Systems Assessment

2022

Contents

List of Acronyms

ABRCS	Antigua and Barbuda Red Cross Society
AWS	Automatic Weather Systems
BGIS	Barbados Government Information Service
BTC	Bahamas Telecommunication Company Limited
CAP	Common Alerting Protocol
CBO	Community-Based Organisation
CCRDR	Caribbean Community Resilience to Disaster Risk
CDC	Civil Defence Commission
CDEMA	Caribbean Disaster and Emergency Management Agency
CDM	Comprehensive Disaster Management
CDRT	Community Disaster Response Team
CERT	Community Emergency Response Team
CEWS	Community Early Warning System
CIMH	Caribbean Institute of Meteorology and Hydrology
CREWS	Climate Risk Early Warning Systems
CWSA	Central Water and Sewerage Authority
DANA	Damage Analysis And Needs Assessment
DEM	Department of Emergency Management
EMAC	Emergency Management Advisory Council
EOC	Emergency Operations Center
EOP	Emergency Operations Plan
eVCA	Enhanced Vulnerable Capacity Assessment
EWS	Early Warning System
FEWS	Flood Early Warning System
GDP	Gross Domestic Product
GFDRR	Global Facility for Disaster Reduction and Recovery
IFRC	International Federation of Red Cross and Red Crescent Societies
JSMN	Jamaica Strong Motion Network
JSN	Jamaica Seismograph Network
MAS	Maritime Authority Suriname
MHEWS	Multi-hazard Early Warning Systems
MOU	Memorandum of Understanding
NaDMA	National Disaster Management Agency
NCCR	National Coordination Centre for Disaster Relief
NEMA	National Emergency Management Agency
NEMO	National Emergency Management Organisation
NEWS	National Early Warning System
NGO	Non-Government Organisation
NODS	National Office of Disaster Services
ODM	Office of Disaster Management
ODPEM	Office of Disaster Preparedness and Emergency Management
ODPM	Office of Disaster Preparedness and Management
POS CCD	Port of Spain Country Cluster Delegation
RDLG	Ministry of Rural Development and Local Government

SOP	Standard Operating Procedure
SVGMET	St. Vincent and the Grenadines Meteorology Service
TAG	Technical Advisory Team
TEMA	Tobago Emergency Management Agency
ToT	Training of Trainers
TTMET	Trinidad and Tobago Meteorological Services
TTRCS	Trinidad and Tobago Red Cross Society
UNDRR	United Nations Office for Disaster Risk and Reduction
UNDP	United Nations Development Programme
UWI	University of the West Indies
WRA	Water Resources Agency

1.0 Introduction

Climate change, inadequate urban planning, , and population increase are some of the key drivers of vulnerability in the Caribbean region. These factors contribute to the region being prone to a multitude of hazards including, but not limited to, hydrometeorological (hurricanes and drought), seismic (earthquakes) and biological (vector borne diseases such as dengue and zika), environmental, chemical, technological and societal hazards. According to the sixth Intergovernmental Panel on Climate Change (IPCC) Report[1], 22 of the 29 Caribbean islands were affected by at least one category 4 or 5 storm in 2017. Hurricanes not only severely impact lives, property and livelihoods, but can also completely overwhelm the economy of these countries. In 2017, Hurricane Maria in Dominica resulted in damages that were estimated to be 225% of its Gross Domestic Product (GDP). In addition to the devastating impacts of storms, the IPCC report also highlighted that between 2013-2016, the region experienced the most severe drought during a period spanning from 1950- 2016, and in 2021, the eruption of the La Soufriere volcano in St. Vincent and the Grenadines caused an estimated USD 150 million in infrastructure damage and USD 150 million in agricultural losses due to ash fall and pyroclastic lava flows.

As expected, the region's increasing vulnerability has resulted in more complex disasters whereby countries have to respond simultaneously to dual disasters or even multiple disasters. A recent example is the La Soufriere eruption, which also occurred during the COVID-19 pandemic, and on the heels of the dengue outbreak in St. Vincent and the Grenadines. For St. Vincent and the Grenadines, responding to the eruption had to take place within the context of the pandemic with volunteers and members of the Community Disaster Response Team (CDRTs) applying COVID-19 considerations while assisting with community evacuations. Managing and reducing risk, with a holistic view of all its interconnections is therefore critical. The COVID-19 pandemic revealed and exacerbated underlying risk factors, disrupting livelihoods, eroding Caribbean economies, and ultimately undoing development gains. There is therefore an urgent need to prioritise both national and community resilience.

Communities can enhance their resilience and better support themselves through improving their understanding of risks and vulnerabilities, understanding how to reduce these risks, ensuring access to a suitable communication system to relay incoming threats to persons within the community, and enhancing preparedness capacities. Over the years, the IFRC and the national societies have conducted different projects to build this resilience namely through training of CDRTs with the capacity to act as first responders, storing of emergency equipment in communities with trained CDRTs, and conducting enhanced Vulnerability Capacity Assessments (eVCAs). Another significant mechanism for improving community resilience is via the implementation of Community Early Warning Systems (CEWS).

The IFRC defines Early Warning Systems (EWS) as "set of capacities needed to generate and disseminate timely and meaningful warning information that enables at-risk individuals, communities and organisations to prepare and act appropriately and in sufficient time to reduce harm or loss". These systems can be implemented on a national level or could be specific to a community, therefore

[1] https://www.ipcc.ch/report/ar6/wg2/

being either community-based (i.e. based in the community but not owned by the community) or community-driven (owned and driven by the community). There are four main components to any EWS, be it on a national level or on a community level. These components are as follows:

1) Disaster risk knowledge – understanding disaster risk and vulnerabilities based on the collection of national or community related information.
2) Hazard detection, monitoring and forecasting – utilizing science and technology to systemically to detect and monitor multiple hazards.
3) Warning Communication – dissemination of warnings/alerts in a timely manner to vulnerable persons needing the information.
4) Response Capability – systems in place for first responders and persons exposed to take appropriate action and cope with the hazard impact.

Early warning systems are crucial in safeguarding life, property and livelihoods. On a global level, both the IFRC and the United Nations Office for Disaster Risk and Reduction (UNDRR) have developed guidelines to integrate the establishment of appropriate EWSs as an effective disaster risk reduction measure. According to the IFRC Strategy 2030, "The use of technology and innovation to anticipate risks and disasters and provide proactive action" is one way of combatting the global challenge of evolving crises and disasters, while Target G of the UNDRR Sendai Framework for Disaster Risk Reduction, endorses "substantially increasing the availability of and access to multi-hazard early warning systems and disaster risk reduction information and assessments to the people by 2030". The same advocacy for EWS can be found regionally as outlined in the Caribbean Disaster and Emergency Management Agency (CDEMA) Comprehensive Disaster Management (CDM) Strategy 2014-2024 under Priority 4: Strengthen and sustain community resilience through CDM. One of the outcomes of Priority 4 is the improvement and further integration of early warning systems at the community level. Regionally, within the last five years, national societies partnered with other local stakeholders to either develop CEWS or discuss elements of an EWS with communities, especially that of communicating relevant warnings/alerts to community members through CDRTs. This assessment outlines the work done by or in collaboration with national societies with regards to early warning systems in the Caribbean. It presents an overview of countries' national early warning systems, national societies' contributions to advancing early warning systems at the national level and the community level, and maps out the challenges and best practices observed in the region. The recommendations and best practices present opportunities for advancing the early warning systems framework in the countries and ultimately, advancing Target G of the Sendai Framework and supporting the resilience agenda in the region. This report is therefore beneficial to the IFRC and national societies and their key stakeholders with an interest in understanding how national societies are supporting early warning systems, and the challenges faced, with a view to addressing these challenges through partnerships and dedicated interventions.

The countries considered in this report are:

1. Antigua and Barbuda
2. The Bahamas
3. Barbados
4. Belize
5. Dominica
6. Grenada

7. Guyana
8. Jamaica
9. St. Kitts and Nevis
10. St. Lucia
11. St. Vincent and the Grenadines
12. Suriname
13. Trinidad and Tobago

2.0 Methodology

The overall aim of this assessment was to gather information on the work being done by (or in collaboration with) the thirteen national societies as it relates to early warning systems and to determine the types of challenges faced and any lessons learnt. In this regard, secondary research was done to identify any projects implemented by the national societies in the region. It should be noted that this assessment also highlights some of the work done by IFRC Port of Spain Country Cluster Delegation (IFRC POS CCD) and CDEMA with the national societies and other stakeholders to better prepare them to implement CEWS projects or enhance the way they interact with the communities to set up CEWS.

Additionally, primary information was collected via a questionnaire (see Appendix 1) disseminated to the thirteen national societies and/or through meetings with the societies' focal points as deemed necessary. The questionnaire mainly sought to collate information on existing national early warning systems, the methods used to share this information with community members as well as the location of any community-based or community driven EWS implemented by the national societies. The questionnaire also contained questions aimed at identifying the presence of a Common Alerting Protocol (CAP) and in-depth information on how it works. The IFRC defines the CAP as the international standard format to communicate the key facts of an emergency such as what is the emergency, its estimated time of impacted and the actions persons should take. The information collected regarding CAP is not included in this report but will be used to develop a separate report (Alert Hub Initiative: Gap Analysis for the Caribbean). More information can also be found on the IFRC's dedicated Alert Hub website[2].

[2] https://preparecenter.org/initiative/the-ifrc-alert-hub/

3.0 National Early Warning Systems

A national early warning system (NEWS) is one whereby credible and reliable data about an impending hazard impact is collected and disseminated on a national level as mandated by a policy or law. In terms of detecting and monitoring hazards, a NEWS usually utilizes specialized technology such as a doppler radar system used by meteorologists to detect precipitation, hurricanes and storms or a seismometer to measure earthquakes, as well as require highly trained technicians or specialists to read, interpret and scientifically analyse the data collected by these instruments. Once the data is collected and a threat is confirmed, the NEWS would trigger a national broadcast of warning information/alerts.

This section takes a closer look at the NEWS in place in the different countries. The findings described are consolidated from national societies' input from the survey tool and the Mapping Report of Early Warning Systems developed by the UNDRR and the Association of Caribbean States (ACS)[3]. The UNDRR Hazard Classification system is utilized with a focus on hydrometeorological, geological, environmental and biological hazards. Technological and societal hazards are not covered in this report.

3.1 Antigua and Barbuda

The National Office of Disaster Services (NODS), with key partners such as the Antigua and Barbuda Meteorological Services and the University of the West Indies (UWI) Seismic Research are the main agencies that monitor and detect hazards on the island. As the national disaster office, NODS monitors all hazards and disseminates warnings to the public and relevant agencies. The Antigua and Barbuda Meteorological Services has responsibility to detect, forecast and monitor hydrometeorological hazards. The nation's meteorological services uses a variety of tools such as a radar system, local satellite and rain gauges located around the country to detect and monitor rainfall, storms and drought conditions[4]. The Meteorological Service also has the responsibility for disseminating weather-related warnings to the public. In the event an earthquake triggers a tsunami which will potentially impact the country, the Pacific Tsunami Warning Centre (PTWC) will issue a bulletin to the Antigua and Barbuda Meteorological Service, which will then forward the information to NODS for public dissemination.

Other key state institutions support the NEWS. The Ministry of Health is mandated by law to detect, monitor, analyse and forecast the risk of new diseases as well as to communicate warnings to the public. The Veterinary and Livestock Division of the Ministry of Agriculture, Lands, Housing and the Environment is also responsible for detecting, monitoring, and analysing the risk of new diseases which have the potential to impact livestock and domesticated animals, while the Department of Environment, Forestry Division and Development Control Authority are mandated to manage risks associated with environmental hazards.

Antigua and Barbuda is one of the few Caribbean countries with a CAP system in place. The system was officially launched in 2019 in collaboration with the United Nations Development Programme (UNDP), the IFRC and CDEMA. It is through this digital application-based system that citizens can get accurate and quick warnings and alerts which also advises on the appropriate actions to take.

[3] https://www.undrr.org/mapping-mhews-capacities-cdema-participating-states
[4] http://www.antiguamet.com/

However, persons must be subscribed to the application in order to receive these alerts. In tandem with the application, the Antigua and Barbuda Broadcasting Services radio and television channels interrupts programmes to issue warnings and alerts. Information is also shared through social media platforms and the Meteorological Services' website.

3.2 The Bahamas

The Bahamas is made up of 700 islands, of which only 30 are inhabited. The islands have an Island Administrator or a government official whose remit is to act as the government appointed focal point to deal with government matters. These matters include that of keeping residents of the island safe from disasters.

As it relates to monitoring and detecting hazards, tThe Bahamas' National Emergency Management Agency (NEMA) is responsible for monitoring all hazards and disseminating warnings and alerts to the public. The Bahamas Department of Meteorology has responsibility for detecting and monitoring all weather-related hazards. The Bahamas has a mechanism for the dissemination of tsunami warnings. Should there be a tsunami threat, the PTWC will issue a bulletin to the Bahamas Department of Meteorology, which will then forward the information to NEMA for public dissemination. The Department of Forestry and the Department of Environmental Health Services are responsible for monitoring and detecting environmental hazards. The country's Ministry of Health plays a critical role within the NEWS, with responsibility for monitoring, detecting, analysing and forecasting public health hazards and disseminating associated warnings to the public. The Veterinary Service Division of the Bahamas Agricultural Health and Food Safety Authority detect, monitor, and analyse the risk of new diseases which have the potential to impact livestock and domesticated animals.

The public is alerted of any impending hazard impacts by NEMA through the Bahamas Information Services Department and service agreements with the two (2) local telecommunications providers (ALIV and the Bahamas Telecommunication Company Limited (BTC)). The Bahamas Information Services Department is a government agency mandated to provide a "central channel through which may flow information to and inquiries from local, regional and international media and the public" and is linked with many of the islands' news agencies with the ability to quickly release information to the public[5]. In addition to these established systems, NEMA can also utilize the Marco alerting system which is a multi-agency public notification system that sends emergency information as SMS messages to mobile phones as well as be shown on billboards. Relevant stakeholders are also part of a WhatsApp group and receive pertinent information through this platform.

3.3 Barbados

The Department of Emergency Management (DEM) is the national lead government agency with oversight of all disaster risk reduction activities in the country, and monitors all hazards as directed by the Emergency Management Act[6]. The DEM is supported by a range of other state institutions such as the Barbados Meteorological Services. The Barbados Meteorological Services is mandated under the Barbados Caribbean Meteorological Organization Act to monitor and predict weather related hazards, process data and provide flood, severe weather, and special weather warnings to the public and other relevant stakeholders[7]. The office uses radar systems as well as rain gauges placed around the country

[5] https://www.bahamas.gov.bs
[6] https://dem.gov.bb/home
[7] https://agriculture.gov.bb/Departments/Meteorological-Services/

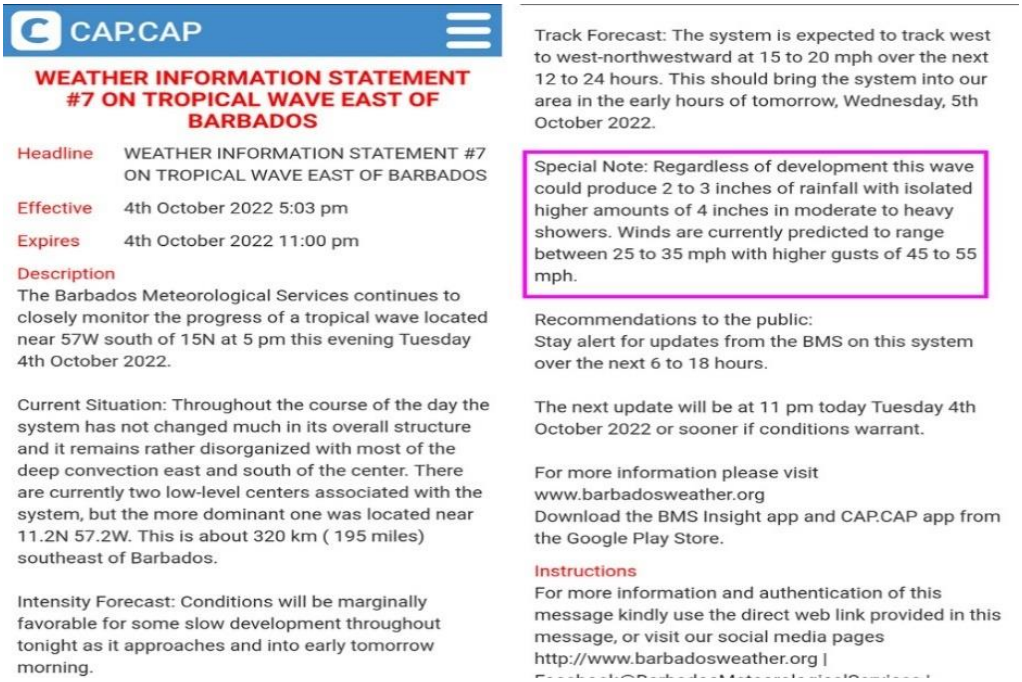
to predict, monitor and measure rainfall. Figure 1 below shows a system used to measure the height of the water as well as temperature and wind speed.

Figure 1: EWS in Speightstown, Barbados

Under the DEM, there is an Emergency Management Advisory Council (EMAC) comprising of 15 standard committees chaired by the Heads of relevant agencies. The Barbados National Society has a complimentary role in the EMAC but still needs to be officially represented in the EMAC and the Emergency Operations Center (EOC) during disaster response activations.

If an earthquake triggers a tsunami, the PTWC will issue a bulletin to the Meteorological Services which in turn forward the warning to the DEM for public dissemination. The Ministry of Environment and National Beautification is the lead agency with responsibility for managing risks associated with land and soil degradation and biodiversity loss in terrestrial ecosystems. As they relate to biological hazards, the Ministry of Health is mandated by law to detect, monitor, analyse and forecast the risk of new diseases as well as to communicate warnings to the public while the Ministry of Agriculture and Food Security performs a similar function as it relates to livestock and animals.

The DEM also disseminates warnings and alerts via social media, SMS messages, its website and traditional media such as television and radios. Warnings and alerts are also sent via the Barbados Government Information Service (BGIS) alert application as well as the CapCap application, under the national CAP system. Figure 2 is an example of a CapCap weather alert.



CAP.CAP

WEATHER INFORMATION STATEMENT #7 ON TROPICAL WAVE EAST OF BARBADOS

Headline WEATHER INFORMATION STATEMENT #7 ON TROPICAL WAVE EAST OF BARBADOS

Effective 4th October 2022 5:03 pm

Expires 4th October 2022 11:00 pm

Description

The Barbados Meteorological Services continues to closely monitor the progress of a tropical wave located near 57W south of 15N at 5 pm this evening Tuesday 4th October 2022.

Current Situation: Throughout the course of the day the system has not changed much in its overall structure and it remains rather disorganized with most of the deep convection east and south of the center. There are currently two low-level centers associated with the system, but the more dominant one was located near 11.2N 57.2W. This is about 320 km (195 miles) southeast of Barbados.

Intensity Forecast: Conditions will be marginally favorable for some slow development throughout tonight as it approaches and into early tomorrow morning.

Track Forecast: The system is expected to track west to west-northwestward at 15 to 20 mph over the next 12 to 24 hours. This should bring the system into our area in the early hours of tomorrow, Wednesday, 5th October 2022.

Special Note: Regardless of development this wave could produce 2 to 3 inches of rainfall with isolated higher amounts of 4 inches in moderate to heavy showers. Winds are currently predicted to range between 25 to 35 mph with higher gusts of 45 to 55 mph.

Recommendations to the public:
Stay alert for updates from the BMS on this system over the next 6 to 18 hours.

The next update will be at 11 pm today Tuesday 4th October 2022 or sooner if conditions warrant.

For more information please visit
www.barbadosweather.org
Download the BMS Insight app and CAP.CAP app from the Google Play Store.

Instructions

For more information and authentication of this message kindly use the direct web link provided in this message, or visit our social media pages
http://www.barbadosweather.org |

Figure 2: Example Of The CapCap Weather Alert

3.4 Belize

In Belize, the National Emergency Management Organisation (NEMO) monitors all hazards in the country and is responsible for comprehensive disaster management activities. The organization does this through its 15 national operational committees and support from the public sector, the private sector, civil societies and nine (9) District Emergency Committees[8]. It should be noted that the Belize Red Cross is cited as one of its supporting members.

The National Meteorological Service of Belize is the government agency with the authority to detect and monitor weather and climate related hazards[9]. The organization has Automatic Weather Systems (AWS) such as evapotranspiration stations, which has the ability to calculate the amount of water lost from soil due to evaporation, a doppler radar as well as weather and river flow stations. Currently, the organization has 57 river and rainfall monitoring stations across the country (see Figure 3). The National Hydrological Service, under the Ministry of Natural Resources, also plays a key role in EWS as one of its mandates is to advise the government on watershed management, environmental concerns and other related hazards such as floods, droughts and water pollution[10].

[8] http://site.nemo.org.bz
[9] http://nms.gov.bz/
[10] https://naturalresources.gov.bz/index.php/hydrology/

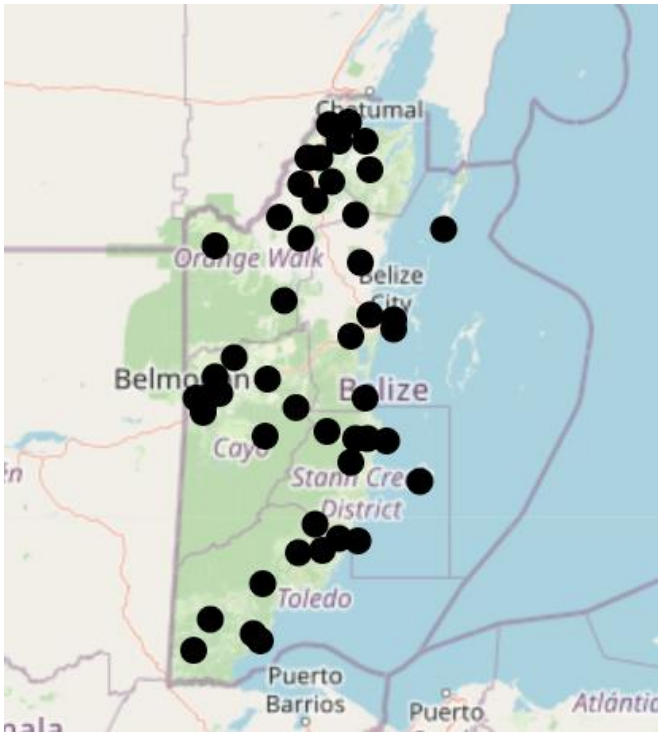


Figure 3: Location of Weather Stations In Belize

Concerning environmental hazards, the Department of Environment and the Forest Department are responsible for the detection, monitoring, and analysis of changes within terrestrial and marine ecosystems, while the Ministry of Health is the authoritative voice on health-related hazards and has responsibility on disseminating these warnings to the public. The Belize Agricultural Health Authority has responsibility detecting, monitoring, and analysing the risk of diseases which have the potential to impact livestock, domesticated animals, and plant material.

The country has a CAP system which can be used to send warnings and alerts to targeted communities, certain districts or to the entire nation. These messages can be received by citizens as SMS messages from two (2) of the country's telecommunications provider and as bulletins over the television, radio and social media. Warning information can also be found on the websites of NEMO and the Meteorological Service.

3.5 Dominica

The Office of Disaster Management (ODM) monitors all hazards and warns the population about impending hazards. The ODM coordinates all disaster risk reduction activities with key stakeholders including the seven (7) disaster districts and the Kalinago Territory[11]. The ODM and the Meteorological Service share warnings and alerts with the public through television, radio and social media platforms. An informal information sharing system exists whereby relevant disaster management stakeholders are part of a Whatsapp group through which they can receive hazard impact and disaster updates. The Dominica Meteorological Service provides weather forecasts and disseminates severe weather information to the public based on a colour-coded system (see Figure 4). The colours represent different levels of severity and are also associated with specific actions. More information on the colour meanings and the expected actions are outlined in a Weather Warning (Vigilance level) Guide

[11] https://odm.gov.dm/

found on the organisation's website[12]. The organization also works together with the Caribbean Institute for Meteorology and Hydrology. Dominica's CAP system - CAPCAP – supports its NEWS.

Figure 4: Dominica Weather Warning Guide

The UWI Seismic Research Centre for information also supports the ODM on monitoring seismic hazards related to earthquakes and volcanic hazards. In the event of a tsunami threat, like other Caribbean territories, the PTWC will issue a bulletin to the ODM which will in turn issue an alert to the public. The Forestry, Wildlife and Parks Division, Environmental Coordinating Unit and the Fisheries Division are the public agencies mandated to manage the risks associated with environmental hazards. Health hazards are monitored, detected, analysed and managed by the Ministry of Health. The Livestock Development Unit performs a similar function of detecting, monitoring, and analysing the risk diseases to livestock and domesticated animals.

3.6 Grenada

As seen with the other countries, Grenada has a dedicated national disaster office, the National Disaster Management Agency (NaDMA) responsible for working with other agencies for comprehensive disaster management. The NaDMA serves as the authority for dissemination of actionable warnings. One of the organisations that NaDMA works closely with is the Grenada Meteorological Services with responsibility for monitoring weather-related events. Persons can receive information from the Meteorological Services by signing up for their notification system, however, public alerts are broadcasted over the television and radio. A CAP system was established on the island in 2017 but has not been used or tested to date. In an interview with a national society staff member, it was noted that before a public alert can be issued by the Grenada Meteorological Services, approval must be obtained from the Trinidad and Tobago Meteorological Service, which can result in delays. In the instance that an earthquake triggers a tsunami which will potentially impact the country, the PTWC will issue a bulletin to the Grenada Meteorological Service, which will then forward the information to NaDMA for public dissemination.

Other state agencies also support the NEWS. The Ministry of Health is mandated by law to detect, monitor, analyse and forecast the risk of new diseases as well as to communicate actionable warnings and possible consequences to the public. Similarly, the Forestry and National Park Department and Fisheries Division are mandated to monitor and manage environmental hazards including those related to deforestation, land &and soil degradation, and biodiversity loss in terrestrial &and marine ecosystems. Environmental pollution is specifically monitored and detected by the Environmental Health Division.

[12] https://www.weather.gov.dm/

3.7 Guyana

The Civil Defence Commission (CDC) is the country's national disaster office, responsible for monitoring all hazards as well as coordinating disaster risk reduction activities across the ten (10) regions of Guyana[13]. The CDC works closely together with the Hydrometeorological Service, the Environmental Protection Agency, the Ministry of Health, the Guyana Defence Force and the Guyana Red Cross. Volunteers also provide needed support with search and rescue, community mobilization, first aid, damage assessments and conflict resolution.

In Guyana, the Hydrometeorological Service, a division under the Ministry of Agriculture, is responsible for monitoring and issuing public alerts relating to adverse weather conditions. Like other meteorological institutions in the Caribbean, it uses radar, satellite and a WRF atmospheric modeling system to make forecasts and predictions[14] and is also responsible for issuing public alerts. Apart from impending adverse weather alerts, the Hydrometeorological Service provides pertinent information through the Drought and Farmers' Bulletin which gives an overview of the "chance of rainfall in relation to crop water needs" over a three (3) month period as well as general advice for crop framers and livestock farmers (Figures 5-8).

In the instance that an earthquake triggers a tsunami which will potentially impact the country, the PTWC will issue a bulletin to the Hydrometeorological Service, which will then forward the information to the CDC for public dissemination. The Guyana Forestry Commission, Guyana Lands and Surveys Commission, and Guyana Wildlife Management Authority Forestry are the public agencies mandated by legislation to manage the risks of environmental hazards, while the Ministry of Health oversee hazards related to public health and disseminates warnings accordingly. The Livestock Development Authority, detects, monitors, and analyses the risk of diseases which have the potential to impact livestock and domesticated animals, and issues alerts accordingly.

Chance of Rainfall in Relation to Crop Water Needs for September-October-November

Table 3: Probability of rainfall exceedance in relation to the minimum water requirement for the growing period of selected crops

Crop	Average Days to Maturity	Minimum Water Requirement (mm)For the Total Growing Period	Timerhi	Georgetown	Lethem	Kamarang
Pepper	60	635	0%	0%	0%	0%
Okra	50-65	381	36%	39%	0%	40%
Tomato	60-80	508	6%	18%	0%	22%
Cassava	270-330	270	78%	63%	24%	80%
Squash	50	178	98%	90%	79%	100%
Cabbage	80-105	508	6%	18%	0%	22%
Bora	50	381	36%	39%	0%	40%
Rice (Autumn Crop)	110-125	450	21%	27%	0%	38%
Celery	90	762	0%	0%	0%	0%
Eggplant	70-85	508	6%	18%	0%	22%
Cucumber	60-65	508	6%	18%	0%	22%
Pumpkin	90-120	508	6%	18%	0%	22%
Peanuts	90-140	750	0%	0%	0%	0%
Soyabean	100-120	450	21%	27%	0%	38%

Note: The table above gives you the chances of getting a specified amount of rainfall over a given timescale, in this case 3 months. This information can be used to guide stakeholders on the probability of a crop getting the minimum amount of water over a certain period if it is rain-fed.

Figure 5: Rainfall Information From Farmer's Bulletin

[13] https://cdc.gy/new/
[14] https://hydromet.gov.gy/

Advice for Farmers for the September-October-November Season

Table 4: Advice for Farmers for the September- October-November Season

REGIONS	SEASONAL OUTLOOK	ADVICE
1 to 10	Wetter than Usual Rainfall Conditions Expected	**Advice for Crop Farmers** • Harvest water during the wetter days of the season. • Maintain drains around crop beds and/or plant crops on raised beds. • Store fertilizer, feeds and pesticides away from moisture and water sources. **Advice for Livestock Farmers** • House animals on high ground and/or on raised pens. • Monitor livestock for pests and diseases associated with dry conditions. • Provide proper shelter for animals.

Recommended Crops for the September-October-November Season

Figure 6: Advice Given To Farmers From Farmer's Bulletin

DROUGHT OUTLOOK

Both the short and long-term forecasts to the end of July and May 2022 are indicating that there no concerns for drought. We advise all stakeholders to keep monitoring drought and look for our monthly updates.

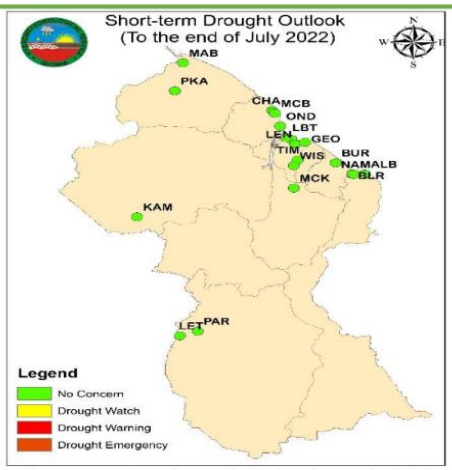


Fig.5: Short-term Drought Outlook by the end of July 2022 (Updated in April 2022- covering February to July 2022)

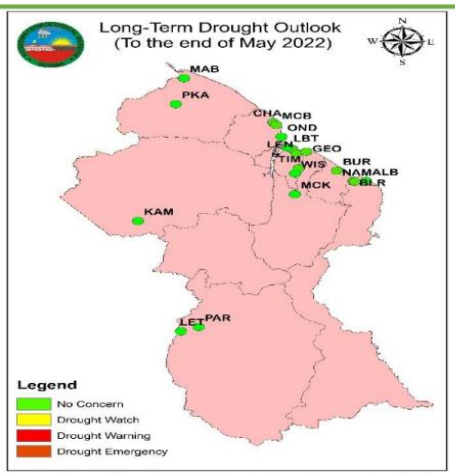


Fig.6: Long-term Drought Outlook by the end of May 2022 (Updated in April 2022– covering June 2021 to May 2022)

***Note**: The 12-month SPI-based drought outlook (long-term) uses observations to forecast potential impacts **on large surface water reservoirs and groundwater**. While the 6-month outlook (short-term) can be used as an indication of effects on **agriculture**, etc.*

Figure 7: Maps Included In Drought Bulletin

ALERT LEVELS

Alert Levels	Meaning	Action Level
No Concern	No Drought Concern	• monitor resources • update and ratify management plans • public awareness campaigns • upgrade infrastructure
Drought Watch	Drought is Possible	• keep updated • protect resources and conserve water • implement management plans • response training • monitor and repair infrastructure
Drought Warning	Drought Evolving	• protect resources • conserve and recycle water • implement management plans • release public service announcements • last minute infrastructural repairs and upgrades • report impacts
Drought Emergency	Drought of Immediate Concern	• release public service announcements • implement management and response plans • enforce water restrictions and recycling • enforce resource protection • repair infrastructure • report impacts

Figure 8: Drought Alert Colour Code System In Guyana

Public alerts are disseminated by the CDC and the Hydrometeorological Service via television, radio and social media platforms such as Facebook and Twitter. Persons can also subscribe to the Hydrometeorological Service's RSS Feed, which would allow subscribers to access weather alerts on computer browsers and their mobile devices.

Guyana has a CAP system in place; however, this is not being utilised at this time.

3.8 Jamaica

All hazards are monitored by the Office of Disaster Preparedness and Emergency Management (ODPEM). The organisation's remit includes increasing and supporting national preparedness and mitigation as well as early warning, emergency response, relief and recovery operations in all parishes[15]. It also relies on volunteers to assist with supporting local communities/parishes with preparedness, mitigation, recovery and reconstruction efforts before, during and after emergencies. Collaborations with other organisations such as the Meteorological Service of Jamaica, the Earthquake Unit of the Mona Campus of UWI, the Water Resources Authority and the Jamaica Red Cross are integral to the operations of the organisation.

The Earthquake Unit[16] operates and monitors the Jamaica Seismograph Network (JSN) as well as the Jamaica Strong Motion Network (JSMN). The JSN has 13 broadband stations used to monitor seismic activity (Figure 9) and 42 accelerographs which records surface level ground motion resulting from earthquakes. The Unit keeps a record of earthquakes felt on the island and is responsible for informing the public of these earthquakes.

[15] https://www.odpem.org.jm/
[16] https://www.mona.uwi.edu/earthquake/

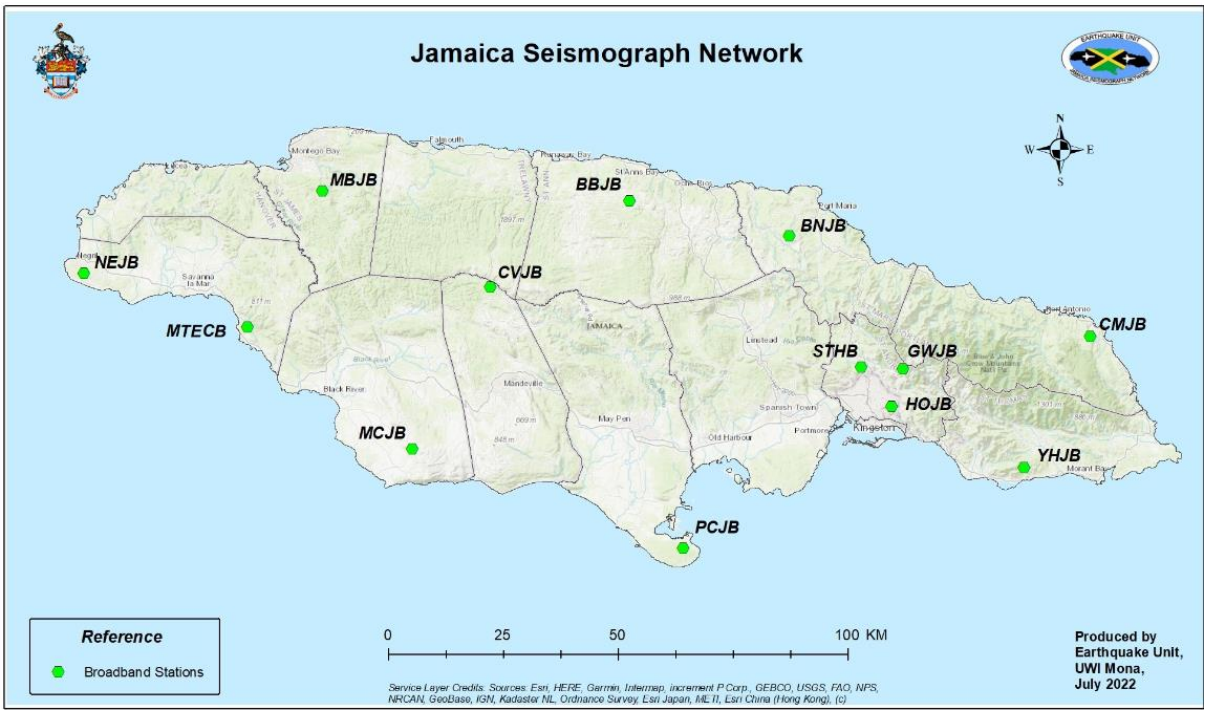


Figure 9: Location Of The 13 Broadband Stations

As it relates to EWS, the Water Resources Authority[17] monitors and collects streamflow data using river gauging stations. It has 133 stations (see Figure 10), 100 of which are fully automatic, while the remaining 33 are manual and requires a technician to collect the data. The Authority uses this data to forecast estimated future river flows and the potential of the occurrence of flooding at different points along the river. The Authority also creates floodplain maps and works closely with ODPEM.

Figure 10: New Station On The White River At Labyrinth, St. Mary

[17] https://www.wra.gov.jm/

The Meteorological Service of Jamaica has three (3) branches and uses a radar system, the Caribbean Rawinsonde Network Section and a Synoptic Sub-Station to observe and forecast weather and weather systems. Monthly rainfall summaries which include rainfall distribution maps for the island as well as the latest weather advisories can be found on the service's website[18]. The Service also maintains a 24-hour communication with the National and Regional Hurricane Centre in Florida, USA, during the hurricane season. The service also collaborated with the Jamaica Fire Brigade to establish a digital platform index which is installed on computers in fire stations across the island, with the purpose of collating data on fires, weather conditions, rainfall, temperature, soil type and land use in an effort to improve responses to bush fires.

In the instance that an earthquake triggers a tsunami which will potentially impact the country, the PTWC will issue a bulletin directly to ODPEM which will in turn disseminate to the public. Jamaica's National Environment and Planning Agency has responsibility for managing and monitoring environmental hazards. As it pertains to biological hazards, the Ministry of Health and the Veterinary Services Division have responsibility for managing, monitoring, detecting, forecasting and issuing warnings pertaining to public health hazards, and health hazards to livestock and domesticated animals respectively.

The aforementioned organisations, together with ODPEM share alerts and press releases to the public via radio, television, social media (Twitter, Facebook and Instagram) and SMS messages. Information is also shared among agencies via WhatsApp. When appropriate, public alerts will include information on the need for evacuation to nearby shelters or assembly points.

3.9 St. Kitts and Nevis

The National Emergency Management Agency (NEMA), acts as the official source for warnings. Volcanic hazards are monitored by the UWI Seismic Research Centre of the University of the West Indies, which is relayed to the NEMA. NEMA is responsible for the detection and surveillance of oil spills, and the dissemination of related warnings. The Agency also has the responsibility for disseminating warnings to the public for tsunamic hazards but the monitoring of this hazards is facilitated through the PTWC. In the instance an earthquake triggers a tsunami, the PTWC will issue a bulletin to the Royal St. Christopher and Nevis Police Force which will then forward the information to the NEMA, which will then disseminate the information to the public.

Meteorological hazards for the country are monitored, detected and forecasted by the Antigua and Barbuda Meteorological Services. St. Kitts and Nevis' Department of Environment has responsibly for detecting and monitoring environmental hazards including the loss of biodiversity, deforestation, land and soil degradation, and environmental pollution. The Ministry of Health is responsible for detecting, monitoring, analysing and forecasting the risk of new diseases as well as to communicating related information to the public. The Ministry of Agriculture, Fisheries &and Marine Resources performs a similar function of detecting, monitoring, and analysing the risk of diseases which have the potential to impact livestock and domesticated animals.

[18] http://metservice.gov.jm/

3.10 St. Lucia

The National Emergency Management Organisation (NEMO) is the national disaster organization comprising of "a collection of Government, Non-Government, Faith-Based Organisations, Civil Society and many others"[19] with the remit of implementing and coordinating disaster risk reduction activities. The organization has 13 national committees ranging from health, telecommunication and damage analysis and needs assessment (DANA) to hospitality crisis management, oil spills and HAZMAT; and several District Committees. The NEMO Secretariat is the coordinating unit and ensures that the various committees are involved and engaged in emergency planning as well as coordinate the response of all the committees during and after a disaster. NEMO has the responsibility for disseminating and communicating warnings to the public. Monitoring, detection and forecasting of weather and climate related hazards are provided by the Meteorological Office. As with all the islands, the St. Lucia Meteorological Services is responsible for monitoring weather and alerting the public about weather related hazards[20]. The Service works in tandem with NEMO as well as the St. Lucia Red Cross.

In the event of a tsunami threat, PTWC will issue a bulletin to the Meteorological Office, which will then forward the information to the NEMO for public dissemination. The Biodiversity Unit and Fisheries Division supports environmental hazard monitoring, detection and management. The Ministry of Health and Wellness is mandated to detect, monitor, analyse and forecast the diseases and communicate warnings to the public. The Veterinary and Livestock Services, in the Ministry of Agriculture, Fisheries and Food Security performs a similar function of detecting, monitoring, and analysing the risk of diseases which have the potential to impact livestock and domesticated animals.

The public receive alerts via a local television station, television, radio and social media. The St. Lucia Red Cross also send messages to stakeholders and CDRTs using WhatsApp.

3.11 St. Vincent and the Grenadines

The National Emergency Management Office (NEMO) is the national agency responsible for disaster risk reduction and its services can be divided into five categories: Informing; Warning; Co-ordinating; Providing and Evaluating[21]. The organization also analyses and forecasts potential hazards and releases public alerts. The NEMO also has the responsibility for disseminating and communicating actionable warnings to the public as the official source. In the event of a tsunami threat, the PTWC will issue a bulletin directly to NEMO. NEMO works closely with the St. Vincent and the Grenadines Meteorology Service (SVGMET), the lead agency overseeing weather forecasts and monitoring. SVGMET releases daily weather forecasts and also develops monthly climatological bulletins containing a three (3) month forecast on drought, rainfall and temperature; information that would be useful to the agricultural sector.

The Fisheries Division, and Forestry Department detect and monitor the loss of biodiversity in terrestrial and marine ecosystems, while the Environmental Engineering Unit in close collaboration with the Fisheries Division is charged with monitoring environmental pollution threats. The Ministry of Health is charged as the authority for public health hazards, responsible for their overall management, detection and warning communication. The Animal Health and Production Division, Ministry of Agriculture, Forestry, Fisheries, Rural Transformation, Industry and Labour performs a

[19] http://nemo.gov.lc/About-Us/NEMO/Organisation
[20] https://met.gov.lc/
[21] http://nemo.gov.vc/nemo/index.php/about-us/function-services-structure

similar function in detecting, monitoring, and analyses the risk of diseases which can affect livestock and domesticated animals.

The Water Resources Management Unit of the Central Water and Sewerage Authority (CWSA) is involved in monitoring and assessing the management of the country's water resources and does this by measuring surface runoff, stream flow, ground water and precipitation[22]. The Unit monitors 10 automatic water level recording stations, five (5) automatic climate stations that measures rainfall, temperature, relative humidity, wind speed and soil temperatures, 26 automatic tipping bucket rainfall stations, 26 groundwater measuring stations and 21 flow measuring stations (see Figures 11 and 12). In 2018, the unit assisted in the installation of four (4) EWS in Owia, Majorca, Arnos Vale and Dixon. The information is shared with SVGMET and NEMO.

Figure 11: Location Of River Stations

[22] https://www.cwsasvg.com/wrmu

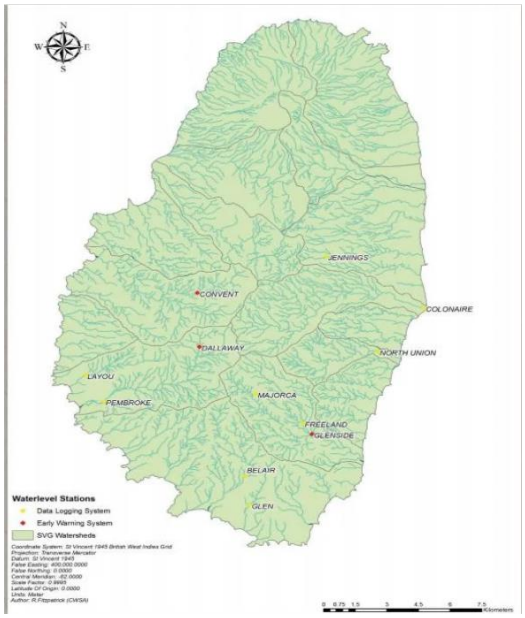


Figure 12: Location Of Water Level Stations

St. Vincent and the Grenadines has one active volcano, the La Soufrière volcano, located on the northern part of the island. The UWI Seismic Research Centre monitors the volcano and provides information on other geological hazards such as earthquakes. With regards to tsunamis, tsunami alerts are received from the Pacific Tsunami Warning Center.

Emergency and disaster alerts are broadcast over the national television and local radio stations, social media and the NEMO and SVGMET websites. Persons can also join the SVGMET email list, to receive alerts via email. As an alternative means to traditional media, NEMO created an Emergency Communications Network within communities throughout the islands. This network is a national telecommunications solution that uses digital radios. The system was tested recently in October 2022. It should also be noted that St. Vincent and the Grenadines has a CAP system and alerts can be received via the CAP.CAP application. Details on setting up the application can be found on the NEMO and SVGMET websites. Persons can also obtain alerts from the CAP system through email. Citizens can submit hazard impact and disaster impact information from their communities over the “My Haz APP”.

Figure 13: Social Media Advertisement Outlining An Early Warning Tool

3.12 Suriname

Suriname, like Guyana, is part of the South America mainland. According to the Global Facility for Disaster Reduction and Recovery (GFDRR) hazard profile for Suriname[23], the country is most prone to flooding events, not just from rainfall but from coastal flooding given the fact that almost 30% of the country is within a few meters above sea level. The GFDRR further reports that almost 90% of the population lives along the coastline and is therefore susceptible to the effects of sea level rise.

The National Coordination Centre for Disaster Relief (NCCR) is the national disaster organisation with the remit of disaster risk reduction through the development of more resilient communities. The NCCR has five (5) specialised units: Logistics, Operation, Communication, Planning and Research and a Legal Unit. The organisation is responsible for identifying, monitoring and analysing possible disasters and crises, develop and establish frameworks, ensure an integrated approach to the protection of critical infrastructure and act as the coordinator and facilitator in crisis and disasters[24]. The organisation works with the Meteorological Service of Suriname and collects tide station reports from the Maritime Authority Suriname (MAS) and the Suriname Red Cross.

The Meteorological Service of Suriname uses radar images, satellite images and information from automated weather stations and radio probe recordings to forecast and monitor weather systems. There are numerous weather stations located around the country (see Figure 14), 45 of which are operational according to the Service's website. The information collected is also used to create monthly climate reports which is found on their website[25].

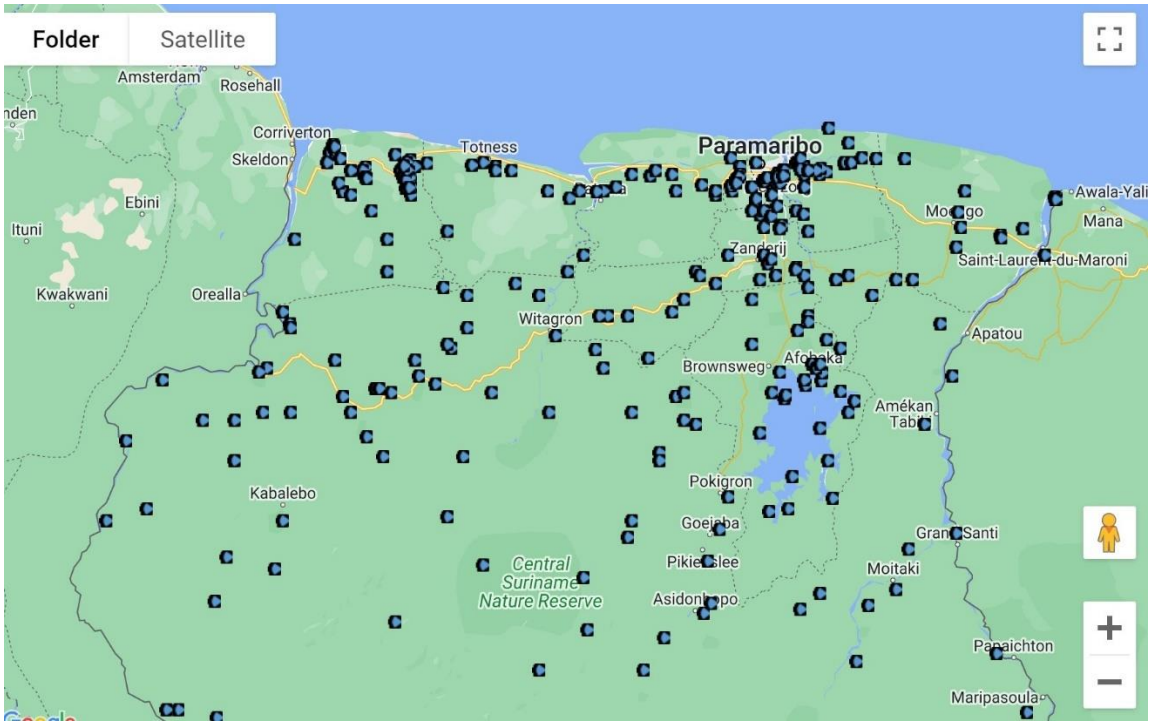


Figure 14: Local Of Weather Stations In Suriname

[23] https://www.gfdrr.org/en/suriname
[24] https://www.preventionweb.net/files/53917_53917finalcountryreportsuriname.pdf?
[25] https://www.meteosur.sr

The MAS initiates and facilitates maritime development in Suriname. It has tidal stations and water gauges in several river basins. Given that flooding events can be coastal, the information collected from the tidal stations are shared with the NCCR, the Meteorological Service, the Suriname University and the Suriname Red Cross. The information from these stations is used in the national early warning system to alert citizens of potential flooding.

Figure 15: Tidal Station Located At The Entrance Of The Suriname River

The Foundation for Forest Management and Forest Supervision and the National Institute for Environment and Development are responsible for the management of environmental hazards. These institutions have the responsibility to detect, monitor, analyse and forecast the impacts of deforestation, land and soil degradation, and biodiversity loss in terrestrial and marine ecosystems. The Ministry of Health is mandated by legislation to detect, monitor, analyse and forecast health hazards and disseminate relevant warnings to the public, while the Department of Agriculture, Livestock and Fisheries, Ministry of Agriculture, Animal Husbandries and Fisheries performs a similar function for diseases that pose a threat to livestock and domesticated animals.

3.13 Trinidad and Tobago

The Office of Disaster Preparedness and Management (ODPM) is responsible for disaster risk reduction activities in Trinidad while the Tobago Emergency Management Agency (TEMA) is responsible for Tobago. They work hand in hand with the Disaster Management Units of the 14

regional corporations throughout the country under the Ministry of Rural Development and Local Government (RDLG). The OPDM collaborates with Non-Government Organisations (NGOs), Community-Based Organisations (CBOs) and other Ministries to build community and national disaster resilience. An important stakeholder is the Trinidad and Tobago Red Cross Society (TTRCS).

The Trinidad and Tobago Meteorological Services (TTMET) uses radar imagery, satellite imagery, information from automatic weather stations and UV biometer to forecast and monitor weather. Automatic weather stations are found in seven (7) communities: Brasso, Caroni, Chatham, El Reposo, Guayaguayare, Penal and Piarco. An agro-met bulletin[26] which can be useful to farmers and livestock producers is developed every 15 days giving a summary of the probability of rainfall, expected temperatures, relative humidity and wind. The TTMET releases advisories and alert warnings to the public using a colour code system (see Figure 16). There are four colours and each colour represents a different risk level and appropriate actions to be taken by the public.

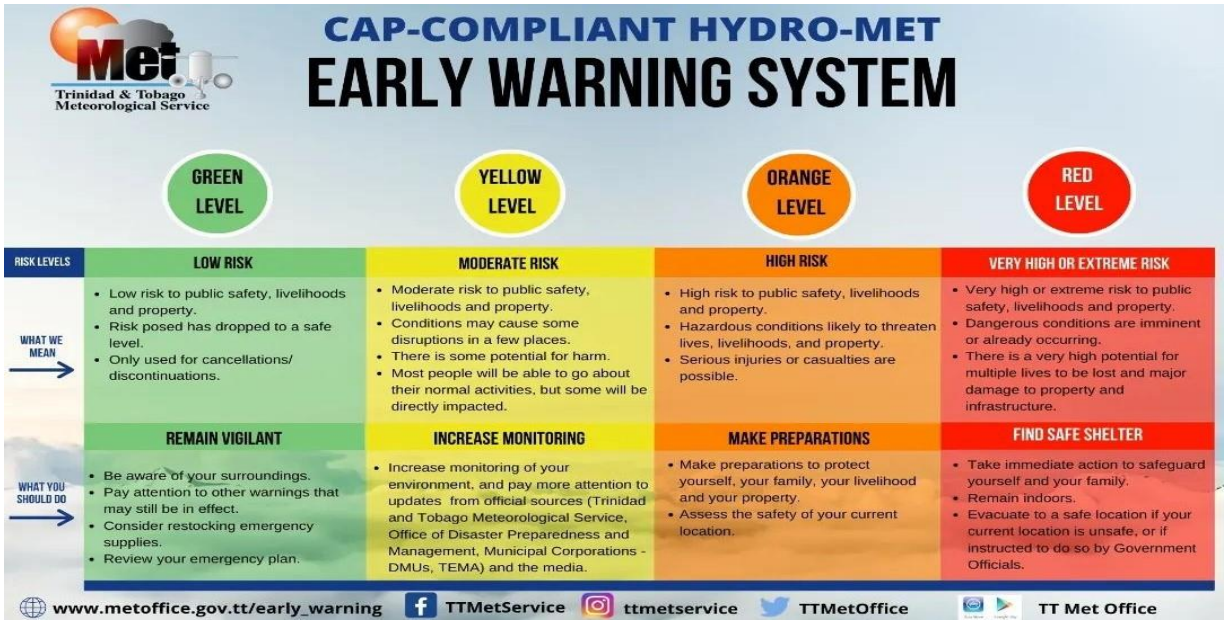


Figure 16: TTMET Colour Coded Early Warning System

Additionally, the Water Resources Agency (WRA) collects data on rainfall, streamflow, groundwater, evaporation and water quality parameters from a network of gauges found throughout Trinidad and Tobago[27] (Figure 17). This information is shared with the ODPM, TTMET and the Disaster Management Units of the regional corporations. This information is used to create river level advisories released by the RDLG (Figure 18).

[26] http://www.metoffice.gov.tt/agrobulletin
[27] https://www.wasa.gov.tt/WASA_WRA.html

Figure 17: River Level Advisory

Figure 18: WRA Real-Time Monitoring Station in Trinidad

The UWI Seismic Research Centre monitors seismic and geological hazards such as earthquakes and tsunami related information is obtained from the PTWC The TTMS monitors information from the Pacific Tsunami Warning Centre and shares this information with the public.

The Forestry Division and the Environmental Management Authority are the public agencies mandated by legislation to manage environmental hazards, specifically as they relate to detecting, monitoring, analysing and forecasting the impacts of deforestation, land and soil degradation, and biodiversity loss in terrestrial and marine ecosystems. The Ministry of Health serves as the authority on health hazards, responsible for their reduction and management, including the issue of relevant warnings and alerts. The Animal Production and Health Division, within Ministry of Agriculture, Lands and Fisheries performs a similar function as it relates to diseases among livestock and domesticated animals.

Public alerts and warnings from the ODPM and the TTMET are shared with the public on local television and radio stations, on their social media accounts and on official websites. The ODPM and the Trinidad and Tobago Police Service also send information as SMS texts.

4.0 Community Early Warning Systems

A community early warning system (CEWS) is one where an early warning system is placed within a community and can be either community-based or community-driven. The IFRC defines a community-based CEWS as an EWS installed in a community but not monitored by the community. In these circumstances, an external organization monitors the system either electronically, where the data is automatically received by the monitoring agency or manually by trained technical personnel. In contrast, a community-driven early warning system is one that is monitored and, in some cases, maintained by community members.

The system used in a CEWS can be formal (linked to the NEWS) or informal (data is collected and used by the community). CEWS can be complex and rely on technology such as streamflow gauges or automatic rain gauges or they can be simple, where staff gauges are used, or river levels are observed by someone living close to a river.

A good CEWS is one that integrates transmitted knowledge and experiential knowledge from within the community. Transmitted knowledge is knowledge which has been transferred to an individual through any form of communication and registered in oral histories or recorded memory through stories, songs and discussions. While experiential knowledge is knowledge which is learned from personal exposure or experience[28].

This section takes a closer look at the CEWS in place in the different countries in which IFRC and/or national societies played a key role.

4.1 Antigua and Barbuda

In its response to the CEWS Assessment survey, the Antigua and Barbuda Red Cross Society (ABRCS) has indicated that they have not been involved in any of these initiatives for the country. Notwithstanding, the national society contributes to the national early warning system through its involvement with the national disaster organization and national projects to improve early warning systems. This is demonstrated through ABRCS's participation in an assessment done on the national early warning system and developing a roadmap towards enhancing the NEWS. Antigua and Barbuda was one of the countries chosen to pilot the "Strengthening integrated early warning systems for more effective disaster risk reduction in the Caribbean through knowledge and transfer of tools" project, implemented in 2019 by UNDP in collaboration with the CDEMA and the IFRC, with ECHO funding. During this project a multi-sectoral approach was used to assess the countries' national early warning system using a Multi-Hazard Early Warning System (MHEWS) Checklist that was developed under the project.

[28] https://www.ifrc.org/document/community-early-warning-systems-guiding-principles

4.2 The Bahamas

While the Bahamas Red Cross Society did not implement any community early warning systems, they are a key partner in improving national and community disaster resilience and response. Staff of the society are in the process of enhancing their EWS knowledge and capacity, having recently participated in a CEWS Training of Trainers (ToT) conducted by CADRIM in June and July of 2022.

The Bahamas does not have a CAP system and the national society will be one of the eight (8) participating countries in the Alert Hub Initiative, which aims to increase the use of CAP and actionable messages for public alerting within the region.

4.3 Barbados

There are three (3) CEWS in Barbados (Figure 19). The first is located at Martin's Bay which is a coastal community to the east of the island. Multiple hazards are monitored which include seismic hazards and tsunamis. A rain gauge, which is maintained and monitored by the Department of Emergency and the Meteorology Service, was established in the community to measure rainfall. Seismic data is also gathered from equipment stored in a house owned by a trained CDRT member. Alerts stemming from information from the CEWS which is shared through the CDRT network via WhatsApp or by word of mouth. An airhorn is also used to warn community members.

Another CEWS was established at the Charles Rowe Bridge (northeast of Bridgetown). A staff gauge is used to measure the height of the river flowing through the community. The gauge is monitored by the Meteorological Services and information is passed to community members through the CDRT WhatsApp network and amateur VHF radios which were bought as part of an OFTA project. School bells are also used to alert community members of dangerous bush fires. A similar system was created in the community of Sherman (north of the island) which also uses a staff gauge to measure river levels. Information is shared with community members in the same way as the Charles Rowe Bridge community. The staff gauge is also maintained by the meteorological service.

The Barbados Red Cross Society has also benefited from the CEWS ToT held by CADRIM in 2022**.**

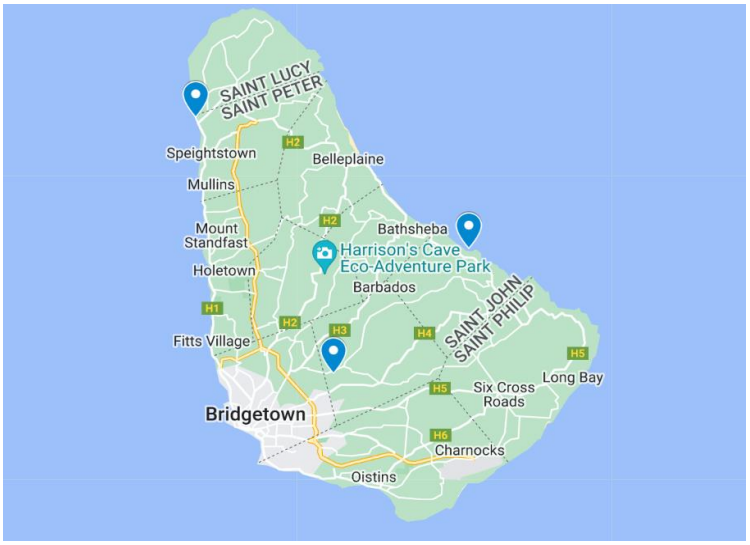


Figure 19 : Location Of CEWS In Barbados

4.4 Belize

Community early warning systems were implemented in More Tomorrow, Belize to monitor the flooding hazard, which significantly impacts the country, especially after the landfall of hurricanes and storms. CEWS were implemented by the National Hydrology Service to measure river flow and river level in flood prone several communities in Belize River Valley (which is made up of nine (9) communities, as well as in communities within two (2) of the six (6) districts in Belize. These are the Belize and Cayo Districts. The map below (Figure 20) shows the location of More Tomorrow as well as the Belize and Cayo Districts.

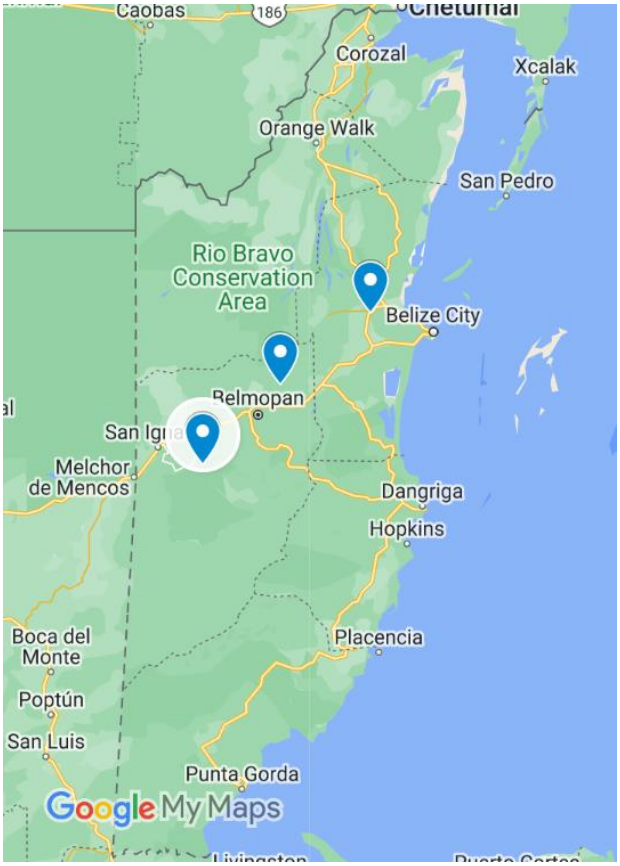


Figure 20: Location of Districts In Belize Where CEWS have been Implemented

Data from the CEWS is received electronically by the National Hydrology Service and shared with NEMO. Data can also be obtained manually by trained village observers and CDRTs. The information collected manually is shared with the Hydrology Service and NEMO, which uses it to send alerts when needed through the public communication system via radio, television, social media and SMS texts. CDRTs also have their own WhatsApp groups which they primarily use to share pertinent information with each other, especially as it relates to appropriate actions to be taken once an alert is received.

The Belize Red Cross Society has worked with and trained CDRTs in over 90 of the 192 communities in Belize. As part of their training, the national society raises awareness of “in-house” communication systems and guides them to better understand their community early warning systems and to develop simple CEWS of their own, if it doesn’t exist in the community. CDRTs also develop their own methods of sharing warnings and alerts with each other as well as their “readiness to respond” or safe actions they can take.

4.5 Dominica

Three (3) communities benefit from community early warning systems in Dominica. These communities are Wotten Waven; Gallion and Soufriere (Figure 21). The system in Wotten Waven monitors flooding, landslides, hurricanes and storms and information on these are collected by trained CDRTs within the community. The information is disseminated through the CDRT call cascade system or through the CDRT Network.

The system in Soufriere (south of the island) is similar in that storm surges, hurricanes and storms are monitored whereas the CEWS in Gallion (south of the island) monitors volcanic activity, landslides, hurricanes and storms. CDRTs also collect this information and pass it on through the CDRT cascade system.

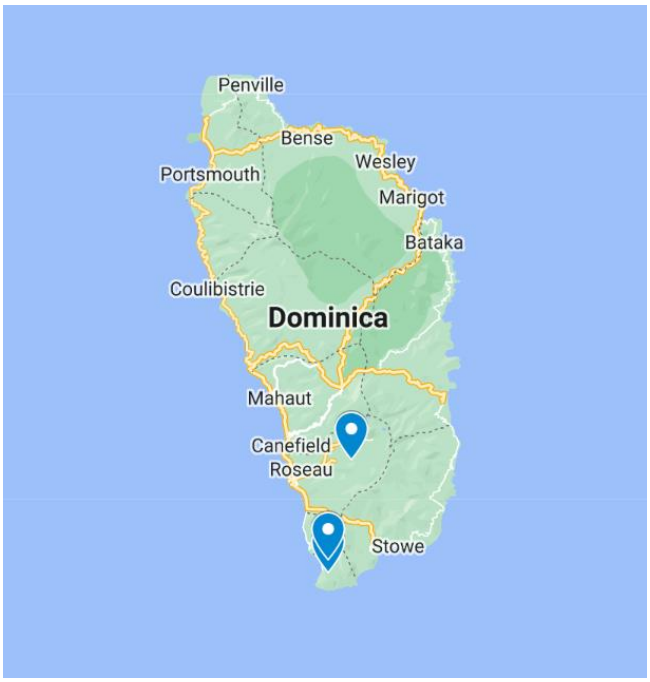


Figure 21: Location of CEWS In Dominica

The Dominica Red Cross also participated in the UNDP's "Strengthening Early Warning Systems in The Caribbean" project where participants conducted a Gap Analysis of the island's MHEWS using the checklist created, and participated in a hazard, vulnerability and risk study for floods. The national society also enhanced their capacity to help communities understand the importance of CEWS and warnings by participating in the CEWS ToT conducted in 2022 led by CADRIM.

4.6 Grenada

Flood early warning systems were established in two (2) communities along the Balthazar River and they are the only CEWS that the national society has highlighted for Grenada. These communities are St. Cloud and St. Andrew (Figure 22). An integral part of early warning systems is communities knowing what to do what alerts are received. Against this backdrop, tsunami smart drills and simulations were done at the national level in three (3) communities.

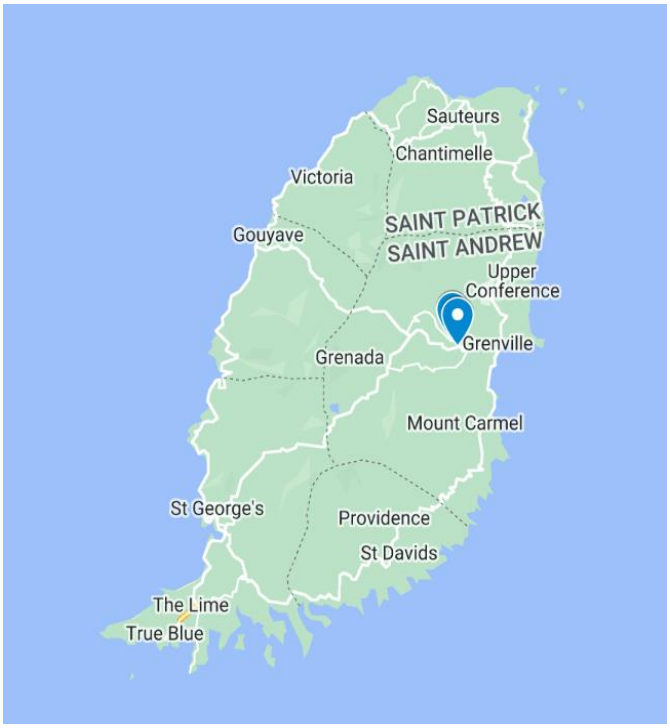


Figure 22: Location of CEWS In Grenada

4.7 Guyana

The Guyana Red Cross stated that there are 19 communities with CEWS that monitor multiple hazards. Data is collected on water levels, seasonal changes, dryness of pasture lands and temperature levels. Trained CDRTs are integrated in the process as the CDRT Leader in each community is tasked with collecting and disseminating the information. The information is disbursed using various means including via phone, VHF radio or by runners or word of mouth. The method used is dependent on the communication capacity of the community. The 19 communities are: Apoteri; Crashwater; Kumaka; Pariwaranaua; Quarrie; Mara; Baracara; Broken Water Land; Perth; Strathcampbell; Charity; Gordon Table; Jacklow; Mora Point; Karia Karia; Saxicalli; Forty-Six Village; Light Town and Lima Sands (Figure 23).

The Guyana Red Cross also participated in a community resilience building project titled the "Caribbean Community Resilience to Disaster Risk (CCRDR)" implemented by the Canadian Red Cross aimed at firstly identifying the most vulnerable communities in Guyana and secondly, empowering members of these communities to identify and analyse their risks and increase their disaster resilience[29]. Another goal was to further enhance inter-agency relationships between the national society and the national disaster office to build community resilience. Under this project, the national society conducted eVCA and CDRT training.

[29] https://reliefweb.int/report/dominica/caribbean-community-resilience-disaster-risk-ccrdr-enhancing-community-resilience

Figure 23: Location of CEWS In Guyana

4.8 Jamaica

There are three main CEWS in Jamaica which monitor different hazards (Figure 24). These three communities are Bog Walk, Old Habour Bay (both in St. Catherine) and Fellowship (Portland). An automatic gauge was installed in Bog Walk that collects streamflow data that can be used to warn against the hazard of flooding. Data from the gauge is monitored by the Water Resources Authority. This information is also shared with ODPEM, which in turn sends out alerts to the public as well as notifies the Parish Disaster Coordinator, the Fire Brigade, the Jamaica Constabulary Force and the National Works Agency.

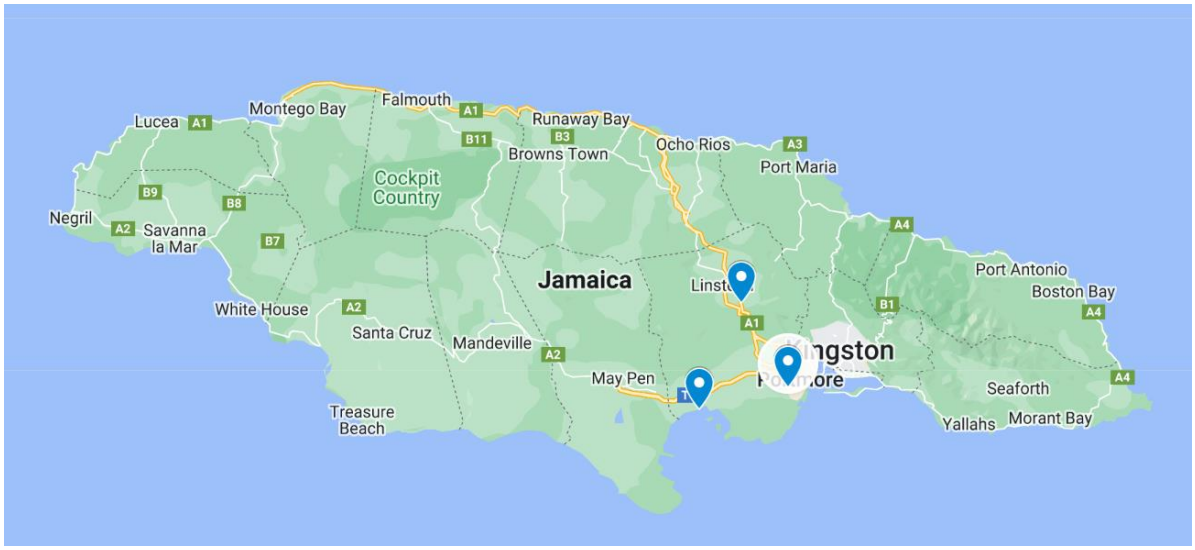


Figure 24: Location Of CEWS In Jamaica

The system in Fellowship is also used to monitor floods. Rainfall and streamflow gauges are used to measure rainfall and river levels as part of a USAID funded project called the JaREEACH II project[30]. Before the CEWS was installed, the community participated in a series of risk assessment and planning workshops under the JaREEACH II initiative. Data is collected by the Water Resources Authority and by community members. Information is also shared with ODPEM and is disseminated within the community by runners or word of mouth, telephone and bullhorn.

Figure 25: Signage at the CEWS Installed in Fellowship, Jamaica

The third CEWS monitors tsunamis at Old Harbour Bay. This system monitors the location and magnitude of offshore earthquakes and is maintained by the Earthquake Unit of the University of the West Indies. The Unit sends information to ODPEM, who then decides if an alert is needed. ODPEM then notifies the public, the Parish Disaster Coordinator, the Fire Brigade and the Jamaica Constabulary Force. Old Harbour Bay was also outfitted with a siren to support warning efforts. The CERT of Old Harbour Bay and ODPEM conducted public education sessions, conducted drills and formulated an emergency operations plan (EOP) for the community. Other documents that were prepared were an evacuation map, an inundation plan and a response plan. Figure 26 below shows the evacuation map created.

[30] https://www.acdivoca.org/projects/jamaica-rural-economy-and-ecosystems-adapting-to-climate-change-ja-reeach-ii/

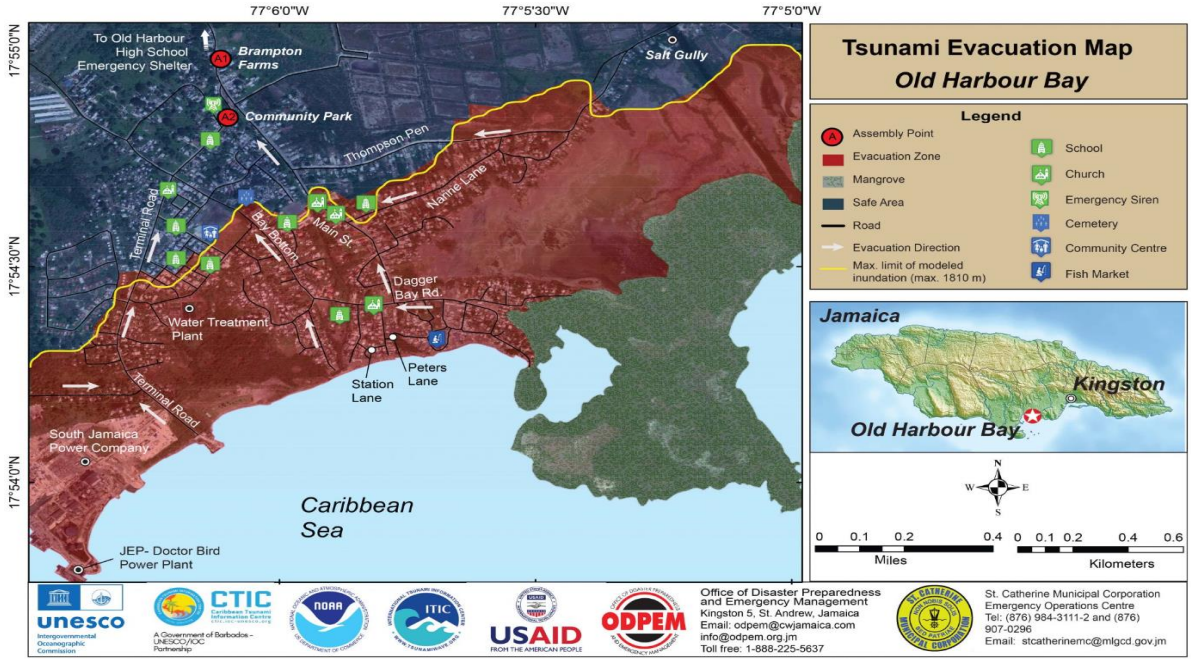


Figure 26: CEWS Tsunami Evacuation Map In Old Harbour, Jamaica

As part of setting up these CEWS, there was a project to enhance emergency telecommunications and the ODPEM radio network and as such persons were trained on using radios. It should also be noted that in 2022, the Jamaica Red Cross participated in the CEWS ToT.

4.9 St. Kitts and Nevis

The National Society did not report their involvement and interaction with any CEWS for St. Kitts and Nevis.

4.10 St. Lucia

The communities of Marc and Anse-La-Raye, two communities most susceptible to flooding, benefitted from community early warning systems installed in 2020 by the St. Lucia Red Cross. The CEWS system uses staff gauges to monitor floods and droughts by collecting rainfall data and information on river levels. The national society trained CDRTs within the two communities to improve disaster preparedness and response capacities. CDRTs monitor the staff gauges which signify the alert level. The CDRTs share this information to the national society on WhatsApp or by forwarding an Excel spreadsheet containing the data.

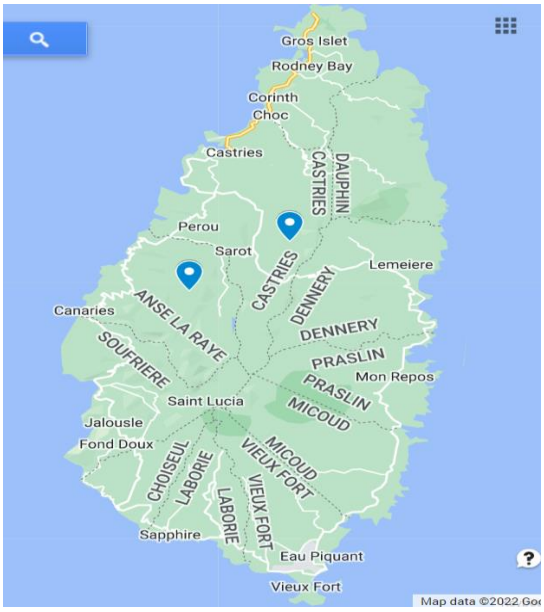


Figure 27: Location of CEWS In St. Lucia

The national society also created and distributed cards to community members to raise awareness of the three levels of alerts, which were assigned colours, as well as expected actions to take once a specific alert level is received (see Figure 28). The first level, which is yellow, lets community members know that flooding is possible, and they should be prepared. The second level or the orange level indicates that the situation has worsened, and flooding is expected anytime, and persons should consider evacuating if needed. The third level, assigned the colour red, warns of serious flooding ahead and it is hoped that by the time this alert level is given, persons needing to evacuate would have done so already.

Figure 28: Cards Used To Increase Awareness Of Colour Coded Alerting System

St. Lucia also participated in the UNDP "Strengthening Early Warning Systems in the Caribbean" project lea by CDEMA in collaboration the IFRC. The initiative resulted in the identification of gaps in the system based on the application of the MHEWS Checklist, and made recommendations to address these gaps.

4.11 St. Vincent and the Grenadines

Community early warning systems were established in four (4) communities to monitor river levels and warn of potential flooding events (Figure 29). The Water Resources Management Unit determined the target communities based on exposure and need. These four communities are Spring Village, Vermont, South Rivers and Georgetown. Each community was equipped with staff gauges to measure the water levels in the rivers that flow through them. Community members who received the CDRT training monitor the system and relay relevant information to SVGMET and NEMO, by WhatsApp or phone call. Information was also passed onto community members by CDRTs and using megaphones and runners.

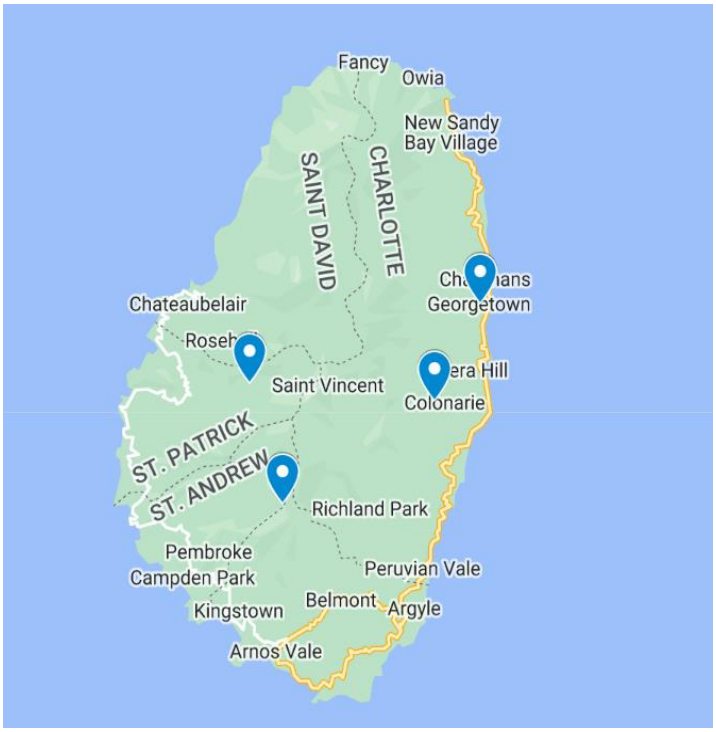


Figure 29: The Location Of CEWS In St. Vincent And The Grenadines

St. Vincent and the Grenadines also participated in the UNDP "Strengthening Early Warning Systems in the Caribbean" project spearheaded by CDEMA in collaboration the IFRC. A Multi-hazard Early Warning System (MHEWS) Gap Assessment was done using CDEMA's EWS Checklist and a MHEWS Roadmap was developed. The project also centered around applying a system of voluntary river observations. The national society was also represented at the CEWS ToT hosted by CADRIM in 2022.

Figure 30: Participants Being Trained in River Observation

4.12 Suriname

The Maritime Authority Suriname (MAS) has tidal stations and water gauges placed throughout the country that can be used to detect and warn against the probability of flooding (Refer to Section 3.12). The Suriname Red Cross has since signed a MOU with the Maritime Authority, to assist with its CEWS project. A tide station was placed in the river in Marowijne (Figure 31) by the MAS to provide early warning to the surrounding communities. As part of the national society's CEWS, the MAS provided training in one community on the indicators of flooding. According to the National Report Suriname 2021 by the MAS[31], the CEWS project is still ongoing with plans to place tidal gauges at the Cottica River and place tide gauges at the Commewijne River.

[31] MACHC22_2021_03.11_EN_National.Report_Suriname_v1.pdf (iho.int)

Figure 31: The Location of The New Tide Station In Marowijne

In addition to the MOU with the MAS, the national society has been working towards enhancing existing practices in communities and training them on ways to disseminate warning information as quickly as possible. An example of this is the establishment of a "call tree" using WhatsApp where persons are assigned to call others within the community to spread the message. The WhatsApp system was introduced to indigenous communities that are often cut off from others due to flooding. These communities traditionally used drums to alert each other, however the addition of WhatsApp helps to spread the message further. In another community called Wageningen, sirens are used to warn members. The national society also trains CDRT in alerting the communities.

CEWS training is also conducted by the national society. Reference was made in a case study done (Suriname Continuing Disaster Risk Reduction During COVID-19)[32], where participants who already received technical training in CEWS participated in an online CEWS Training of Trainers via zoom (Figure 32).

Figure 32: The Online Training Being Conducted By The Suriname Red Cross

[32] https://communityengagementhub.org/wp-content/uploads/sites/2/2020/11/Case-Study_Suriname_Aug2020_EN.pdf

It should be noted that the Suriname Red Cross Society has future plans to install water gauges (staff gauges) in various communities. Additionally, the national society participated in the CEWS ToT in 2022 led by CADRIM.

4.13 Trinidad and Tobago

Though the national society has not implemented any CEWS on its own, the Trinidad and Tobago Red Cross Society (TTRCS) used funds received from the RBC Royal Bank for flood response to help enhance the national early warning system in Trinidad[33]. The national society assembled a technical working group which included the Trinidad and Tobago Meteorological Service, the Water Resources Agency and the Ministry of Rural Development and the Local Government to explore ways to contribute towards the NEWS. The technical group decided on the establishment of a Flood Early Warning System (FEWS) in two communities, Oropune Gardens and Manuel Congo/La Horquetta, that were hard-hit but devastating flooding in 2018 (Figure 33). Under the NEWS, the Water Resources Agency has a network of rain gauges and streamflow gauges that measures river capacity levels. The TTRCS and the technical working group further enhanced infrastructural capacity by adding two streamflow systems to the Water Resources Agency's network of gauges. The new solar powered systems (Figure 34) monitor the river levels close to Manuel Congo/La Horquetta and Oropune Gardens. The two (2) streamflow systems are maintained by the Water Resources Agency and the information collected is used by the Meteorological Service to send out localized riverine flooding alerts when needed.

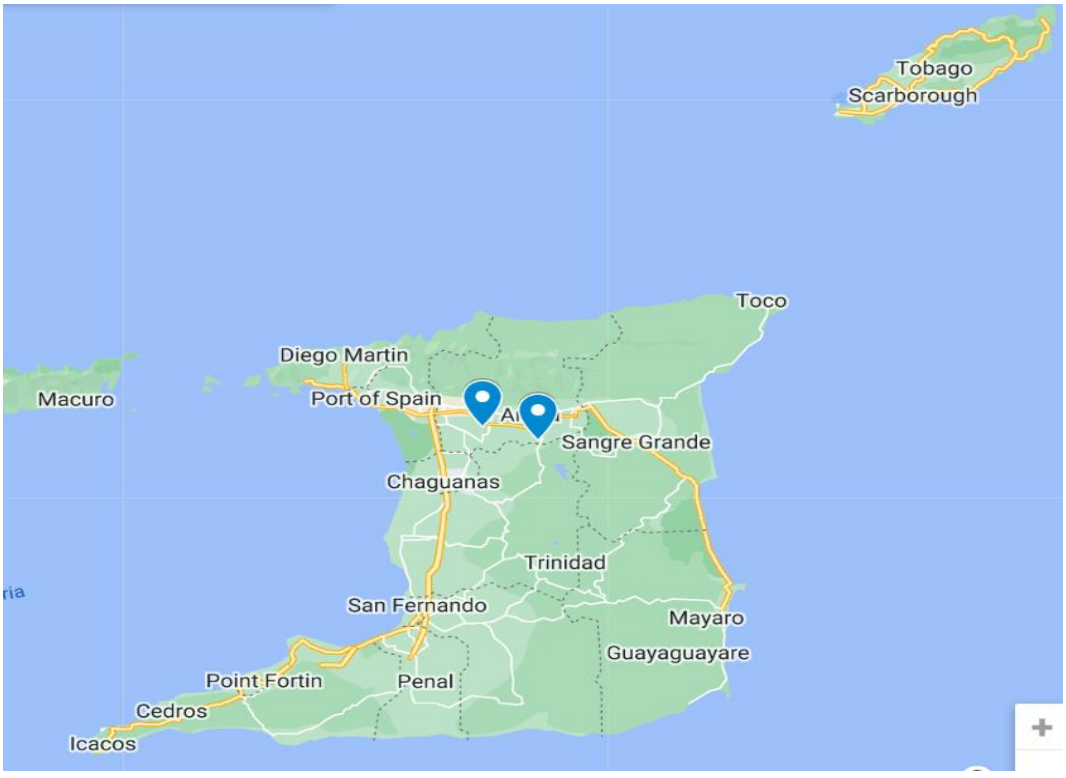


Figure 33: Location of CEWS In Trinidad and Tobago

[33] https://ttrcs.org/hub/documents/index.php?file_id=9

Figure 34: Streamflow Gauges Set Up By The TTRCS And The Technical Group

The technical working group also implemented software that integrates the streamflow data with rainfall data and projected forecasts to help with the EWS decision making process (see Figure 35 below). The software is unique to Trinidad and Tobago.

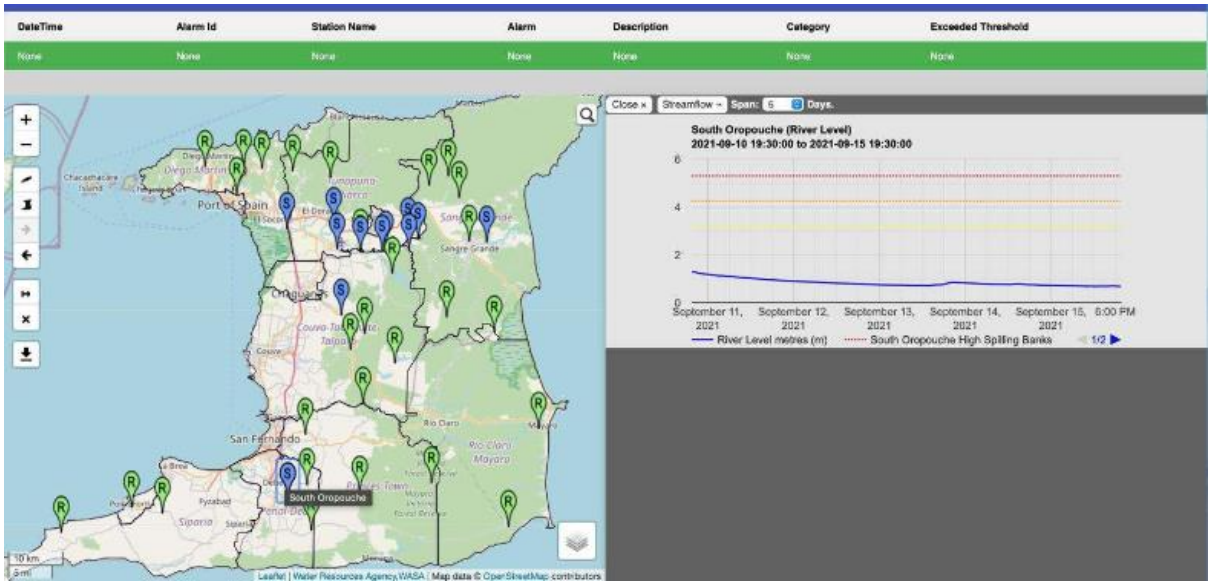


Figure 35: Output from The Software Developed By The Technical Working Group

It should be noted that before the streamflow gauges were launched, awareness sessions were held in the communities by the TTRCS and by the Ministry of Rural Development and Local Government through the Disaster Management Units of the Regional Corporations, through their Community Emergency Response Team (CERT) training

CERTs are not currently trained in CEWS, but it is envisioned that Standard Operating Procedures (SOPs) will be implemented to engage them more in the process. CERTs are a critical resource for

overall disaster preparedness and response activities, and are also used to verify river levels. The Trinidad and Tobago red Cross Society also participated in the CEWS ToT held in 2022.

5.0 Overview of Major Projects EWS Projects

Thus far, many of the EWS and CEWS activities of which national societies were involved, were undertaken as part of the United National Development Programme (UNDP) "Strengthening integrated early warning systems for more effective disaster risk reduction in the Caribbean through knowledge and tool transfer" project. Participating countries of this project included Antigua and Barbuda, St. Vincent and the Grenadines, Dominica, Dominican Republic and St. Lucia. The IFRC was one of the implementing stakeholders along with CDEMA, DIPECHO partners and national counterparts. It is also important to note more recent initiatives on advancing MHEWS in the Caribbean of which the IFRC and National Societies are involved, notably on initiatives with the UNDRR. This section outlines some of the key EWS milestones and activities completed by the IFRC and the Region's National Societies, and some of the ongoing initiatives

5.1 Redesign and Re-launch of the Early Warning System Toolkit

CDEMA and the IFRC were the main collaborators of the re-design and re-launch of a EWS Toolkit[34]. The IFRC coordinated a Technical Advisory Group (TAG) which included representatives from the OECS Sub-regional Office, NEMO St. Vincent and the Grenadines, CDEMA, the Caribbean Institute of Meteorology and Hydrology (CIMH) and UNDP, to collaborate on the revamping of the toolkit. This toolkit seeks to integrate the eVCA process as well as the CDRTs in community response plans, and provides guidance on the four main components of EWS as follows:

1) Risk Knowledge (contains information on data collection and undertaking risk assessments);
2) Hazard Monitoring and Forecasting (provides information on the monitoring networks in the Caribbean and Forecasting of hazards);
3) Response Capacity (guidance on the recommended measures to build national and community response capacities to warning messages); and
4) Dissemination/Communication of Alerts (include information on recommended methods of communication and disseminating alerts and warnings to the vulnerable population.

The IFRC also supported the launch of the re-designed toolkit through promotion via social media networks and other electronic networks.

5.2 Creation of a Multi-Hazard Early Warning Systems Checklist

A Multi-hazard Early Warning System Checklist was created to guide the process of developing and/or evaluating Early Warning Systems by National Governments, Community-Based Organisations and partners. The checklist was designed to be used when reviewing and evaluating the current state of EWS to inform the update and improvement of any EWS. The checklist is divided into two main sections, the first contains background information and overarching issues crucial to EWS and the second is a checklist of actions and initiatives that should be considered and implemented for improving the EWS mechanism[35].

[34] http://www.cdema.org/ews/
[35] https://cdema.org/component/jdownloads/send/26-checklist/156-english

5.3 Development of Case Studies

Case studies outlining EWS best practices and projects implemented by Caribbean islands were created and made available to further provide guidance to organisations and communities seeking to integrate EWS in their disaster resilience plans. The following case studies were developed:

1) Early Warning Systems in the Caribbean: A Desk Review[36]
2) Case Study in St. Lucia: Strengthening Resilience and Coping Capacities in the Caribbean through Early Warning System Project[37]
3) Case Study in Anguilla: Strengthening Resilience and Coping Capacities in the Caribbean through Early Warning System Project[38]
4) Montserrat case Study on Common Alerting protocols[39]
5) Community Disaster Response Teams in Dominica: A Closer Look At Sustainability And Response[40]
6) Video case Study of the CEWS Training/Facilitation process.

5.4 Caribbean Early Warning System Workshop

A workshop was held in Barbados in 2016 with the aim of finding ways to institutionalize and harmonize MHEWS in the Caribbean. The two-day workshop included presentations and discussions on gaps and lessons learnt from EWS in the Caribbean from 2000-2015; institutional arrangements for EWS in the Caribbean; EWS tools; the harmonization of EWS towards multi-hazard applications; CAP based EWS; and integrating vulnerable groups in the development and implementation of EWS.

5.5 Community Early Warning System Training-Of-Trainers Workshop

The CEWS Type II Training of Trainerd (ToT) Tool was piloted in Dominica in 2018 over a five-day period and was attended by 22 persons of the Marigot community. During the workshop, participants worked towards updating the VCA done for the Marigot community as well as design a flood early warning system (FEWS) for the Dam gullies catchment community. Participants also identified three priority hazards (storm surges, flash floods and landslides) and developed a detailed monitoring plan for each.

The IFRC also procured emergency radio equipment and training for selected communities in Dominica. Six fully operational amateur (ham) radios were obtained and installed in the Red Cross branches.

[36] https://dipecholac.net/docs/xfiles/1054-DESK%20REVIEW-OF-EARLY-WARNING-SYSTEMS-EWS-IN-THE-CARIBBEAN.pdf

[37] https://www.latinamerica.undp.org/content/rblac/en/home/library/crisis_prevention_and_recovery/Saint-Lucia-Case-Study-Strengthening-Resilience-and-Coping-Capacities-in-the-Caribbean-Through-Early-Warning-System-Project.html

[38] https://www.latinamerica.undp.org/content/rblac/en/home/library/crisis_prevention_and_recovery/Anguilla-Case-Study-Strengthening-Resilience-and-Coping-Capacities-in-the-Caribbean-through-Integrated-Early-Warning-Systems-Project.html

[39] https://www.latinamerica.undp.org/content/rblac/en/home/library/crisis_prevention_and_recovery/Montserrat-Case-Study-on-Common-Alerting-Protocol0.html

[40] https://www.latinamerica.undp.org/content/rblac/en/home/library/crisis_prevention_and_recovery/Dominica-Community-Disaster-Response-Teams-in-Dominica-A-closer-look-at-sustainability.html

In 2022, due to the COVID-19 restrictions and the limitations presented with having face-to-face trainings, the CEWS ToT was enhanced and modified to suit an online modality. This seven-day ToT was conducted from June 28, to July 19, 2022 with 16 participants from nine (9) national societies.

5.6 EWS Gap Review Completed for Antigua and Barbuda

The IFRC conducted a mission to Antigua and Barbuda to discuss the EWS gaps (revealed by the checklist tool) and assist with the prioritization of actions towards strengthening EWS in the island in 2018. The following are some of the findings of the completed Checklist Survey:

1) Risk mapping should be built into CAP early warning system for improved messaging.
2) Communications audit (hardware and channels) for improving hazard resilience and message coverage is needed.
3) EWS equipment need to be updated and training and maintenance support needed.
4) Risk probability forecast and area impact information should be strengthened.
5) MHEWS using CAP is needed, with organization and decision-making protocols in place.
6) Warning communications should be expanded using amateur radio operators and social media.
7) Feedback mechanisms should be established to verify that warnings have been received and to correct potential failures in dissemination and communication.
8) Communication and dissemination systems should be tailored to the different needs of specific groups & sub-populations.
9) More communities should be engaged in drills and simulations.
10) Preparedness for the rare but severe events e.g tsunamis need attention. There is a need for more awareness and risk perception of rare and severe events.

The National Office of Disaster Services also received the CAP software online through the IFRC's Hurricane Irma Appeal.

5.7 Knowledge, Attitude and Practice (KAP) Survey Conducted in Antigua and Barbuda

The IFRC shared its revised KAP tool with the National Office of Disaster Service to capture baseline data on public awareness and change in awareness of the national EWS process in four communities (Bethesda, Grays Farm, Point and Urlings). Volunteers collected survey responses from more than 100 community members over a six-week period. The preliminary results of the survey indicated that there was an increase in awareness of and knowledge of disaster shelters, however community members did not clearly understand early warning systems and showed little or uncertain knowledge of their community evacuation routes and other components of early warning systems. As a result of these findings, more drills will be conducted.

The National Office of Disaster Service held a three-day workshop on drills and alert scripting for 29 officers from key EWS- related agencies and in January 2019, a Tsunami Drill was piloted in the Bethesda community. The lessons learnt from this drill will then be used to conduct larger scale drills in more complex communities.

5.8 Technical Assistance Provided to the Dominican Republic

IFRC staff supported project activities in the Dominican Republic and worked together with the National Red Cross Society staff and volunteers to develop and test the Community Early Warning ToT tool in 2019. The IFRC CEWS Field Guide 2014 was translated into Spanish and piloted in the El Taloa community which was attended by 17 participants from El Taloa as well as the neighbouring communities of Yabacao and Mata los Indios.

5.9 Risk Perception Studies with the UNDRR

Between May and November 2022, the IFRC and National Societies partnered with the UNDRR, to undertake a risk perception study for four Caribbean countries namely Trinidad and Tobago, St. Lucia, St. Vincent and the Grenadines and Jamaica, with the financial support of the Climate Risk and Early Warning Systems (CREWS) Initiative. The study increased understanding of risk and early warning systems perceptions of communities and policymakers for increased engagement and use of MHEWS by stakeholders and practitioners. In this way, policymakers design and implement EWS that accurately and effectively contemplate the experiences, capacities, challenges and interactions of the community, thereby improving their effectiveness.

The study was conducted through a discussion-based, participatory exercise via stakeholder workshops in the four countries and using a discussion questionnaire with five resilience parameters that were developed and applied for scoring across 27 indicators. The methodology applied by the study provided a forum to generate greater dialogue between two key EWS stakeholders-policymakers/authorities and community members, to identify the potential strengths and challenges that influence the effectiveness of EWS. The findings of the study informed seven (7) priority areas to improve the effectiveness of EWS:

- Improving disaster risk knowledge through public education, outreach, training and simulations
- Strengthening the institutional architecture within which MHEWS operate (leveraging partnerships with the community, private sector, media and non-governmental organisations)
- Strengthening community integration mechanisms and socioeconomic capacities
- Enhancing infrastructural capacity
- Improving the understandability of warnings
- Instituting feedback mechanisms to measure the effectiveness of warnings
- Strengthening the overall governance framework for MHEWS

5.10 Development of a MHEWS Addendum to the Disaster Resilience Scorecard under Making Cities Resilient (MCR2030) with the UNDRR

In December 2022, the IFRC commenced discussions with the UNDRR, regarding the development of a dedicated tool under MCR2030 to support MHEWS design, planning and implementation at the local level. Tools and methodologies under the UNDRR's MCR2030 have been valuable in enabling and sustaining subnational and local level action for resilience. In the Caribbean specifically, MCR2030 tools and methodologies have been applied in Trinidad and Tobago, Jamaica and St. Vincent and the Grenadines, with more countries underway. MCR2030 is strategically placed to target the local level - where people and communities exist, and where people-centred early warning systems has its place.

However, currently, tools under MCR2030, namely the Disaster Resilience Scorecard Preliminary and Detailed tools, do not adequately and comprehensively address MHEWS. Within this context, the IFRC Caribbean Office is partnering with the UNDRR Regional Office of Latin America and the Caribbean to develop a tool within the MCR2030 suite of tools, that specifically and comprehensively addresses MHEWS at the local and community level. The UNDRR views the IFRC as an advocate for community resilience, and is reliant on the IFRC to bring these perspectives into the development of a suitable tool.

The MHEWS Addendum to the Disaster Resilience Scorecard is conceptualised with the objective of allowing users of the tools, to more comprehensively assess MHEWS at the local level, for improved planning, reach and effectiveness of these early warning systems. The tool will support the development of people-centred, multi-hazard approaches to early warning systems and ensure their integration in disaster risk reduction and resilience strategies.

Development of the tool commences with the literature review, drafting of the tool, piloting and reviews, and final approvals and publication. The development of the tool is currently in the literature review stage, with ongoing engagement between the IFRC and UNDRR.

6.0 Challenges and Recommendations

6.1 Lack of Standard Operating Procedures/Policies

The findings of this study are consistent with regional studies[41] that point to the shortfalls in the governance framework for EWS. In some countries, there are no defined standards and guidelines through legislation or policy that identifies roles and responsibilities, as well as processes in EWS. This is especially the case as it relates to dissemination of warnings. In many instances, national disaster offices send out media releases or alerts on all hazards while the national meteorological service/offices release alerts regarding inclement weather, storms, hurricanes, potential flooding and droughts. Informal systems as they relate to warning messages can be found in Suriname and Grenada. A similar issue exists in Dominica with regards to its CAP system. In Belize, the national society cannot release warnings/alerts unless authorized by its national disaster office, NEMO due to a lack of MOU or protocol with NEMO. Having established SOPs, policies and MOUs in place can clarify roles and responsibilities, reduce delays in getting the message out to the public, leveraging the national society (as well as other key stakeholders) as partners in the MHEWS framework.

6.2 Lack of Ways to Reach Vulnerable Populations/Remote CommunitiesAlerts are shared with the public via television, radio, social media and relevant organisations' websites. These modes can reach persons or communities that have access to electricity, televisions, internet connections, and mobiles devices. However, persons such as, the poor and persons living in rural or indigenous communities do not always have the means to receive the warning through these media. Finding ways to ensure inclusivity of vulnerable groups is crucial as these persons are disproportionately and often most negatively affected by hazard occurrences and have the most difficulty in rebuilding after a disaster. Addressing this issue calls for a multiprong approach. There is a need to institute evaluation mechanisms to determine warning interaction (i.e. reach, mode, and capacity), expand the media used to communicate warnings, improve the socioeconomic contexts of marginalized groups such as the poor and indigent, and also integrate formally informal warnings systems to the formally warning structure to expand reach. Some communities use sirens, runners and in the case of an indigenous community in Suriname, drums were used to warn community members. A good CEWS is one that has redundancy built in or one that allows for warnings to be disseminated in multiple ways.

6.3 Lack of Actionable Messages

Apart from warning persons who can be potentially impacted by a hazard, a good CEWS is one in which persons receiving the warnings know what to do, consistent with component four (preparedness capability) of early warning systems. The purpose of a CEWS is not just to warn others but to elicit community members to take the appropriate actions to reduce the loss of lives and damage to properties. Communities need to understand the meaning of warnings and the different warning levels. They need to understand when it is necessary to evacuate or put measures in place, such as using sandbags, in the case of flooding. However, many Caribbean countries employ traditional messaging in early warnings, focused more on the hazard itself, rather than what impacts the hazards might have and what actions should be taken. Communicating hazard impacts, through impact based forecasting, can aid communities in better understanding the significance of the hazards, and prompt the appropriate protective actions. In the same way, actionable messaging, informing the community

[41] CDEMA 2016; Mahon et al. 2015; Williams 2018

of what protective actions to take in preparation and response to a hazard event, can improve the effectiveness of the warning. This form of warning dissemination can be supported by awareness and outreach sessions to improve community knowledge and capacity to take preparedness action and respond appropriately.

6.4 Messages Not Being Translated in Other Languages Spoken in the Country

Closely related to the phrasing and style of message, is the direct language of the message in warning dissemination. In some countries of the Caribbean, there are communities that speak different languages, for example indigenous populations and migrant communities. A pertinent example is the case of Trinidad and Tobago where there is a large Spanish-speaking migrant population but alerts here are typically shared in English only. There is therefore a need for alerts to be translated and shared in multiple languages to ensure that all persons understand the message. In a similar way, warnings must contemplate the needs of persons with disabilities such as visually and hearing-impaired persons, to ensure these vulnerable groups are reached in warning dissemination.

6.5 Lack of Funds

Flooding was the main hazard being monitored by the community early warning systems implemented within the region. In many of these instances, the CEWS for floods were comprised of automatic equipment that transferred data electronically to a monitoring agency. This type of equipment can be costly and there's also a high cost attached to maintaining these systems. However, there were some communities that relied on staff gauges or rain gauges that were manually monitored by either trained community observers or CDRTs. In both cases, where data was collected either manually or electronically, information collected is shared with the national disaster office and the meteorological office as applicable. However, both automatic and manual systems require considerable technology, and oftentimes there are not sustainable financing streams available to ensure their maintenance and functionality. Sustainable financing for CEWS infrastructure is therefore required. Additionally, it is best to link the community early warning system with the national early warning system.

7.0 Best Practices

This section presents additional recommendations and some of the best practices observed in or that can be beneficial to CEWS in Caribbean countries.

7.1 Ensuring Communities Understand What Action is Needed

In some instances, alerts or warnings that contained information on what to do or are colour-coded for example the three levels of alerts used by the St. Lucia Red Cross in the CEWS in Marc and Anse-La-Raye. Cards with the colour system and the advisable actions were shared with community members. A colour-coded system was also used in some of the national early warning systems. In Dominica and Trinidad and Tobago, the national meteorological services/offices use such as system when warning citizens about possible flooding. In Guyana a similar system is used by its meteorological office when issuing alerts on droughts. These mechanisms aid in ensuring communities understand the warning.

7.2 Ensuring Redundancy

One of the signs of a good CEWS, is one that has redundancy alerting measures in place. A good example is the way in which an alternative method of spreading alerts was introduced to an indigenous community that used drums. Though this method worked, it had its limitations as the sound of the drums could not reach all the members of the community. The national society introduced a call tree system so warnings can be spread to persons further away by telephone.

Communities in other countries also use runners or spread the message through word of mouth. In St. Vincent and the Grenadines, stakeholders were able to enhance the national early warning system mechanism by improving, empowering, and testing their radio network (Emergency Radio Communication Network). Training in using radios was also included in Jamaica when setting up their CEWS so the use of radios or tapping into amateur radio networks in the country -can be a viable method of spreading pertinent information. The CEWS in Charles Rowe, Barbados also uses sirens to warn the community as well as used school bells to alert the community of harmful bushfires. Also, in St. Vincent and the Grenadines, a system of alerting persons within a fishing community by using conch shells is in the works. These, among others, are simple and cost-effective methods that can be used in communities to enhance their alerting system.

7.3 Empowering CDRTs/CERTs

Trained CDRTs and CERTs played an integral part in either monitoring CEWS or spreading alerts to other CDRTs, CERTs and community members through their established CDRT communication system. CDRTs and CERTs can be a great resource not only in sharing information but in also getting other community members to take appropriate actions. As part of the CDRT/CERT training, participants should be made aware of early warning systems that exist in the community and made to understand how the equipment works and the importance of understanding alerts and what appropriate actions to take when an alert is received. CDRTs/CERTs should also be made aware of the national alerting system, and integrated within this system.

7.4 Ensuring the Participation of the Community When Implementing a CEWS

Whether or not a CEWS is community-based or community -driven, community members should be included in the implementation process. A good CEWS also takes into consideration indigenous knowledge or local knowledge also known as transmitted knowledge and experiential knowledge. Awareness sessions should also be held with the community so that persons can be made aware of how the system works and the ways in which it can be used to benefit the community. CDRTs/CERTs can also be utilized to help with community buy-in as well as play an important role in the sharing of information.

7.5 Conducting Simulations

Simulations and drills are effective tools to help persons better understand the roles that they play in all the phases of the disaster management cycle be it preparedness, mitigation, response, or recovery. Simulations and drills that are regularly done will help persons to understand/test, not only how to receive information, but also their response to the information being received. It is a good way to get community involvement and to increase community understanding.

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9.0 Appendix 1

Community Early Warning System (CEWS) Assessment

Purpose of CEWS Assessment

According to the UNDRR report, 2020: The Non-COVID year in Disasters, 90% of the recorded events were climate related which affected 98.4 million people, caused 15,080 deaths and resulted in economic loses of at least US$171.3 billion. These statistics reiterate the need for greater community resilience. Key to the efforts to improving this resilience is the establishment of community early warning systems (CEWS), as these are integrated systems that include hazard monitoring, risk assessment, communication, and preparedness activities, which will enable the National Societies and empower communities to take timely actions to reduce the loss of life and damage to property in the event of a disaster.

The purpose of this assessment is to gain a better understanding of what exists, what are some of the best practices and challenges faced in establishing, maintaining, and monitoring these systems within a regional context as well as to determine improvements that can be integrated into existing and newly developed early warning systems.

Basic National Society Information

The following aims to collect some basic information about the National Society.

Date	
Name of National Society	
Name of Person Completing Form	
Name of National Society CEWS Focal Point	
Email for CEWS Focal Point	
Phone Contact for CEWS Focal Point	

National Early Warning Systems

The following seeks to provide a better understanding of any National Early Warning Systems that exist. Please identify any organizations that provide early warning information and describe the early warning system. (E.g. Hurricane Watch/Warning alerts disseminated by the local meteorological office or the monitoring of rivers by the local water resources agency).

Name of Organisation	Type of Hazard Being Monitored	Description of System in Place

Please provide the name and contact information of any persons that the National Society liaises with from any of the organisations mentioned above.

Name of Organisation	Name and Title of Contact	Email and Phone Number of Contact

Community Early Warning Systems Implemented by National Society

The following seeks to gather information on the types of CEWS implemented within the past 5-10 years.

Has the National Society implemented/helped vulnerable communities to implement any CEWS within the past 5-10 years? (Yes or No)

If yes, please identify the communities as well a brief description of the system implemented

Name of Community	Type of Hazard Being Monitored	Type of Information being Collected	How is the Information Collected and by Whom	How is the Information Disseminated?

Are all the CEWS identified above still being maintained by the communities?

Name of Community	System being Maintained (Yes or No)

Lessons Learnt, Best Practices and Challenges Encountered

The following seeks to identify some of the lessons learnt, best practices and challenges faced by the National when developing these early warning systems. Please provide short explanations to the following:

Lessons Learnt	•
Best Practices	•
Challenges faced	•

Thank you for completing this assessment.

Please send any supplementary documents to vanita.redoy@ifrc.org or shivanie.mahase@ifrc.org