



International Telecommunications Union (ITU)

**Assessment of Emergency Telecommunication plans
and systems in the Caribbean Region
(Job Description #8274)**

FINAL REPORT

Prepared by: Stephen Louis

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Putting IT together

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LIST OF ACRONYMS

CDEMA	Caribbean Disaster Emergency Management Agency
CDERA	Caribbean Disaster Emergency Response Agency (predecessor to CDEMA)
CDM	Comprehensive Disaster Management
CIDA	Canadian International Development Agency (now Global Affairs Canada)
CTU	Caribbean Telecommunications Union
ICT	Information and Communications Technology
EOC	Emergency Operations Centre
ITU	International Telecommunications Union
LDCs	Least Developed Countries
NDO	National Disaster Organization
NETP	National Emergency Telecommunications Plan
NEOC	National Emergency Operations Centre
RCP	Regional Coordination Plan
RECEN	Regional Emergency Communications Network
RECP	Regional Emergency Communications Plan
RRM	Regional Response Mechanism
SIDS	Small Island Developing States
SOP	Standard Operating Procedure
TOR	Terms of Reference
WTDC	World Telecommunications Development Conference

1. INTRODUCTION

1.1 Purpose of the Report

This document presents the Final Report for the assignment to conduct an “*Assessment of Emergency Telecommunication plans and systems in the Caribbean Region*”. The assignment is being undertaken for the International Telecommunications Union (ITU) through the office of its Area Representative for the Caribbean.

The document presents the assessment of legislation, regulations and policies that relate to emergency communications, with particular emphasis on the role and responsibilities of the designated National Disaster Organizations (NDOs). It also takes into consideration the impact of the recent hurricane season and the lessons learnt with regard to emergency communications capability and makes recommendations for addressing key issues identified.

1.2 Scope

1.2.1 Geographical Scope

The Terms of Reference (TOR) refers to “Caribbean Countries”. For the purposes of the assignment, this has been interpreted as referring to those countries and territories in the Caribbean region that are within the jurisdiction of the ITU Caribbean Area Office, or are members of the Caribbean Disaster Emergency Management Agency (CDEMA).

The review of Disaster Management legislation referred to in section 2 below as well as the territories identified in the “lessons learnt” from the 2017 Hurricane Season are members of CDEMA. A map illustrating the geographic area and list of CDEMA “Participating States” is shown in Fig 1 below.

1.2.2 Focus of Study

As discussed in the *Inception Report*, The TOR indicates a focus on policies, legislation and regulations, as opposed to the operational and technical aspects of emergency telecommunications. Therefore, the study has sought to identify what aspects of national legislation/ regulation, policies and plans address emergency communications.

A related issue also discussed in the Inception Report is the interpretation of the term “Emergency Communications” in the context of the assignment. As previously explained, for the purposes of this study, we consider Emergency Communications to be the technical tools, methods and procedures that provide the capability to effectively communicate, transfer and manage information as required to support emergency management activities, before, during and after disaster events.

Given the above, it is important to note that the study addresses overall emergency communications *capability*, as opposed to specific emergency communications technologies,

procedures or protocols. An ever-widening range of Information and Communications Technologies (ICT) are becoming available to support emergency communications¹ and these often warrant adjustments to existing procedures.

It was also explained that the focus will be on disaster-related communications as opposed to day to day public safety communications. Additionally, unless otherwise indicated, the terms “emergency communications”, “disaster communications” and “emergency telecommunications” can be construed as having the same meaning for the purpose of this report.

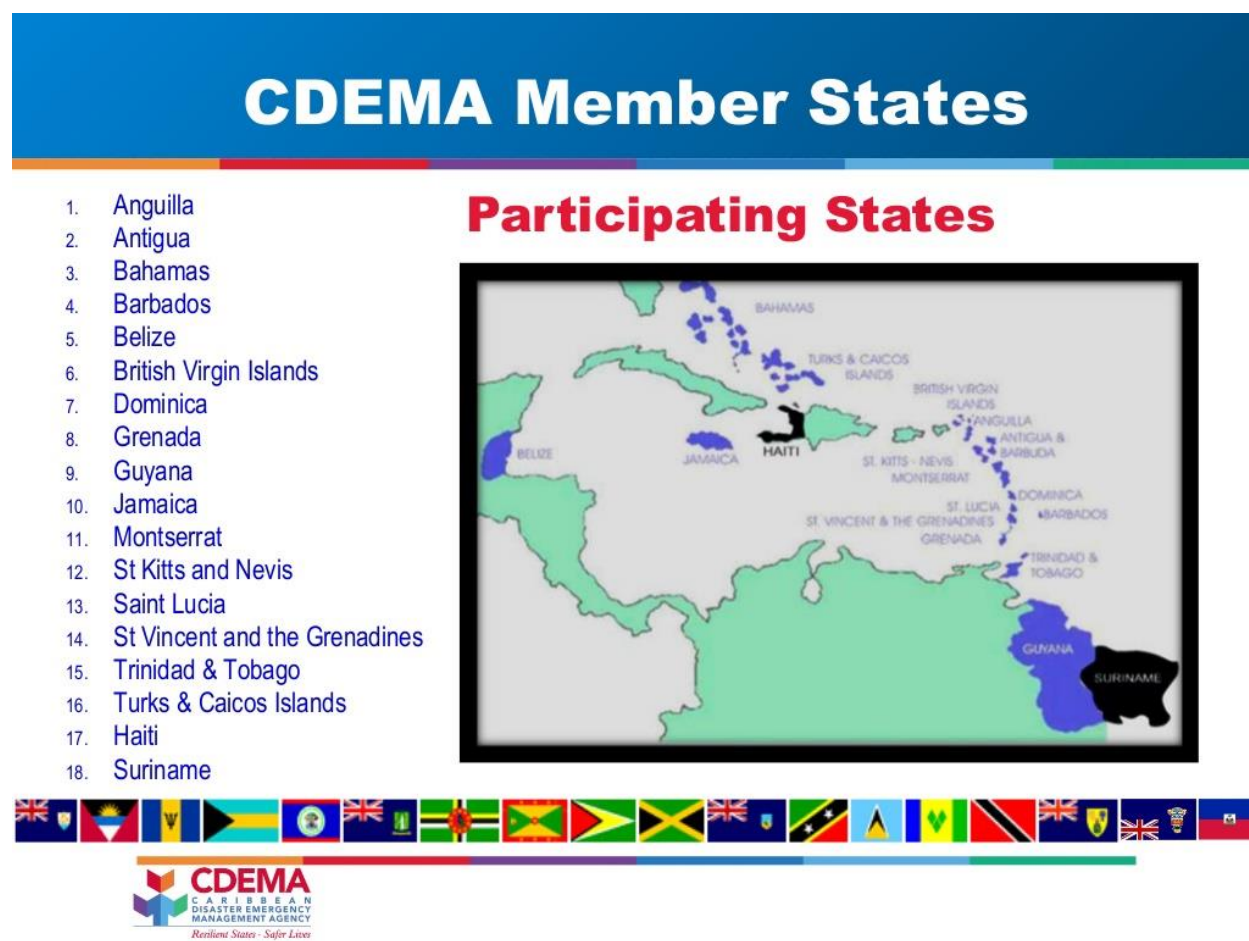


Fig 1: Map and listing of CDEMA’s Participating States. Source: Slideshare presentation (<https://www.slideshare.net/MateoGarciaPrieto/cdema-presentation-at-peer-to-peer-exchange-activity-at-oas>)

¹ For a discussion of available technologies see “Question 5/2: Utilization of telecommunications/ICTs for disaster preparedness, mitigation and response: Final Report” (ITU, 2017).

1.3 Determining “Best Practice”

The process of deriving a framework for assessing “best practice” was outlined in the Inception Report. The process included reviewing documents produced by organizations known to have prior experience and expertise in this area, as well as reviewing prior work on the assessment and strengthening of emergency communications undertaken in the Caribbean. The proposed “best practice” categories derived are shown in Table 1 below.

Table 1: Proposed “Best Practice Categories”

	Category	Description
1	Governance Framework	The oversight and management structures, along with the legislation, regulations and policies that exist for ensuring availability of suitable emergency communications arrangements.
2	Plans and Operational Guidelines	The documented plans that provide guidance on how the emergency communications arrangements will function.
3	Personnel, Staffing, Training and Exercising	Arrangements for ensuring availability of suitably skilled persons to competently provide emergency telecommunications services and support when required.
4	Equipment Facilities and Technology	Availability and operating condition of suitable technical equipment, facilities, infrastructure, networks, etc. along with appropriate technical documentation and operating/maintenance instructions.

The categories, along with key elements addressed by each, are illustrated in Figure 2 below. These categories have help guide the search for and analysis of information on emergency communications legislation, policies and practices in the Caribbean.

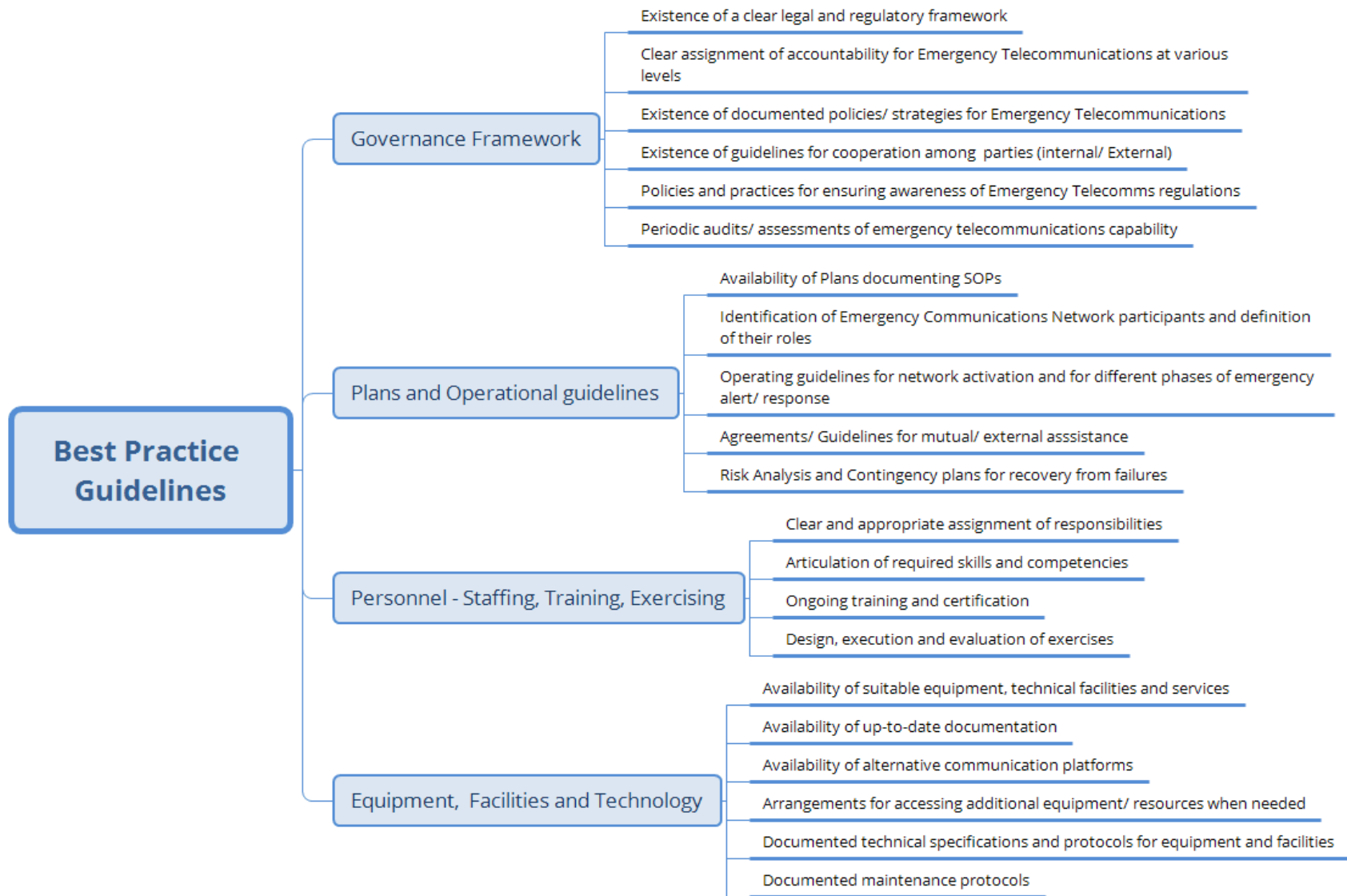


Fig 2: Proposed Best Practice guidelines

1.4 Approach and Methodology

In the absence of field visits to the target countries, much of the information for this study was sought through searches of publicly available web sources. This included, among others, the websites of national disaster organizations and regional and international institutions that maintain repositories of relevant information. (E.g. the IFRC's Disaster Law Database available at <http://www.ifrc.org/en/publications-and-reports/idrl-database/>).

The main types of information sought included:

- Disaster Management Legislation that outlined the legal arrangements for disaster management within the respective states
- Telecommunications Acts for the states
- National Disaster Plans and Emergency Telecommunications Plans

In addition to the searches, the information was supplemented by discussions with “key informants”. The author was also able to identify relevant documents based on prior experience in assessing emergency communications capability in the Caribbean.

The intent of the above was to identify characteristics of the existing legal, regulatory and policy framework for emergency telecommunications. **Table 2** below provides a summary of documents reviewed and observations noted. It covers all CDEMA states with the exception of Haiti. Note that the availability of relevant documentation in the public domain and the currency of these documents varied from country to country.

For the review of the 2017 Hurricane Season, information was sought via a questionnaire to affected countries, which was circulated by CDEMA. Additionally, searches were also conducted for Situation Reports and assessments prepared by national regional institutions. Where possible, multiple sources were sought to allow comparison and validation of information.

2. REVIEW OF LEGAL REGULATORY FRAMEWORK

The review of the legal and regulatory framework aimed to identify the extent to which legislation existed that addressed responsibilities for emergency communications in a disaster context. This was undertaken through a search for available disaster management documentation – particularly legislation, plans and policies that addressed this issue.

For the most part, the search was conducted through publicly available sources on the Internet and covered 17 of CDEMA Participating States, with the exclusion of Haiti. (Haiti was excluded because in many ways its circumstances are different from other CDEMA states and requires special attention).

Table 2 below summarizes key findings and observations from this search.

2.1 Main Observations

The following are some observations derived from the analysis of disaster management legislation, plans and policies in the Caribbean that are particularly relevant to the formulation of strategies for improving emergency communications capability:

- All the states within the scope of this assignment (as indicated in Section 1.2 above) have a formally designated National Disaster Organization that is responsible for coordinating and managing the state's Disaster Management activities. This is a requirement of the CDEMA Agreement. The authority for this function may be derived from national legislation or from other government decisions.
- At least 12 of the states have enacted specific legislation for disaster management. This legislation was written based on Model Disaster Management Legislation developed by CDEMA and its predecessor organization (CDERA).
- Included in the disaster management legislation, is the requirement to develop a National Disaster Management Plan. The legislation specifies certain matters to be covered by the Plan, some of which relate directly to emergency communications. This is outlined in **Appendix A**.
- For some countries (e.g. St Vincent and the Grenadines), the legislation mandates specifies private sector and non-government organizations (e.g. telecommunication service providers, amateur radio operators) be included in the committee responsible for emergency communications. Typically however, such provision is made in the National Disaster Plan rather than in the legislation.
- In all cases, the legislation gives the NDO the latitude to engage other entities as deemed necessary.
- From the limited review of the Telecommunications Acts, only one case was identified (Antigua and Barbuda) where the legislation seems to explicitly require the service providers

to develop plans to deal with situations where there is “serious and substantial interruption in the provision of telecommunications services”

- While not specifically addressed in Table 2, it was noted that only five CDEMA states are signatories to the *Tampere Convention on the Provision of Telecommunication Resources for Disaster Mitigation and Relief Operations* (See: https://treaties.un.org/Pages/ViewDetails.aspx?src=TREATY&mtdsg_no=XXV-4&chapter=25&lang=en&clang=en). These are Barbados, Dominica, Haiti, St Lucia and St Vincent and the Grenadines.
- National Disaster Plan were only located for a few of the countries, although there is reason to believe most countries have formal National Disaster Plan. Among the plans located, there was considerable variation in the way emergency communications was addressed. In some cases (e.g. Jamaica), detailed SOPs were provided, while in other cases there was little articulation of the provisions for emergency communications beyond identifying the committee responsible.

Within every CDEMA state, the National Disaster Office (which goes by different names in different states). The authority for this function may be derived from national legislation or from Executive decision. Of the 18 CDEMA Participating States, at least 12 currently have specific legislation for disaster management.

Table 2: Review of Telecommunications Aspects of Disaster Plans and Legislation

	Country	Documents/ sources	Key Observations	Remarks
1	Anguilla	<ul style="list-style-type: none"> • National Disaster Plan - Part I (2012)[1] and - National Response Plan - Part II (2012). [2] • Disaster Management Act (2008)[3] • Draft National Comprehensive Disaster Management Policy (2013)[4] 	<ul style="list-style-type: none"> • Section 8 (National Disaster Management Plan) of the Disaster Management Act requires provisions for emergency communications described in Appendix A. • Section 25 of the National Disaster Plan states (a) “The DDM is responsible for the functioning and maintenance of the NEOC emergency communications networks and equipment, both internal and external” (25.1); The DDM is responsible for developing and maintaining an effective warning dissemination and call out notification system for the NEOC. (25.2) • After the “Initial threat confirmation”, the Plan requires that “Communication systems shall be checked and essential repairs made prior to any potential NEOC activation”. • Also stipulates that “Ham” [Amateur Radio] operators “be alerted for potential activation” 	<ul style="list-style-type: none"> • National Disaster Plan and National Response Plan assign responsibility for managing the emergency communication for the NEOC during the alert phase or during or after the disaster. • Some indications of a formal role for Amateur Radio operators to provide communications • In paragraph 9.4, responsibility for “radio and communications systems” falls under the “Logistics Section” • Additionally, Comprehensive Disaster Management (CDM) Policy (2013) document identifies “Maintaining an early warning and emergency communication systems” as a priority strategic intervention.

	Country	Documents/ sources	Key Observations	Remarks
2	Antigua and Barbuda	<ul style="list-style-type: none"> • Disaster Management Act (2002)[5] • Telecommunications Act (2007)[6] • Comprehensive Disaster Management Policy (2015-2017)[7] 	<ul style="list-style-type: none"> • Section 8 of the Disaster Management Act (2002) requires provisions for emergency communications described in Appendix A.; • Section 60 (Telecommunications during a state of emergency) of Telecommunications Act stipulates among other things that when a State of Emergency has been declared, operators will “give priority to requests and orders for the transmission of voice or data that the Governor-General deems necessary in the interest of national security and defence”. • Paragraph (5) of Section 60 states that “Telecommunications suppliers shall develop plans for operating networks and providing services during force majeure and where there is serious and substantial interruption in the provision of telecommunications services, and shall cooperate in the development and implementation of these plans”. 	<ul style="list-style-type: none"> • Paragraph (5) of section 60 seems to indicate a requirement that Telecommunication Service providers develop contingency plans to allow continuity of service during disasters and other events.

	Country	Documents/ sources	Key Observations	Remarks
3	Bahamas	<ul style="list-style-type: none"> Disaster Preparedness and Response Act (2006)[8] Telecommunications Act (2006)[9] 	<ul style="list-style-type: none"> Section 7 of the Disaster Preparedness and Response Act (2006) requires provisions for emergency communications described in Appendix A.; Additionally, Part V Para (12) – stipulates requirement for "wireless telecommunication station" operators to broadcast emergency messages. Telecommunications Act: Section 9 (5) (h) states that a licence may include “conditions relating to provision of emergency services”; 	<ul style="list-style-type: none"> Para (12) (3) of Disaster Preparedness and Response Act states: “(3) It shall be deemed a term of any licence issued to an owner or operator of a wireless telecommunications station that upon the making of, or in the event of there being made, an Order by the Prime Minister under section 27, the station shall comply with any directive given or request made by the Prime Minister, whether orally or in writing or by the Director as regards the broadcasting of bulletins or notices pertaining to an impending or existing disaster”.
4	Barbados	<ul style="list-style-type: none"> Emergency Management Act (2006)[10] Telecommunications Act (2001)[11] 	<ul style="list-style-type: none"> Section 9 (Emergency Management Plan) of the Emergency Management Act (2006) requires provisions for emergency communications described in Appendix A.; Emergency Management Act makes provision for the Director of Emergency Management to operate a “National Alert System”. Paragraph 109 (2) of the Telecommunications Act makes provision for the Crown to “take temporary possession of any telecommunication lines and radio apparatus and installations whether used for public correspondence or not”, during a “period of public emergency” 	

	Country	Documents/ sources	Key Observations	Remarks
5	Belize	<ul style="list-style-type: none"> • Belize Disaster Preparedness and Response Act (2000)[12] • Belize Telecommunications Act (2003)[13] 	<ul style="list-style-type: none"> • Section 8 of the Disaster Preparedness and Response Act (2000) requires provisions for emergency communications described in Appendix A.; 	Telecommunications Act does not make any specific reference to emergency communications
6	British Virgin Islands	<ul style="list-style-type: none"> • Disaster Management Act (2003) • Telecommunications Act (2006) 	<ul style="list-style-type: none"> • Section 11 of the Disaster Management Act (2003) requires provisions for emergency communications described in Appendix A.; • Section 22 makes provision for the operation of a National Emergency Broadcast System • Section 89 (Telecommunications during a Public emergency) of the Telecommunications Act states that “when a period of public emergency has been declared”, the Governor “may authorise the taking of possession and control by the Government of any facilities, telecommunications equipment or service” for the purposes that are indicated in the Act. 	Note that while the 2003 Disaster Management Act is referred to here, a “2011” Act was located during web searches. However, this was in draft form. It was not clear what is the current status of this 2011 version.

	Country	Documents/ sources	Key Observations	Remarks
7	Dominica	<ul style="list-style-type: none"> National Disaster Plan (2001)[14] Telecommunications Act 2000 Emergency Powers Act (1987)[15] 	<ul style="list-style-type: none"> Emergency Powers Act only addresses emergency powers and not broader disaster response issues. No reference to emergency communications. National Disaster Plan includes a diagram outlining the configuration of the emergency communications network and a table indicating deployment of radio equipment Disaster Plan also briefly addresses role of Amateur and CB radio operators. Disaster Plan refers to an Appendix titled “National Emergency Telecommunications Procedures and Guidelines” but this appendix was not located. 	<ul style="list-style-type: none"> Emergency Powers Act is old and limited in scope. However, according to a press release of dated 10 May 2017, appearing on the CDEMA website, “The Office of Disaster Management (ODM) - Commonwealth of Dominica has been awarded Euro 9,640.00 to facilitate a review, consultation and update of their draft Comprehensive Disaster Management (CDM) Legislation”.
8	Grenada	<ul style="list-style-type: none"> National Disaster Plan (2005)[16] Emergency Communications Baseline Assessment and Investment Plan (2014)[17] 	<ul style="list-style-type: none"> National Disaster Plan provides for creation of an Emergency Telecommunications committee chaired by the NTRC and including representatives of services providers and amateur radio operators. Committee’s responsibilities include designing emergency telecommunications plan, training of radio operators and conducting simulation exercises. 	<ul style="list-style-type: none"> No recent Disaster Management Act or equivalent was located for Grenada The CBA report is the output of a consultancy assignment for preparation of a communications management plan and investment program for the Grenada National Disaster Management Agency (NaDMA)..
9	Guyana	<ul style="list-style-type: none"> National Integrated Disaster Risk Management Plan and Implementation Strategy for Guyana: Integrated Disaster Risk Management Plan (2013)[18] 	<ul style="list-style-type: none"> A “Telecommunications” plan is identified as one of the emergency plans needed. 	No current disaster response plans or disaster-specific legislation were located.

	Country	Documents/ sources	Key Observations	Remarks
10	Jamaica	<ul style="list-style-type: none"> Disaster Risk Management Act (2015)[19] National Disaster Action Plan Part 4 (1997)[20] 	<ul style="list-style-type: none"> Part 4 of the Plan focuses on EOC operations Provides SOPs for emergency communications, including job descriptions for Telecommunications Officer and Radio Operator Section 17 of the Act requires provisions for emergency communications similar to that described in Appendix A.; Part VIII. (National Alert System) provides for establishment of a “National Alert System” which may include an “National Emergency Broadcast System” Second Schedule (National Disaster Risk Management Council) provides for inclusion of CEO of each telecommunication service provider on Council 	<ul style="list-style-type: none"> The Act is based on CDEMA’s “Model Comprehensive Disaster Management Legislation” [21], which is more recent than the Model Legislation referred to in Appendix A. It is noted that the Plan is 20 years old. However, no later version was located.
11	Montserrat	<ul style="list-style-type: none"> Disaster Preparedness and Response Act (Revised 2002)[22] Montserrat National Hurricane Plan[23] 	<ul style="list-style-type: none"> Section 8 of the Disaster Management Act requires provisions for emergency communications described in Appendix A.; The “National Hurricane Plan” provides a hazard-specific checklist of actions to be taken in specified timeframes by identified entities. This includes telecommunications responsibilities. 	

	Country	Documents/ sources	Key Observations	Remarks
12	St Kitts and Nevis	<ul style="list-style-type: none"> • National Disaster Management Act (2002)[24] • St Kitts & Nevis National Disaster Plan (2013)[25-27] • St Kitts & Nevis EOC SOP (2015)[28] • Nevis Disaster Plan Draft (2011)[29] 	<ul style="list-style-type: none"> • Section 12 (National Disaster Management Plan) of the Disaster Management Act requires provisions for emergency communications described in Appendix A.; • National Disaster Plan provides for an “Education, Communications and Warning Sub Committee” whose responsibilities include emergency communications. • The EOC SOP document further defines responsibilities of staff, including communications and information management. • Nevis Disaster Plan makes provision for an Emergency Telecommunications Centre (ETC) within the EOC 	
13	St Lucia	<ul style="list-style-type: none"> • Disaster Management Act (2006)[30] • National Emergency Management Plan (2007)[31] • National Emergency Management System - Companion to the National Emergency Management Plan (2011)[32] 	<ul style="list-style-type: none"> • Section 11 (National Emergency and Disaster Response Plan) of the Disaster Management Act requires provisions for emergency communications described in Appendix A.; • National Emergency Management Plan assigns responsibility for Emergency Communications to a Telecommunications Subcommittee that includes government, private sector and Amateur Radio membership. 	

	Country	Documents/ sources	Key Observations	Remarks
14	St Vincent and the Grenadines	<ul style="list-style-type: none"> National Emergency and Disaster Management Act, (2006)[33] St. Vincent and the Grenadines National Disaster Plan (2005)[34] 	<ul style="list-style-type: none"> Section 17 of Act requires provisions for emergency communications described in Appendix A.; Part II (National Emergency Management Organization) of Disaster Management act, explicitly identifies “Managers” of companies providing telecommunications services as part of the National Emergency Council. NEC to establish sub-committees as necessary, including emergency telecommunications (9 (1) (g). According to National Plan (2005) this subcommittee includes representatives of main service providers as well as amateur radio clubs National Plan provides detailed listing of role of each of the entities involved (including emergency communications) 	<ul style="list-style-type: none"> In addition to the National Disaster Plan, there are a number of hazard-specific (e.g. Volcano, Flood) and function-specific plans that form annexes to the National Plan Not clear if the version of the National Plan located is latest available. Noted that a 2014 version of the Volcano Plan is available
15	Suriname	<ul style="list-style-type: none"> Disaster Risk Reduction Country Document for Suriname (2014)[35] 	<ul style="list-style-type: none"> No disaster-specific legislation located. No National Disaster Plan located 	DRR Country document alludes to weak communications capability as a vulnerability, e.g. stating that “the lack of communication and warning systems emphasize the vulnerability of remote communities” (p.11).
16	Trinidad and Tobago	<ul style="list-style-type: none"> Disaster Measures Act (1978)[36] Consultative Document on the National Emergency Communications Plan (2017)[37] 	<ul style="list-style-type: none"> Disaster Measures Act deals with emergency powers and not broader Disaster Management issues (such as emergency communications) The National Emergency Communications Plan document “outlines emergency communication mechanisms and the roles and responsibilities of responder agencies”. 	According to the ODPM’s website, “Currently the primary piece of legislation governing disaster management in Trinidad and Tobago is the Disasters Measures Act Chapter 16:50 (Act 47 of 1978).” (http://www.odpm.gov.tt/node/159)

	Country	Documents/ sources	Key Observations	Remarks
17	Turks and Caicos Islands	<ul style="list-style-type: none"> • Disaster Management Ordinance (2015)[38] • National Disaster Management Plan (Third Draft, 2014) [39] • NEOC Standard Operating Procedures Manual (Revised 2013)[40] 	<ul style="list-style-type: none"> • Section 5 of Ordinance requires provisions for emergency communications described in Appendix A. • NEOC SOPs outline staffing and responsibilities in NEOC, including emergency communication responsibilities of service providers, amateur radio operators, etc. • The National Disaster Plan provides more comprehensive discussion on the role and responsibilities of various parties, including responsibility for emergency communications. 	

3. LESSONS FROM THE 2017 HURRICANE SEASON

The TOR of the study was prepared before the start of the 2017 Hurricane Season, and as such made no reference to addressing the events that subsequently took place. However, the severe impact of Hurricanes Irma and Maria on some Caribbean territories make it worthwhile to address lessons learnt with regard to Emergency Telecommunications.

With the assistance of CDEMA, a questionnaire was sent to the member states most directly impacted by the 2017 hurricanes. The questionnaire addressed four (4) areas:

- Resilience of the network, particularly the “before” and “after” status of the various components
- Challenges encountered with Emergency Communications
- External assistance
- Lessons Learnt

Responses were received from Anguilla and British Virgin Islands. These are presented in the subsequent sections.

3.1 Response to Questionnaire - Anguilla

The responses were received 22 November, 2017 and were provided by Deputy Director, Department of Disaster Management. Response to each of the four (4) questions are shown below:

(a) *Of the various communications methods and resources available prior to impact (e.g. public telephone system, radio networks, satellite phones, etc), how did each one fare? (in terms of its availability and level of functionality during and after the event)*

COMMUNICATIONS NETWORK			
	MEDIUM	BEFORE	AFTER
1	PHONE SYSTEM	Landline, smart phones worked well	Landline network suffered tremendously and is being restored along with power. One cellular provider retained connectivity through the storm. The other cellular provider was online a few days after Irma's passage. This despite 37/40 of the total cell towers on island suffering damage or total destruction.
2	SATELLITE COMMUNICATIONS	All satellite communications were tested worked well before the event	BGAN unit functional after the event. Two Iridium satphones are also functional. VSAT terminal satellite dish destroyed.
3	VHF RADIO NETWORK	All VHF radio networks were functional prior to impact	Both VHF repeaters and antennas survived Irma
4	AMATEUR RADIO COMMUNICATIONS	Functioned before impact	HF radio was repaired immediately after Irma and was functional before the passage of Jose and Maria
5	EMERGENCY MANAGERS WEATHER INFORMATION NETWORK (EMWIN)	Functioned before impact	External antenna was destroyed making it impossible to receive information via satellite. The EMWIN computer also suffered water damage and a replacement has to be sought.
6	MARINE VHF COMMUNICATIONS	Functional before impact	Functional after impact – radio equipment with VHF marine frequencies were used and are still being used for both land and marine communications. VHF antennae at the NEOC was repaired after Irma.
7	ANGUILLA WARNING SYSTEM	Functional before impact	CAP mobile app functional FM broadcast interrupt devices 1 of 4 verified functional. (internet access is the main issue see below) NOAA weather radio antennae destroyed and has to be replaced Email system functional
8	INTERNET	DSL communications , mobile data functioned before impact	ADSL connections were extensively damaged. phone lines are being repaired and replaced along with the restoration of electricity.

(b) *What were the main challenges identified with regard to emergency communications immediately preceding, during and after the impact?*

CHALLENGES WITH EMERGENCY COMMUNICATIONS				
	MEDIUM	PRECEDING	DURING	AFTER
1	PHONE SYSTEM	None	Some capability was retained	Land lines being restored Cellular communications largely restored and functional
2	SATELLITE COMMUNICATIONS	None	Units were mobile no external antennas utilized	Functional except for VSAT
3	VHF RADIO COMMUNICATIONS	None	Used extensively during the event	Functional. All antennas were repaired after Irma.
4	MARINE VHF COMMUNICATIONS	None	Not utilized	
5	AMATEUR RADIO COMMUNICATIONS	None	Used extensively by radio amateurs	No challenges
6	EMERGENCY MANAGERS INFORMATION NETWORK	None	Satellite dish blown away Internet connection lost	Antennae destroyed / missing. Computer not functional
7	INTERNET	None	Land line – sporadic Mobile – none	Landline – minimal Mobile – mostly restored

(c) *Was external assistance to support emergency communications provided or pledged (and the relevant details)?*

Response: No specific assistance to support emergency communications was provided or pledged.

(d) *Were there any challenges in accessing this assistance?*

(No response, given the response to (c) above)

(e) *What lessons/ recommendations have so far emerged from this experience?*

Response:

- The use of solar and wind powered chargers for essential items such as chargers for mobile phones and computers need to be encouraged.
- Resources must be committed to the moving of power and telecommunications underground especially in critical areas or areas with critical infrastructure such as hospitals and Government offices.
- Where possible and cost permitting redundant equipment and services must be made available for critical telecommunications infrastructure.

3.2 Response to Questionnaire - British Virgin Islands

Responses as at 16 November 2017. Responses provided by Telecommunications Officer, Department of Disaster Management.

(a) *Of the various communications methods and resources available prior to impact (e.g. public telephone system, radio networks, satellite phones, etc), how did each one fare? (in terms of its availability and level of functionality during and after the event)*

COMMUNICATIONS NETWORK			
	MEDIUM	BEFORE	AFTER
1	PHONE SYSTEM	LANDLINE, SMART PHONES WORKED WELL	Limited landline capability in and around the capital , smart phone access limited to capital only (please note these answers are related to what happened 2 – 3 days after the event)
2	SATELLITE COMMUNICATIONS	All satellite communications were tested worked well before the event	BGAN Satellite Phones worked well after the event. A number of Iridium handheld units proved difficult to use after the event. Providers contacted and units were fine. Likely issue may have been satellite coverage in this location.
3	VHF RADIO NETWORK	All VHF radio networks were functional prior to impact	Most repeaters lost antennas and entire networks went offline. To date majority of the systems are down and needs replacing.
4	RADIO DATA SYSTEM (RDS)	System was tested prior to impact	Radio Stations's infrastructure was destroyed making the RDS system unable to function. The NEOC was also destroyed which housed the master control unit.
5	AMATEUR RADIO COMMUNICATIONS	Functioned before impact	Functioned immediately after the event. Radio was reinstalled at a temporary location and still functions.
6	EMERGENCY MANAGERS WEATHER INFORMATION NETWORK (EMWIN)	Functioned before impact	External antenna was destroyed making it impossible to receive information via satellite. EOC was destroyed; equipment suffered water damage making it impossible to receive alerts via internet.
7	MARINE VHF COMMUNICATIONS	Functional before impact	Functional after impact – radio equipment with VHF marine frequencies were used and are still being used for both land and marine communications
8	EMERGENCY BROADCAST SYSTEM	Functional before impact	Destruction of NEOC and Radio Stations made this system inoperable.
9	INTERNET	DSL communications , mobile data functioned before impact	DSL communications functioned at a minimal, mobile communications gradually restored as power was reinstated in some locations
10	FM TRANSMITTER	Not utilized	Installed at Virgin Gorda and a community radio station was established which is still on air and functioning

(b) What were the main challenges identified with regard to emergency communications immediately preceding, during and after the impact?

CHALLENGES WITH EMERGENCY COMMUNICATIONS				
	MEDIUM	PRECEDING	DURING	AFTER
1	PHONE SYSTEM	None	Went off	Building destroyed
2	SATELLITE COMMUNICATIONS	None	Units were mobile External antennas not utilized	When using Iridium lots of dropped calls
3	VHF RADIO COMMUNICATIONS	None	Used at a minimal during event	Simplex operation was capable however duplex operation via repeater was not capable
4	MARINE VHF COMMUNICATIONS	None	Many land mobile units not programmed with frequencies	Not many people familiar with marine band operation and procedures
5	AMATEUR RADIO COMMUNICATIONS	None	Not utilized for safety of the users	No challenges
6	EMERGENCY BROADCAST SYSTEM	None	Loss of internet and power at some stations	NEOC and radio stations destroyed
7	RADIO DATA SYSTEM	None	Loss of internet and power at some stations	NEOC and radio stations destroyed
8	EMERGENCY MANAGERS INFORMATION NETWORK	None	Satellite dish blown away Internet connection lost	NEOC destroyed
9	INTERNET	None	Land line – sporadic Mobile – none	Landline – minimal Mobile – minimal

(c) Was external assistance to support emergency communications provided or pledged (and the relevant details)?

- CDEMA provided the expertise in the form of a communications specialist that was stationed with the NEOC staff for over four weeks. This individual was instrumental in helping to re-establish international communications via Amateur Radio Communications. He also provided communications advice to a number of agencies and prepared a report on the restoration of the VHF network in the Territory and assisted with the proposal for re-establishing the network
- The UK military and UK government provided a BGAN 700 and a number of hand held sat phone devices for utilization. DIGICEL provided a number of Huawei mobile wifi routers boxes and mobile smart phones with data and voice. FLOW also provided Huawei boxes.

- Mr. Kurt Richardson, local entrepreneur donated a number of laptops for use by the NEOC and other agencies. British Telecoms also installed VSAT satellite communications with four ip phones and WIFI internet access giving access to other EOCs around the region.

(d) Were there any challenges in accessing this assistance?

- The technical support needed was provided. The biggest challenge came in identifying support for providing the equipment we needed to re-establish communications. Transportation was also a significant issue because of the level of impact to the road network.

(e) What lessons/ recommendations have so far emerged from this experience?

- Establish amateur radio communications in government agencies and introduce amateur radio communications to private citizens to help expedite the recovery process and provide an alternative means of disseminating critical information
- Encourage the population in utilizing more solar powered items and consider purchasing items that is capable of charging via solar or even wind.
- Amend communications plans to reflect areas that need improvement as discovered after the passing the hurricanes.
- Ensure that a stock of replacement equipment is available to support immediate response in this regard

3.3 Observations on Anguilla and BVI response

- It is noted that each country had multiple communication methods available prior to the events
- As expected the terrestrial phone system was severely disrupted, with landlines being worse affected. It was also noted that the restoration of those services began fairly rapidly.
- Services that rely on external antennas and infrastructure, including RDS, VSAT, and repeater-based VHF communications, were very vulnerable to destruction
- Amateur Radio service was made operational relatively quickly
- Difficulties reported with the use of satellite phones.

3.4 Dominica – Hurricane Maria

3.4.1 Overview

Maria, the 13th named storm of the 2017 Atlantic Hurricane Season, became a category 5 hurricane near the Leeward Islands on Monday September 18th, 2017. Hurricane Maria impacted Dominica at approximately 9:35pm on September 18th as an extremely strong hurricane with wind speeds of 155 mph. Maria then impacted Antigua and Barbuda , Montserrat and St. Kitts and Nevis on September 19th, 2017 and the Virgin Islands September 19 -20, 2017. (*Source: Hurricane Maria Situation Report #9, - October 6, 2017 – CDEMA*)

Maria caused extensive damage and significant loss of life in Dominica. Additionally, it caused significant damage to telecommunications infrastructure, leading to major disruption of communications, both during and after impact.

A questionnaire response was not obtained for Dominica, but the effects of Hurricane Maria on telecommunications in Dominica were determined through a combination of means including:

- Discussion with Programme Officer, ITU Caribbean Area Office, who had been involved in ITU’s post-Maria response in Dominica and was familiar with the situation
- Reviews of Situation Reports issued by the Government of the Commonwealth of Dominica, CDEMA, OECS Commission and other regional and international agencies
- Media reports

The following are some of the main observations noted.

3.4.2 Communication Disruption and Recovery

- In the immediate aftermath of the passage of Maria, communications with and within Dominica was severely disrupted. Much of the initial awareness of the extent of damage was based on social media posts by the Prime Minister.
- On 22 September, CDEMA’s Situation Report #2 reported: “Telecommunications system severely damaged with only text messaging available through Digicel and Flow” Also, “Reestablishment of communication networks” and “Communications equipment” were also identified as one the immediate needs.
- CDEMA’s 25 September Situation Report (#4) reproduced a map from MapAction (see Figure 3 below) showing the current telecommunications coverage. As can be seen from the map, service from the main commercial service providers was primarily limited to the south-west coastal region of the island.



Figure 3: Dominica Telecoms coverage status at 25 September 2017. (Source: Map by MapAction. Extracted from CDEMA Situation Report #4).

- It was noted that the Amateur Radio community were on standby prior to the impact of the hurricane (<https://www.iaru-r1.org/index.php/emergency-communications/1717-caribbean-nets-activate-for-hurricane-maria>) and played a critical role in establishing and maintaining communications in the immediate aftermath. (<http://www.arrrl.org/news/caribbean-emergency-weather-network-handling-high-volume-of-post-storm-traffic>)
- Several organizations and groups reported providing emergency communications to Dominica, including the ITU (<http://news.itu.int/hurricane-irma-emergency-telecoms/>), Telecomms Sans Frontier (<https://www.inmarsat.com/news/tsf-connecting-hurricane-hit-dominica/>), Emergency Telecommunications Cluster (<https://www.etcluster.org/blog/photostory-connecting-hurricane-affected-population-dominica>)
- 30 November United Nations Situation Report (#12) stated “Limited telecommunications coverage on the east coast continues to hamper communications and causes important information gaps” while 14 December Situation Report (#13) stated that “Communication remains limited on the east coast. Voice service and data (2G) are unstable in La Plaine and Saint Sauveur.”

The above suggests that progress in restoring communications infrastructure to the east of the country is slow.

The following additional observations emerged from the discussion with the ITU Programme Officer:

- There appeared to be an inadequate level of preparedness among the responsible agencies with regard to emergency communications. Among the effects – several government agencies did not have emergency communications resources available to establish or maintain communications nationally during and after impact.
- There appeared not be an emergency operations plan or lack of awareness of such a plan and its provisions if it existed. (Note: As indicated in section 2 above, a National Disaster Plan dated 2001 was located from web searches).
- The extensive damage to telecommunications infrastructure and the slow restoration by service providers raises questions of the robustness of the infrastructure
- It was not clear which service providers had equipment and which locations suggesting the need for better information on the location and status of critical facilities.
- The Amateur Radio community were very helpful in establishing post-event external communications. However that was a lack of clarity about the role and particularly how to interface with other entities.
- There were some issues with understanding of message handling procedures, including in some cases, a lack of clarity about authority and procedures for disseminating information
- There is a need for more simulation exercises and training.

4. SWOT ANALYSIS

To place the various issues related to emergency communications capability of Caribbean countries in context, and to facilitate the process of developing strategies for improvement, an analysis of Strengths, Weaknesses, Opportunities and Threats (SWOT) was performed. Given the existence of a regional mechanism for Disaster Management, the analysis was performed for the region as a whole, as opposed to individual countries.

It is anticipated that in due course this analysis can be further refined as more data becomes available, and country-level analyses can be performed as part of assessment and planning for national-level interventions.

The SWOT analysis is presented in the table below.

4.1 Strengths

	Item	Description
1	Formally established national and regional mechanisms for Disaster Management	All the countries identified in this report are members of CDEMA, which is governed by a formal Agreement. Each country has a formally designated, full-time national disaster management organization which is responsible for leading the country's disaster management activities. Additionally, there are mechanisms, such as the Comprehensive Disaster Management (CDM) Strategy, for identifying, structuring and pursuing common priorities and strategies.
2	Established legal framework, including explicit responsibility for creating disaster plans	Under the Agreement establishing CDEMA, Participating States have formally committed to establishing and maintaining emergency telecommunications capability (Article XIX, paragraphs (f) and (g)). Further, as shown in Section 2 above several states have passed national legislation that obligates the national disaster organization to develop plans for emergency telecommunications. Thus the foundations for legal framework exist.
3	Established arrangements for regional and international cooperation in disaster management, mutual assistance, and inter-agency coordination	There are established mechanisms at both the national and regional levels, for providing disaster-related assistance to countries (both short-term/emergency and long/term developmental). These mechanisms can be leveraged to address identified weaknesses in countries' emergency telecommunications capabilities.
4	Track record of activities to assess and strengthen national and regional emergency communications networks and arrangements	CDEMA has previously initiated and executed various activities throughout its existence to assess and strengthen the ICT and emergency communications capability of Participating States (e.g. Emergency Telecommunications Review – 2005, ICT Review – 2009). Efforts have included improvement of emergency communications plans and SOPs, improvement in ICT/ communications hardware and facilities and training and exercising. Individual states have also independently or jointly undertaken or participated in initiatives to improve capability.

	Item	Description
5	Wording of existing legislation gives NDOs latitude to engage wide range of participants in communications networks	The wording of existing disaster legislation Participating States allows sufficient latitude for national disaster organizations to engage a wide range of entities at the national or regional level to participate in or support emergency communications networks. This includes for example, commercial telecommunication service providers, government agencies, NGOs and amateur radio operators. In some cases, participation of these groups is mandated by the legislation. This allows for the possibility of maximising the pool of resources and skills available to support emergency communications.
6	Wide range of technologies currently available and used at national and regional levels	There are a wide range of technologies available to support emergency communications. As illustrated in the Anguilla and BVI case studies, a number of these are in use at the national level. The availability of multiple technologies increases redundancy and improves resilience of networks.

4.2 Weaknesses

	Item	Description
1	Persistent weaknesses in national and regional emergency telecommunications networks (both technical and operational)	Telecommunications failures occurring as a result of disaster events during the recent and prior hurricane seasons (e.g. Hurricane Ivan, 2004), despite ongoing efforts to strengthen national and regional emergency communications capability, point to persistent weaknesses in emergency communications networks and operational capability. This includes deficiencies in resources, procedures and skills.
2	Vulnerability of public telecommunications infrastructure	Despite notable improvements over the years the recent events demonstrated that the public telecommunications networks are still vulnerable to extensive disruption, particularly due to damage or destruction of infrastructure and facilities. Further, in many cases the levels of vulnerability or resilience of critical facilities operated by the private service providers is not known to emergency planners and thus cannot be accounted for in national risk and contingency planning.

	Item	Description
3	Apparent of lack of awareness and preparedness (including inadequate training and exercising)	In the case of Dominica, some of the reports suggested there was both a lack of preparedness and a lack of awareness among national entities with regard to emergency communications resources, procedures and responsibilities. This also manifested itself in adequate levels of coordination among national-level entities such as government agencies and amateur radio operators.
4	Low levels of participation in international arrangements (such as Tampere Convention) to simplify access to international assistance in emergency telecommunications	Only five (5) Caribbean countries – Barbados, Dominica, Haiti, St Lucia and St Vincent and the Grenadines are currently signatories to the Tampere Convention ²
5	Inadequate resources to invest in developing and maintaining resilient communications networks	While various technical and non-technical approaches are available for making communications networks more resilient to disasters, these require investments for which the necessary resources may not be immediately available.
6	No evidence of routine risk assessment for emergency communications at national level	There have been occasional evaluations and communication exercises to assess emergency communications capability at the regional level and at the national level in some countries. However, there does not appear to be an established practice of routine assessments at either the national or regional levels. In particular, there is no indication that the risk and vulnerability of the resources relied on for emergency communications is routinely assessed.

² See: https://treaties.un.org/Pages/ViewDetails.aspx?src=TREATY&mtdsg_no=XXV-4&chapter=25&lang=en&clang=en for a list of signatories.

4.3 Opportunities

	Item	Description
1	Development of improved operational emergency telecommunications plans	For several countries, national legislation requires development and periodic review emergency communications plans. Formal plans should be developed where they do not currently exist while existing plans should be reviewed with a view to making improvements, taking into account lessons learnt from recent events.
2	Increase awareness of Emergency Communications plans and responsibilities among key agencies and individuals	Take action to ensure that all entities – organizations and individuals, that have a designated role within the emergency communications network is aware of the emergency communications plan, and their specific responsibilities.
3	Improvements to legislative/ regulatory framework to introduce more explicit obligations for maintaining suitable emergency communications capability	Within the legislative and regulatory framework to support emergency communications, there should be clear accountability for the responsibilities of various parties. This should include, where appropriate, sanctions for not fulfilling the designated role.
4	Introduction of mandatory periodic emergency communications exercising and reporting at the national level	More rigorous and systematic exercising and evaluation of emergency telecommunications systems, resources and participants Also, all entities with designated roles should be required to formally report on their participation. The outputs of this process will be used to assess and improve their capabilities.
5	More effective training for emergency communication network participants	Training should be provided for all network participants to ensure not only that they have the basic skills required, but that they fully understand their roles and responsibilities vis-à-vis other network participants, and relative to specific scenarios. Where practical, this should be supported by or incorporated into appropriate simulation exercises.
6	Definition of minimum levels of emergency communications capability	Efforts should be made to define minimum standards for national emergency communications capability for Caribbean countries. The standard should be functional in that it should specify what a country should be able to do (as opposed to what resources it should have). Plans of Action can then be developed to assist individual countries in achieving the standard.
7	Access available international assistance to improve resilience of emergency communications as part of overall disaster and climate-resilience thrust	In addition to participating in arrangements for emergency communications assistance, Caribbean countries should also pursue opportunities for assistance to strengthen resilience of emergency communications networks.

4.4 Threats

	Item	Description
1	Predicted increase in intensity and frequency of extreme weather	With predictions that global warming and climate change will lead to more frequent or more intense occurrences of extreme weather such as hurricanes and floods, the threat to the emergency communications infrastructure can be expected to increase.
2	Continuing vulnerability, susceptibility and inadequacy of emergency telecommunications networks	Unless significant improvements are made in the short-term, the countries of the region will continue to be vulnerable to severe communications disruption due to natural or man-made disasters.
3	Increased cost of providing telecommunications services (both routine and emergency)	The destruction of telecommunications infrastructure inevitably results in a need to rebuild. This may lead to increases in the cost of providing telecommunication services, some of which may be passed on to consumers.
4	Negative effects of disruption of telecommunications amplified as reliance on networks for routine day-to-day activities increase	Given the increasing reliance on telecommunications services – particularly Internet, for daily social, business and government activity including the delivery of critical services, the potential adverse effect of disruptions to telecommunication services will continue to increase.

CONCLUSIONS AND RECOMMENDATIONS

The foregoing review has revealed that the Caribbean countries collectively have in place the foundations of a legal and regulatory framework for emergency communications. This includes a formal agreement at the regional level to specific undertakings by each country, as well as national legislation in most countries that specify responsibilities for emergency communications.

However, the events and disruption of the 2017 Hurricane Season have emphasised that the present arrangements whether as documented or as practiced, are not by themselves adequate to ensure that the countries can avoid major disruption of emergency communications in the event of a disaster. The *Draft Regional Emergency Communications Strategy* [41] developed for CDEMA in 2005 proposed a Strategic Objective for Emergency Communications, specified in terms of national and regional capability:

National and regional Disaster Management organizations in the Caribbean have the capability to effectively communicate, transfer and manage information as required to support emergency response activities, before, during and after disaster events.

Such an approach can be revisited to address the current situation. Also, there have been prior activities undertaken or supported by many entities at the national or regional levels, the countries and the region as a whole may benefit from a systematic and consolidated approach to identify and address priority areas.

The items identified under “Opportunities” in section 4.3 above can possibly be pursued after further refinement and prioritization. These items are:

- Development of improved operational emergency telecommunications plans
- Increase awareness of Emergency Communications plans and responsibilities among key agencies and individuals
- Improvements to legislative/ regulatory framework to introduce more explicit obligations for maintaining suitable emergency communications capability
- Introduction of mandatory periodic emergency communications exercising and reporting at the national level
- More effective training for emergency communication network participants
- Definition of minimum levels of emergency communications capability
- Access available international assistance to improve resilience of emergency communications as part of overall disaster and climate-resilience thrust

APPENDIX A: EMERGENCY COMMUNICATION PROVISIONS IN DISASTER MANAGEMENT LEGISLATION

Several CDEMA Participating States have implemented national legislation based on Model Disaster Management Legislation developed in 1996. Thus the Disaster Management Acts of these states contain similar provisions with regard to responsibility for emergency communications.

In all cases, this is addressed under the section covering the requirement for the designated National Disaster Coordinator to prepare and submit an annual “Disaster Preparedness and Response Plan”.

The example below is taken from the Belize Disaster Preparedness and Response Act (2000). The title of the position of “National Disaster Coordinator” varies from country to country, but for the most part, the wording of this section is the same for most of the acts. Items 2 (c), (f) and (g) identify the need for the Plan to address Emergency Communications capability:

- (1) The National Coordinator shall prepare annually, for the approval of the Prime Minister, the National Disaster Preparedness Response Plan, comprising the statement of the contingency arrangements under the coordination of the National Coordinator for responding to the threat or event and aftermath of a disaster in Belize whether or not the threat or the disaster is such as to prompt the declaration of a disaster emergency.
- (2) The National Disaster Preparedness Response Plan shall include -
 - (a) procedures related to disaster preparedness and response of public officers, Ministries and Departments of Government, statutory bodies, local government units, and persons or organisations who volunteer or are required by law to perform functions related to the mitigation of, preparedness for, response to and recovery from emergencies and disasters in Belize ;
 - (b) procedures for coordinating the national disaster response plan and its implementation with the preparation and implementation of disaster response plans of persons and bodies in paragraph (a);
 - (c) procedures for informing persons under paragraph (a) and the public in Belize and elsewhere of the existence of a threatened disaster alert under section 27 or of the existence of a disaster emergency;**
 - (d) procedures for preparing and maintaining inventories of services, systems and supplies for the mitigation of, preparedness for, response to and recovery from emergencies and disasters during a threatened disaster alert under section 27 or the existence of a disaster emergency;
 - (e) procedures for mobilising services and systems for the mitigation of, preparedness for, response to and recovery from emergencies and disasters during a threatened disaster alert under section 27 or the existence of a disaster emergency, including procedures for the manning of Emergency Operations Centres;
 - (f) procedures for the protection and restoration of communications, both nationally and internationally, during a threatened disaster alert under section 27 or in the event or the aftermath of a disaster emergency;**

- (g) procedures for informing persons under paragraph (a) and the public in Belize and elsewhere of the state of affairs during a threatened disaster alert under section 27 or in the event or the aftermath of a disaster emergency;**
- (h) procedures for the release, distribution and replenishment of contingency stores of supplies of food, water, clothing and medical supplies during a threatened disaster alert under section 27 or in the event or the aftermath of a disaster emergency;
- (i) procedures for safeguarding against fire and epidemics during a threatened disaster alert under section 27 or in the event or the aftermath of a disaster emergency;
- (j) procedures for the provision of shelter for persons during a threatened disaster alert under section 27 or in the event or the aftermath of a disaster emergency;
- (k) procedures for cooperation with international organisations and governments of countries outside Belize during a threatened disaster alert under section 27 or in the event or the aftermath of a disaster emergency;
- (l) procedures for accepting and facilitating the distribution of volunteer services and relief supplies during a threatened disaster alert under section 27 or in the event or the aftermath of a disaster emergency;
- (m) procedures to apply in the event that the evacuation of all the residents of any area is considered to be desirable in the event of a disaster emergency;
- (n) procedures to apply in the event that the requisitioning of private property is considered to be desirable in the event of a disaster emergency, including procedures for assessing and paying compensation;
- (o) procedures for protecting life and property from the dangers of looting and riotous behaviour in the event or the aftermath of a disaster emergency.

- (3) The National Coordinator shall consult the National Disaster Preparedness and Response Advisory Committee in the preparation of the National Disaster Preparedness Response Plan.

These provisions are also included in the revised and expanded “Model Comprehensive Disaster Management Legislation 2013” [21]. Additionally, the 2013 revision of the model legislation includes provision the following:

- Establishment of a National Emergency Broadcast System that can be operated directly from the National Emergency Operations Centre
- Operation of Early Warning Systems (EWS) at the District Disaster Management Committee level

Note also that in many cases the national legislation includes a Schedule containing the Agreement establishing CDERA (the “pre-2009” predecessor to CDEMA)

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