C A R I B B E A N
M E T E O R O L O G I C A L
O R G A N I Z A T I O N

REPORT OF THE

ANNUAL MEETING OF DIRECTORS OF METEOROLOGICAL SERVICES

VIRTUAL TELECONFERENCE

17 NOVEMBER 2021

INTRODUCTION

1.1 Under the auspices of the Government of Guyana, the 2021 Meeting of Directors of Meteorological Services was held virtually on Wednesday 17 November 2021, under the Chairmanship of Dr Arlene Laing, Coordinating Director of the Caribbean Meteorological Organization (CMO).

1.2 The Meeting fixed its hours of work and determined the order in which it would conduct its business.

1.3 The Agenda adopted by the Meeting is attached as **ANNEX I** and the list of participants and observers attending the Meeting is attached as **ANNEX II** to this Report.

STATUS OF ACTIONS FROM THE PREVIOUS MEETING

(Agenda Item 2)

2.1 The CMO Headquarters produced a single document containing an ***Action Sheet*** that allowed the Meeting to follow-up on the actions taken to implement the decisions of its previous meeting, and to discuss any further actions if required.

2.2 In this regard, a summary of the decisions of the virtual meeting of 2020 Meeting of the Directors of Meteorological Services (DMS2020) (St Vincent and the Grenadines) was prepared by the CMO Headquarters. The Science and Technology Officer gave the status of actions taken to implement the decisions to the Meeting.

2.3 Arising from the status of actions the **Director (Ag), Antigua and Barbuda Meteorological Service** requested assistance from the CMO Headquarters and the Barbados Meteorological Service to have the Antigua and Barbuda Meteorological Service conform to the requirement of the International Civil Aviation Organization (ICAO) for all aeronautical observations, forecasts, significant weather alerts, forecasts and volcanic ash advisories in IWXXM format. The **Director, Barbados Meteorological Service** offered to work with the Science and Technology Officer, CMO Headquarters to develop an application which can be used the Meteorological Services of CMO Member States.

TRAINING

(Agenda Item 3)

3.1 **Ms Kathy-Ann Caesar**, Chief Meteorologist, Caribbean Institute for Meteorology and Hydrology (CIMH) gave an online presentation on the Meteorological Training offered at the Institute. The presentation provided information on the courses which were completed by the Meteorology Section, the certificates, which were obtained by the participants, the number of passes, conditional passes, failures and incomplete courses. Information was also provided on the quality of the passes.

3.2 The Meeting was informed of the outcome of the meetings, including the review of the proposed Senior-Level Meteorological Technician (SLMT) course, which was presented to the 2021 Meeting of the Directors of Meteorological Services. There were two meetings of the Committee which comprised of a Mr Kathy-Ann Caesar from CIMH, and Directors who desired and the summary of the discussions were:

- There was a need for a SLMT course in 2022.

- Any restructuring of the SLMT programme, should not impact the competence of the graduates. Rather, any change should improve the quality of the programmes and the competence of graduates.
- Due to the COVID-19 pandemic, the conversion of most of its courses to a blended (virtual/face-to-face combination) format would be accelerated. This will reduce the cost of training and accommodate those students who may be unable or unwilling to travel.
- To ensure the competency standards of the online and blended courses were maintained, it would require the National Meteorological and Hydrological Services (NMHSs) to actively and directly support the training programmes.
- It was recommended that NMHSs identify a Liaison officer who would be assigned for each Level of training.
- The request for a shortened SLMT course for persons with a BSc degree in either Mathematics or Physics was repeated. However, CIMH reiterated that due to constraints with teaching UWI degree course and SLMT simultaneously, along with staff limitations, made that difficult.
- The matter of the qualifications of prospective SLMT candidates was raised. It was noted that it would be best if the level of Mathematics and Physics of the prospective candidates was raised to the Caribbean Advanced Proficiency Examination (CAPE) level, like that of UWI. This could ensure that students are better prepared to take the course when they enter the programme. However, CIMH noted that it will remain at the Caribbean Secondary Education Certificate (CSEC) level, until all CMO Member States were satisfied and are able to meet this minimum requirement.
- CIMH was tasked with producing a description of the NEW SLMT proposal with one additional option.

3.3 The new SLMT is proposed as a blended course over an 18-month period, with the following structure:

- ❖ **Bridging Course** – September to December 2021 –
  - The COMET Bridging Course in Mathematics Physics and General Meteorology
  - Self-paced and a must pass Pre-assessment.
- ❖ **Virtual Section** – January to July 2022
  - Synchronous virtual classes.
  - Students must have a passing grade in all core subject areas to move on the Face-to-Face Session
- ❖ **Face to Face Section** – September 2022 to July 2023
  - In person at CIMH
  - Including the Forecast Office Simulation (FOS)

3.4 The Face-to-Face component will be eleven (11) months in duration, with nine (9) months of teaching from September 2022 to July 2023. The Meeting was informed that for the course to be successful, the candidates:

- Cannot be working while on the course;
- Must have the proper administrative support, before, after, and during the course;
- Students must have a proper attitude towards their own success.

3.5 The Meeting was also informed that CIMH is considering putting the following in place:

i. *Applicants with BSc degree in Meteorology (2.5 GPA or higher)*

- These candidates would have the appropriate BIP-M qualifications and only require the training in the Aeronautical Meteorology and forecasting required competencies by taking the Operational Aeronautical Forecasting Course.
- Training would be reduced to 2 to 3 months, with a recommended operational training or On-the-Job-Training of 4 to 6 months. This was in line with most other World Meteorological Organization (WMO) Regional Training Centres (RTCs).
- Risk: *The pool of candidates would be small and may favour the larger CMO Member States.*

ii. *Applicants with BSc degree in Mathematics or Physics*:

- These candidates would need the Basic Instruction Package - Meteorologist (BIP-M) qualifications and the Aeronautical Meteorology training and required competencies.
- Training would be reduced to 15 months, with a recommended operational training of 4 to 6 months, due to the requirements of the University of the West Indies (UWI) programme and staff workload concerns. It was Recalled that the UWI course load has transitioned to a 3-credit course formats, which required all academic meteorology lecturers to be heavily engaged. In concert with required term limits on teaching sessions, it would be difficult to have short course periods unless new human resources are made available.
- Risk: *The pool of candidates* would *be small and may favour the larger CMO Member States.*

iii. *Follow the WMO recommended training track where SLMT candidates are accepted from the ranks of the pool of Medium-Level Meteorological Technician (MLMT) from the NMHS.*

- Graduates from the CIMH's Entry-Level Meteorological Technician (ELMT) and Medium-Level Meteorological Technician (MLMT) courses over the past ten (10) years have the compliant prerequisite of General Meteorology, Mathematics and Physics courses which would enable a candidate to follow on to a SLMT course.
- Candidates with CAPE Maths (Unit 1 and Unit 2) and CAPE Physics (Unit 1) can also be eligible. But will need to take General Meteorology.
- All Meteorological Services should be able to recruit in-house
- In time this option could be reduced to 15 months with the Bridging course in place.
- Risk: *This will always be a lengthy option and cannot be less than 15 months.*

iv. *A standalone SLMT forecasters' course.*

- For this option there would be a need for more lecturers at CIMH to separate the UWI programme from the SLMT programme. The programmes cannot run concurrently with the current staff compliment to achieve the required reduced delivery time. Until a larger staff complement was realized the SLMT course can be no shorter than 15 months.

3.6 There could be a shortened SLMT course every three years, with only the CIMH aeronautical meteorological course offered. However, that would require that there were no other CIMH aeronautical courses offered at the same time (i.e., no ELMT or MLMT).

3.7 The Meeting was also informed of planned short courses and workshop, which were:

- After the successful workshop on Severe Weather Forecast Programme: - future training will include in-country training;
- Training for non-forecasting meteorological services in the area of Hurricane forecaster Competencies;
- Training in the use of satellite imagery to diagnose and track volcanic ash plumes;
- Launching of the recently designed Marine Course for Operational Forecasters;
- Continuation of the Continuous Professional Development Course;
- Launching of the recoded CIMH TAFv software in mid-2022.

3.9 The **Representative of ICAO** commended the CIMH on the aeronautical meteorology training courses, which were offered and the quality of the knowledge attained by students who have graduated from the aeronautical courses. The **Representative of WMO** also expressed gratitude to the CIMH and its willingness to take on multiple responsibilities of WMO activities and also stated that the CIMH methodology should be shared and emulated in other WMO Regions.

OPERATIONAL MATTERS

(Agenda Item 4)

A. Retirement of the Annual Integrated World Weather Watch Monitoring

4.1 The Integrated WWW Monitoring was the integration of the Annual Global Monitoring (AGM) and the Special MTN Monitoring (SMM) in one single scheme. It required National Meteorological Centres (NMC) and Regional Telecommunication Hubs (RTH) to monitor the exchange of observational data on the Global Telecommunication System (GTS) and send the statistics to the WMO Secretariat for elaboration and publication of the results. Member States of the Caribbean Meteorological Organization usually monitored their observations during the Annual Global Monitoring (AGM) from 1-15 October each year and reported the results to the WMO Secretariat.

4.2 Under the WMO Integrated Global Observation System (WIGOS), the WIGOS Data Quality Management System (WDQMS) was developed to monitor and report in near real time, observations received by four centres which are the Deutscher Wetterdienst (DWD), the European Centre for Medium-Range Weather Forecasts (ECMWF), Japan Meteorological Agency (JMA) and the National Centers for Environmental Prediction (NCEP) and it was compared with the Members' information, which was stored in OSCAR/Surface.

4.3 The *Commission for Observation, Infrastructure and Information System*s (INFCOM) at the third part of its first session (12-16 April 2021) produced an information paper on WMO Information System (WIS) Monitoring Procedures and Metadata Quality Indicators. The information paper indicated that IWM and WDQMS were providing similar statistics of observational data. However, WDQMS was providing near-real time updates and web accessible maps, while IWM was a quarterly exercise requiring a longer data collection process. Further, due to the modern design, the near-real-time provision of statistics and the extensibility to cover all WIGOS networks and other needs, the Standing Committee for Information Management and Technology (SC-IMT) supported the further development of WDQMS and suspension of the IWM exercises.

4.4 Further, INFCOM reviewed the data and decided inter alia:

(1) To suspend the operation of the Integrated World Weather Watch Monitoring (IWM) and to adopt the WMO Integrated Global Observing System (WIGOS) Data Quality Monitoring System as operational replacement;

B. Providing Impact-based Forecast and Warning Services through the Common Alerting Protocol (CAP) standard

4.5 The Meeting recalled the discussion on the Common Alerting Protocol (CAP) at the 2019 Meeting of Directors of Meteorological Services (DMS2019_Doc4), Anguilla). This included a free cloud-based CAP editor for the creation and publishing of the alerts internationally through the "Editor Tool", available at https://cap.alert-hub.org/. The tool was initialized for each Member State and it required the Head of the Meteorological Service or National Disaster Office to register with the hub and designate a person authorized to compose or approve alerts.

4.6 The Meeting was informed that at the 18th Session of Regional Association IV (RA IV) (8-11 February 2021) which was held via video conference, the Regional Association decided in regards to "*Providing Impact-based Forecast and Warning Services to stakeholders through the Common Alerting Protocol (CAP) standard*": -

(1) Endorsed the implementation of Impact-based Forecast and Warning Services (IBFWS) by Members through formal engagement with Disaster Management and Civil Protection Authorities (DMCPAs) and other stakeholders;

(2) Adopted the CAP standard for the dissemination of warnings to the stakeholders, as a significant step in the implementation of the Global Multi-hazard Alert System (GMAS) framework in the Region;

(3) Encouraged the Technical Commissions to progress on the development of the GMAS framework implementation plan development and the incorporation of CAP provisions in WMO Technical Regulations.

C. Regional Basic Observing Network and Global Basic Observing Network

4.7 The Regional Basic Synoptic Network (RBSN) consists of approximately 4000 of stations and approximately 3000 stations that comprise the Regional Basic Climatological Network (RBCN), in all of the six WMO Regional Associations. Data from these stations were exchanged globally in real time. These stations would become a major part of the Regional Basic Observing Network, which would replace the RBSN and RBCN.

4.8 Global Numerical Weather Prediction (NWP) and climate reanalysis play essential roles as backbones for all products and services provided by the National Meteorological and Hydrological Services of the WMO Members to their countries, even at regional and local levels. Within the WMO Rolling Review of Requirements (RRR) process, all application areas were listed, with the sole expectation of Space Weather, have some level of dependency on Global NWP and climate reanalysis products.

4.9 The global systems delivering these products depend on access to globally consistent sets of observations provided by surface and space-based observing systems. Preliminary reports from the WDQMS show continued poor availability of surface-based observational data over many areas. This limited the ability of all WMO Members to provide high quality weather and climate products and services to their constituencies.

4.10 In order to ensure that observational requirements for Global NWP and climate reanalysis were met more effectively, a new approach was proposed, in which the basic surface-based observing network that is essential to support these applications was designed and defined at the global level. This network is the ***Global Basic Observing Network*** or GBON.

4.11 The GBON is the foundation upon which the Regional Basic Observing Networks (RBON) are built to respond to requirements of a broader range of WMO application areas, including further requirements of Global NWP beyond the essential base provided by the GBON. Hence, all GBON stations/platforms and their observing programmes were included in the respective RBON of the Region in which they are operating. The design, implementation and management of the GBON would be defined in the *Manual on the WMO Integrated Global Observing System* (WMO-No. 1160), section 3.2.2 Global Basic Observing System.

4.12 In response to the GBON provisions listed in the Manual, Members and relevant international organizations and programmes were requested to commit specific observing stations/platforms with specific observing programmes to be part of the GBON, or to take any steps nationally or regionally to develop the required observing capacity. OSCAR/Surface and WDQMS would play important roles in the designation and monitoring of the GBON stations, respectively.

IMPACTS OF WEATHER DURING 2021

(Agenda Item 5)

5.1 The Caribbean is one of the most disaster-prone regions in the world with impacts from tropical cyclones, seismic activity and active volcanoes, which produce secondary hazards such as floods, droughts, landslides, and coastal inundation. During 2021, the Caribbean experienced all of these impacts to varying degrees, while still managing the effects of the COVID-19 pandemic.

5.2 Most of the Meteorological Services reported flooding as a major impact during and sometimes on the cusps of their rainy seasons. **Guyana** was devastated by **flooding** during May and June, with May recording the second highest rainfall across the country since 1981. By mid-June, 28,228 households were affected by flooding, domestic animals and livestock were in distress and inundated farmlands. The rainfall in June was the twelfth highest across the country since 1981. The economic impact of flooding on agricultural sector was estimated to be USD 121 million.

5.3 On 9th April, **La Soufrière Volcano** in the northern region of **St Vincent** erupted explosively, the **ash cloud** impacted on the neighbouring countries to the north, east, and south. The cloud turned day into night in St Vincent and the Grenadines and Barbados during the heaviest ashfall. The St Vincent and Grenadines Meteorological Service issued specialized forecasts to their marine community and the Water Authority. On 29th April, there was moderate to heavy showers, rain and thunderstorms, over sections of the mainland St. Vincent. Rainfall accumulations ranged from 75 to 150mm during the 24-hour period. **Flooding** and **landslides** were reported in the capital and its surroundings, with the presence of ash in the drainage system exacerbating the flooding. Along the slopes of La Soufrière, lahars occurred from the rainfall, dragging volcanic debris down the slopes, into the water courses and valleys.

5.4 **Barbados** experienced the ash fall from 10th to 14th April, with the northern sections of the island receiving the heaviest concentrations. On 17th June, the island was affected by a **mesocyclone convective system** (MCS), which produced adverse weather conditions for a two-hour period from 0500 UTC. The MCS produced winds of tropical storm strength, which resulted in power outages, fallen trees, and significant property damage.

5.5 **Grenada** experienced **coastal inundation** on 31st January due to gale force raising seas to between 10 to 13 feet along the west coast of the island. There was **flooding** on 4th, 5th and 8th May, associated with moisture advection due to an upper-level trough. There were other flood events on 24th and 30th June, which also produced landslides; both events were caused by propagating tropical waves across the island. There was a reoccurrence of flooding events on 3rd September and 13th October, which were caused by a tropical wave and the Inter-Tropical Convergence Zone respectively.

5.6 Both Trinidad and Tobago and Montserrat experienced flooding albeit at different times during their rainy seasons. **Trinidad and Tobago** experienced **riverine flooding** on 27th July and again on3rd August, which washed cars in the St. Ann's River in northern Trinidad. Southwestern Trinidad experienced a **tornado** on 17th August, which damaged several homes, structures and vehicles. During the early hours of 3rd September, the island of **Trinidad** experienced a **squall line** which damaged more than 500 roofs, created impassable roads with fallen utility poles, and toppled trees, causing loss of electricity. On 27th September in **northeast Trinidad**, a supercell thunderstorm produced **hail** of varying sizes. **Montserrat** experienced **flooding** on 13th October, between 1535 to 1800 UTC on the 13th, 88.7 mm of rainfall was measured.

5.7 An area of disturbed weather to the east of the southern Windwards became Tropical Storm Elsa at 0900 UTC on 1st July. Elsa was upgraded to a hurricane at 1145 UTC on 2nd July, just to the south of Barbados with maximum sustained winds of 65 kt (75 mph). Clouds from the **eyewall** of **Hurricane Elsa** impacted the southwestern sections of **Barbados** between 1120 to 1210 UTC. The maximum wind speed measured in Barbados was 58 kt (67 mph), with a gust of 77 kt (89 mph). Hurricane Elsa damaged 2,733 building with 1,333 homes losing their roofs, 145 collapsed and another 326 had other house damage.

5.8 **Elsa** made landfall over northern portions of **St. Vincent** at 1445 UTC. The hurricane produced rain, heavy showers and thunderstorms over St. Vincent. The rain gauge at Argyle International Airport measured 34.5 mm of rainfall for the 24-hour period ending 1000 UTC on 3rd July, the Central Water and Sewerage Authority (CWSA) stations at Majorca and Jennings measured 57.3 mm and 49.6 mm of rainfall respectively for the same time period. Elsa damaged homes and other infrastructure, downed utility poles and there was the loss of crops and livestock. Flooding, landslides and lahars (settled ash and volcanic debris which are mobilize during rainfall) also occurred in most of the valleys on the volcano. The National Emergency Management Organization (NEMO) reported that over two hundred and fifty (250) houses sustained damages, mainly to the roofs.

5.9 Grenada also had significant impacts from Elsa as it moved across the Windward Islands into the Caribbean Sea. **Elsa** produced **flooding** in five (5) of **Grenada** six (6) parishes and **landslides** in three (3) of the parishes of those which were flooded. This made some roads impassable and affected a number water supply systems. The clearing of the landslides was done by the Ministry of Infrastructure at a amounted to **EC$108,993.00.** The highest rainfall accumulations of 107.6 mm occurred along the western sector in Clozier. At Maurice Bishop International Airport (MBIA), a total of 79.7 mm was received during the 24 hour period.

PRESENTATION

(Agenda Item 6)

6.1 **Ms Anna-Maria Bogdanova**, Operations Officer, World Bank and **Ms Haleh Kootval**, World Bank, together made a presentation entitled. *CREWS Caribbean Priority Actions Transition to Impact-Based Forecasting*.

6.2 Ms Bogdanova provided a progress report of the implementation of the Climate Risk and Early Warnings Systems (CREWS) Caribbean Project. The Meeting was informed that the Regional Multi-Hazard Early Warning Systems (MHEWS) Roadmap was drafted and circulated to the Project Steering Committee (PSC), it was also circulated and commented by regional institutions and those comments have been incorporated into the Roadmap. The Roadmap focuses on a set of Strategic Initiatives (SI), which were of interest and needed by the region. Strategic Initiatives which were identified are:

- SI 1: Supporting the Transition to Impact-Based Forecasting (IBF)
- SI 2: Towards a Caribbean Geospatial Platform
- SI 3: Towards a regional multi-sensor precipitation grid
- SI 4: Integrated Approach to Flooding
- SI 5: Integrating Health Impacts into the MHIEWS
- SI 6: Towards a Caribbean Multi-hazard Operational Plan
- SI 7: Regional Emergency Alert System
- SI 8: Community-based action planning
- SI 9: Sectoral MHIEWS, the Private Sector and Business Continuity Planning

6.3 The Meeting was informed that the priority activities based on the Strategic Initiatives will be approached on a phased basis to optimized sequential implementation of national and regional activities. In the short term, a key objective was to demonstrate the benefits at the national level, the implementation of four agreed Priority Activities through a regional approach. The Priority Activities which were to be implemented are:

a) Supporting a harmonization process to strengthen impact-based forecasting in the region
b) Development of a multi-sensor precipitation grid
c) Setting up an integrated approach to flooding
d) Conducting a feasibility study for a regional Emergency Alert System.

6.4 Ms Haleh Kootval informed the Meeting about the first Priority Activity, which was about supporting the transition to impact-based forecasting (IBF). The goal of the priority activity was to strengthen capacity in IBF services to routinely provide actionable information on the potential impact of hazards, which would support decision making by stakeholders.

6.5 CDEMA engaged a consultant to develop an implementation guide to build capacity in multi-hazard impact-based forecasting in a uniform and structured manner through a step-wise approach. It was expected to develop a series of webinars for practitioners in the region, to guide the different human capacities on IBF to a comprehensive and common understanding among different actors in the Caribbean.

6.6 The Meeting was informed about the twelve implementation steps which ranged from partnerships and community engagement as the first two steps to validation and the issuance of impact forecasts.

OTHER MATTERS
(Agenda Item 7)

7.1 **Captain Robert Harewood**, **Caribbean Disaster Emergency Management Agency** (CDEMA) and **Consultant, Dr Dave K. Roop**, provided the Meeting with a brief overview of the *Consultancy for the Strengthening Early Warning Operational Arrangements between National Disaster Offices (NDOs) and National Meteorological and Hydrological Services (NMHS) in the Caribbean*, which was managed by CDEMA.

7.2 The purpose of the consultancy is to determine what are the frameworks guiding operational arrangements between NMHSs and NDOs, the strengths and weaknesses in the existing frameworks, and the development of Model Standard Operations Procedures (SOPs), or the improvement of already established SOPs for the collaboration/cooperation of NMHSs and NDOs. The consultancy also seeks to test/harmonize the improved and revised model SOPs in four (4) CDEMA Participating States (PSs) for relevance and appropriateness to institutions.

7.3 The outputs of the consultancy would provide input into the remainder of the CREWS Caribbean project and the WMO's wider regional programme. The project also has synergies with the CDEMA-supported Weather Ready Nations (WRN) impact-based forecasting project, implemented in Barbados to help the Participating State become a Weather and Climate-Ready Nation.

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C A R I B B E A N M E T E O R O L O G I C A L O R G A N I Z A T I O N

ANNUAL MEETING OF DIRECTORS OF METEOROLOGICAL SERVICES **Doc. 1(a)**

VIRTUAL MEETING, 17 NOVEMBER 2021

AGENDA

1. INTRODUCTION AND ADOPTION OF AGENDA
2. STATUS OF ACTIONS FROM THE PREVIOUS MEETING
3. TRAINING
4. OPERATIONAL MATTERS
   (a) Retirement of the Annual Integrated World Weather Watch Monitoring
   (b) Providing Impact-based Forecast and Warning Services through the Common Alerting Protocol (CAP) Standard
   (c) Regional Basic Observing Network
5. THE IMPACTS OF WEATHER DURING 2021
6. OTHER MATTERS
7. MATTERS

ANNUAL MEETING OF DIRECTORS OF METEOROLOGICAL SERVICES
VIRTUAL MEETING

17 NOVEMBER 2021

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