FINAL REPORT OF THE FIFTY-NINTH MEETING OF THE CARIBBEAN METEOROLOGICAL COUNCIL

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CHAIRPERSON:

Honourable Curtis Richardson, Minister of Infrastructure, Communications, Utilities, Housing, Agriculture, Fisheries, and Environment of **Anguilla**

VENUE AND DATE:

The Cove,
ANGUILLA
14-15 NOVEMBER 2019

1 OPENING OF THE SESSION AND ELECTION OF CHAIRPERSON

1.1. At the kind invitation of the Anguilla Air and Sea Ports Authority (AASPA), in conjunction with the Government of Anguilla, the Fifty-ninth Session of the Caribbean Meteorological Council was held at The Cove in Anguilla on 14-15 November 2019. The Caribbean Meteorological Council is the Governing and policy-making body of the Caribbean Meteorological Organization (CMO).

1.2. ***Mr Bancroft Battick*****,** Chief Engineer, Ministry of Infrastructure, Communications, Utilities, Housing, Agriculture, Fisheries, and Environment (ICUHAFE) of **Anguilla**, commenced the Opening Session of the Meeting by extending words of welcome after the National Song and a prayer.

1.3. ***Dr Arlene Laing***, Coordinating Director of the CMO, thanked the Anguilla Air and Sea Port Authority (AASPA) and the Government of Anguilla for their hospitality, noting in particular, the tremendous work done by Ms Roshima Roberts, Air Traffic Services Manager of AASPA. Dr Laing then spoke about the role played by the Caribbean Meteorological Organization in fostering scientific and technical cooperation among the Member States. She highlighted the role of National Meteorological and Hydrometeorological Services as a critical service whose primary mission was to save lives, livelihoods, and property but who also added value to the economies of the region and helped the public and private sectors to make better decisions. She noted an example of a National Meteorological Service that provided an outlook for drought to its national government, which then used that information to apply for development funds to mitigate the impacts of the drought; with certification of the drought conditions made by the Caribbean Institute for Meteorology and Hydrology (CIMH), the technical organ of the CMO. She noted that information from the National Meteorological Services and the CIMH were valuable for action by several sectors, such as disaster management, agriculture, public health, water resources, and energy. She also highlighted CMO's advocacy for the safety of Caribbean citizens by working with the Caribbean Telecommunications Union (CTU) to help protect the radio frequencies used for weather observations from satellites, which are vital for forecasting weather in the Caribbean.

1.4. ***Mr Rodney G Martinez Guingla,*** the World Meteorological Organization's Representative for North America, Central America and the Caribbean, addressed the Council on behalf of the WMO Secretary-General, *Prof. Petteri Taalas*. As a newcomer to the region and the Organization, Mr Martinez Guingla took the opportunity to introduce himself, his professional service as an oceanographer, his experience working on climate issues such as El Niño-Southern Oscillation (ENSO), and his endeavour to support the CMO and its National Meteorological and Hydrometeorological Services as the head of the WMO Regional Officer for North America, Central America, and the Caribbean. He noted the fine example that CIMH has set for the world with its Regional Training Centre and contributions to the Global Campus and its Regional Climate Centre, as a world leader in demonstrating successful partnerships with climate sensitive sectors. Mr Martinez Guingla also delivered regards from his predecessor, *Mr Oscar Arango*.

1.5. The feature address was delivered by the ***Honourable Curtis Richardson***, Minister of Infrastructure, Communications, Utilities, Housing, Agriculture, Fisheries, and Environment of Anguilla. In welcoming delegates to the 59th Session of the Caribbean Meteorological Council (CMC), Minister Richardson expressed how pleased Anguilla was to host the meetings. He then spoke of his early interest in weather observations and how he came to have a greater appreciation for the meteorological services in saving lives during the 2017 passage of Hurricane Irma, which made landfall in Anguilla. He noted the value of information provided by the National Meteorological Services about extreme weather events, especially for warnings on Hurricanes Irma and Maria. He noted how much worse the outcomes would have been without the timely updates from the Meteorological Services, which "spurred many to life saving actions", including himself. He expressing his gratitude for the work of the WMO and the CMO; lauding the CMO for helping to shape policies on disaster mitigation and adaptation within the Caribbean, and for providing

enormously valuable weather and climate information to regional governments, to help them to prepare for extreme weather events and climate change. He exhorted technical persons in our regional universities, and other institutions of higher learning, to rise to the challenge of developing areas of expertise that push the science of meteorology to address social and economic challenges, including improving food security, addressing health challenges, and contributing to our tourism sector. He painted a picture of the vulnerability of our main economic engine of tourism, going from "a glorious orchestra of joy to a dangling discord of musical confusion"; from beautiful beaches full of guests relaxing in their chairs to no beach or chairs in an instant. Even with the challenges, he expressed hope that we will find solutions to help to inoculate us from these hazards, to which we are exposed due to geographic location and size. He also asked the audience to consider the cost of inaction on the GDP and the socio-economic sectors of our region. He ended his address by pleading with meteorologists and climate specialists to continue advocating for their professions and services that they provide because our lives and economies rely on their valuable guidance.

1.6. After the feature address, ***Mr Fabian Fahie, Chairman/Accountable Manager, AASPA*** delivered the closing remarks and a vote of thanks to all speakers, to the Jazz band, and to his colleagues at AASPA for hosting this Council session and related meetings and for the excellent facilities, arrangements and hospitality that would contribute to a successful Council session.

1.7. The Meeting elected the **Honourable *Curtis Richardson*** as the Chair of the Caribbean Meteorological Council for its 59th session and the intercessional period until the next annual meeting of the Council**.**

2 ADOPTION OF AGENDA AND PROCEDURAL MATTERS

2.1. The Agenda adopted by the Meeting is shown in **ANNEX I** of this Report. The Meeting fixed its hours of work and determined the order in which it would conduct its business. The list of Delegates attending the Meeting is attached as **ANNEX II** to this Report.

3 CMO EXECUTIVE REPORTS

3(a) Coordinating Director's Report

3.1. The Coordinating Director reported on the activities and issues concerning the CMO Headquarters Unit since the previous session of the Council. The Council first engaged in a brief review of the impacts of weather in the region, noting, in particular, the catastrophic impact of Hurricane **Dorian** in the Bahamas. The first half of the hurricane season was relatively quiet with only three named storms up until the third week in August. On 23rd August, then Tropical Storm **Dorian** brought winds and rain to the islands of the Eastern Caribbean. As a Category 1 hurricane, Dorian was the first hurricane to pass by the Virgin Islands and Puerto Rico since 2017. After intensifying to a Category 5 Hurricane just east of the Bahamas, the powerful, record-breaking hurricane devastated Grand Bahama and Abaco Islands, with 185 mph winds, gusting to 220 mph; the strongest Atlantic hurricane at landfall. As of 1 October 2019, the number of fatalities from Dorian stood at 60, with hundreds missing. Three weeks after Dorian, Tropical Storm **Karen** brought rains, floods, and some strong winds to the Windward Islands. It weakened to a tropical depression while moving northward over the eastern Caribbean Sea then re-intensified before making landfall in eastern Puerto Rico. Council was informed of the Coordinating Director acting as a liaison with a number of international organizations on behalf of Member States, to aid in hurricane preparedness. Specifically, liaising with NOAA/NWS International Training Desk to convey outlooks for heavy rainfall and sharing experimental high-resolution weather model guidance from the UK Met Office and NOAA Earth System Research Laboratory with CIMH and Member States.

3.2. Council noted that Coordinating Director led the CMO delegation to the 9th International Workshop on Tropical Cyclones held in Hawaii. The IWTC, held every four years, is a forum for knowledge exchange between tropical cyclone researchers and forecasters. The CMO delegation, which included Ms Margaret Mayers-Als of CIMH and Mr Dale Destin of the Antigua and Barbuda Meteorological Service, actively participated in the workshop and ensured that written contributions from CMO were reflected in the final set of recommendations submitted to the WMO Tropical Cyclone Programme.

3.3. Council noted that National Meteorological and Hydrometeorological Services needed comprehensive legislation for their operations; to clearly define their roles and responsibilities; the extent of their authority; their organizational structure and funding mechanisms. The CMO Headquarters was collaborating with the Organization of Eastern Caribbean States (OECS), with the support of the CIMH, on a proposal for the drafting of harmonized model legislation for National Meteorological Service of CMO Member States. The development of model legislation would be supported by the WMO *Climate Risk and Early Warning Systems (CREWS) Caribbean* project for the period 2020-2021.

3.4. The engagement of the CMO Headquarters with the *Regional Maritime Adviser of the International Maritime Organization* (IMO) was noted by Council. As part of an outreach to the regional maritime community, the CMO Headquarters conducted interviews with marine customers and forecasters, to understand their service needs and to guide WMO in developing new Marine Meteorology Service Delivery training to benefit regional forecasters.

3.5. Council was reminded of its resolution issued in respect of the responsibility of the Eastern Caribbean Civil Aviation Authority (ECCAA) to perform the audit of the meteorological service providers within the Eastern Caribbean countries under safety oversight as per their legal mandate. Council was informed that the CMO Headquarters wrote to ECCAA during 2019, as directed, but there had been no response or acknowledgement of the correspondence. A few Member States of the OECS reported to Council that ECCCA had visited their airports and had initiated audits of their services. It thus appears that ECCCA is in the process of fulfilling the mandate requested by Council, but it was advisable to monitor the situation and revisit the matter if necessary.

3.6. Council recalled its discussions over the last few years concerning the establishment of a *Caribbean Community Administrative Tribunal* (CCAT). In February 2019, the Heads of Government of the Caribbean Community adopted the CCAT Statute and the CCAT was scheduled to be launched on 30 January 2020. Council noted that the Coordinating Director was a Member of the CCAT Steering Committee. The governing bodies of the Community Institutions were requested to sign the Declaration to submit to the jurisdiction of the CCAT by the launch date. Council was reminded of the agreement that the overall CMO contribution for both the CMO Headquarters and the CIMH be included in the budget of the CMO Headquarters. At CMC58, Council authorized the Coordinating Director to sign the legal documents submitting the Organization to the jurisdiction of the CCAT. However, given that the CMO Headquarters has a small non-unionized staff and is governed by a host country agreement in Trinidad and Tobago, while the CIMH is unionized and without a concluded Host Country Agreement in Barbados, Council was asked to rescind the decision of CMC58 and approve separate signature authority for each organ of the CMO.

3.7. The Council discussed the CMO Headquarters attendance at the 18th WMO Congress and the major reforms of the WMO structure and its corresponding strategic goals and the implications of those changes for the CMO Member States. Emanating from the Congress would be the implementation of several global programmes and initiatives, some of which would involve the Caribbean region, in general, and CMO Member States, in particular. This included the implementation of the WMO Integrated Global Observing System (WIGOS), the Global Multi-hazard Alert System (GMAS), new integrated weather services, the Alliance for Hydromet Development, a

joint initiative of the World Bank and WMO as at mechanism for resource mobilization for Member States.

3.8. The Headquarters Unit also prepared a Strategic Plan for 2020-2023, with input from Member States and the CIMH. The plan which was aligned with the WMO strategic priorities and regional development partners, focused on enhancing the capabilities of National Meteorological and Hydrometeorological Services of CMO Member States and the alignment of CMO Headquarters workforce to facilitate those strategic goals. The Plan was developed using a Results-based Management System (RBMS) as required for all Caribbean Community Institutions.

3.9. Council was provided with background information on the *Caribbean Meteorological Foundation* (CMF), which is an Organ of the CMO that was never functional, and asked to revisit discussions started at CMC58 on the re-implementation of the CMF. Council advised the CMO Headquarters to investigate the undertaking a formal review of CMO to determine the optimal structure and operations of the Organization and the functionality of CMF, especially in light of the ability of the CIMH to raise funds independent of the CMF.

3.10. Council noted the potential negative effects of new International Mobile Telecommunications technology on weather observations and forecasts, and the efforts of the CMO Headquarters to mitigated those impacts, following the resolution from the WMO Congress expressing its “serious concern at the continuing threat to several radio-frequency bands allocated to the meteorological aids, meteorological-satellite, Earth exploration satellite and radiolocation (weather and wind profiler radars) services posed by the development of other radio communication services.” The CMO Headquarters made a formal appeal to the *Caribbean Telecommunications Union* (CTU) and the CTU gave favourable consideration to CMO's appeal. The CTU recommended that its Members support regional proposals, that promote safety and safety related services, inclusive of meteorological and related environmental observations at the World Radio Communications conference being held from 28 October to 22 November in Egypt.

3.11. It was noted that the Coordinating Director was invited to give the 2019 Tarbell Lecture in the Department of Meteorology and Atmospheric Sciences, Pennsylvania State University. That lecture and visit was a vehicle for recruitment to the Caribbean and for developing collaboration with researchers and professors.

3.12. Council noted that, by the end of September 2019, the level of financial contributions received from Member States had improved over last year, standing at 74% compared with only 68% at the same period in 2018. It was also noted that, with a lower than normal level of Member contributions during 2018, some approved activities had to be postponed in 2019.

3.13. The Coordinating Director briefed the Council on some of the scientific, technical and training events in which technical staff of the CIMH and the Services participated and the Headquarters facilitated. Council noted that the schedule of activities undertaken by the CMO Headquarters had been quite heavy, particularly in a year that included a Congress of the WMO, the initiation of the Climate Risk and Early Warning Systems (CREWS)-Caribbean Project, and other initiatives related to early warning systems.

3.14. Council congratulated ***Mr Evan Thompson***, Director of the Meteorological Service of Jamaica, in his new role as ***Acting President of WMO RA IV***. Mr Thompson was nominated to replace *Dr Albert Martis*, as Vice President of WMO RA IV and was subsequently asked to serve as President on the retirement of *Mr Juan Carlos Fallas*, President of RA IV.

3.15. Council noted the official retirements of several Members of Council, starting with the retired Coordinating Director, ***Mr Tyrone Sutherland***, on 30 November 2018. The CMO

Headquarters arranged the production of a video feature on his years in Meteorology, which aired on CaribVision.

3.16. Special tribute was paid to ***Mr Keithley Meade,*** who retired as the Director of the Antigua and Barbuda Meteorological Services in May 2019. Mr Meade joined the Meteorological Service in 1980 and worked in several areas, before becoming the Director in 2008. He also served as the Deputy Co-Chairman of the WMO Regional Hurricane Committee and on the Regional Sub-project Management Team for the Severe Weather Forecast Demonstration Project - Eastern Caribbean. The Council wished Mr Meade well in his retirement.

3.17. Council also lauded the contributions of ***Mrs Corsel Robertson*** who retired as Director of Airports, in St Vincent and the Grenadines. Mrs Robertson served in that position since 2006, when she joined the Council. She was an active participant in CMC Sessions and recently served as the Chair of the Human Resources Committee of the Council. The Council wished Mrs Robinson well in her retirement and transition to a new position.

3.18. Council welcomed three new Heads of Meteorological Offices of Member States: ***Mr Dale Destin***, Director (Ag) of the Antigua and Barbuda Meteorological Service, and ***Mr Andre Joyeux***, Director of the Saint Lucia Meteorological Services. It also congratulated ***Ms Andrea Best***, the new Director of Airports (Ag), St Vincent and the Grenadines on her assumption of duty.

3.19. **The Council**:

(i) **Noted** the activities and issues concerning the CMO Headquarters in 2019 as well as those issues concerning the wider Caribbean Community;

(ii) **Discussed** the impact of the 2019 hurricane and rainy season on the region and, in particular, the impact on CMO Member States;

(iii) **Rescinded** the authorization given at CMC58 to the Coordinating Director to sign the Declaration of Recognition of the Jurisdiction of the Caribbean Community Administrative Tribunal (CCAT) on behalf of the Organization;

(iv) **Approved** the signing of the Declaration of Recognition of the Jurisdiction of the Caribbean Community Administrative Tribunal (CCAT) by the Coordinating Director on behalf of the CMO Headquarters, and by the Principal of the CIMH on behalf of CIMH, respectively.

(v) **Recommended** that the CMO Headquarters Unit seek resources for the undertaking of a review of the CMO, to provide guidance on the re-implementation of the Caribbean Meteorological Foundation (CMF) and present the results of the review to Council. Council would then make a decision concerning the future of the CMF.

(vi) **Noted** and **congratulated** Mr Evan Thompson on his nomination as Acting President of WMO RAIV.

3(b) CIMH Principal's Report

3.20. The Principal started the presentation by noting the passing of four (4) members of the regional meteorological community:

- Ms. Adeline Ifill (retired Technical Officer at CIMH)
- Ms. Rosalind Blenman (Barbados Meteorological Service)
- Mr. Emelien Peter (Barbados Meteorological Service)
- Ms. Lorna Collymore (Former employee of the Barbados Meteorological Service)

Their service to the meteorological community was honored with a moment of silence.

3.21. The Principal as, has become the custom in recent years, addressed the value for money proposition as it relates to the values of the services the CIMH provides to the region. He noted that many of the services were critical to (i) building the region's resilience to climate and hydrological hazards, (ii) identifying new important opportunities and partnership that are improving sector performance and (iii) building current and future regional capacity. The Principal highlighted CIMH's strategy for attracting investment and funding. In particular, he noted CIMH's strategy for aligning aspects of its programme to the global and regional strategies of the development community. The Principal also noted the significant effort the CIMH puts into innovative programmes.

3.22. The Principal noted significant value the CIMH continues to derive from international partnerships. In particular, he noted that it offered the chance to (i) share its expertise, (ii) build its own capabilities through partnerships and collaboration and (iii) enhance its brand and reputation.

3.23. The Principal highlighted its continuing South-South partnership with the South Pacific. In particular, he noted the new South-South arrangement through the CREWS funding mechanism that will likely see students from the South Pacific take courses at CIMH.

3.24. The Principal informed the Council that during August through September 2019, CIMH was invited to attend and share its experience at two meetings in the South Pacific - (i) the 5th Pacific Meteorological Council meeting in Samoa in August 2019 and (ii) a workshop on Impact Based Forecast and Early Warning Services conducted in Solomon Islands in September 2019. Other areas of technical exchange would be developed under the CREWS Initiative

3.25. The Principal outlined the status of the upcoming EUREC^{4}A-ATOMIC-OA field campaign (mid-January through mid-February 2020). The Principal noted the campaign, represented the largest and most sophisticated campaign of this kind ever conducted

3.26. The Principal noted the considerable opportunity to be gained from the region's participation in the campaign. The Principal further noted the significantly level of innovation and new technologies that would be on display and utilized under the field campaign. The Principal informed that to date, national governments, military institutions, academics including students, and operational forecasters have been tightly integrated into the campaign. He further noted that a range of training programmes would also be conducted. In addition, it was noted that a special symposium recognizing the 50th anniversary of the Barbados Oceanic and Meteorological Experiment (BOMEX) which significantly advanced global understanding of tropical oceanic and atmospheric processes, would be held.

3.27. The Principal updated the Council on the status of the regional climate services programme. In particular, he addressed the funding of the programme noting the significant resources currently available for implementing climate services in the region. In particular, it was noted the funds that were available under, for example, (i) the Climate Risk Early Warning Systems (CREWS) initiative which had already committed USD 250,000, (ii) the Intra ACP-EU Climate Services programme which had committed EUR 9 million to development and implementation of climate services in the Caribbean, and (iii) the Pilot Project for Climate Resilience (PPCR) committed USD 975,000 for the development and delivery of climate services in PPCR participating countries and Member Countries of the Inter-American Development Bank (IADB). The Principal noted other funding secured while also highlighting CIMH's plan to approach the Green Climate Fund (GCF) in 2020 to secure a USD 10 million programme under their Simplified Application Programme…

3.28. The Principal noted the many products and services currently being delivered by the WMO Regional Climate Centre for the Caribbean hosted by the CIMH as well as (i) the many regional and international collaborations and partnerships it attracted since it was established and (ii) the areas of global research it is pioneering.

3.29. The Principal addressed the training programme noting its many achievements as well as areas of concern. The Principal noted that the CIMH continued to be one of the best performing of the many WMO Regional Training Centres (RTCs).

3.30. The Principal noted concerns about student performances across its programmes. In particular, while he noted that student performances were reasonably good, he noted the lack of students attaining First Class Honors Degrees in UWI programme as well as the lack students achieving Distinctions in the vocational courses offered directly through CIMH. The Principal noted that an increasing number of students are coming to the CIMH and the UWI unprepared and considerable effort was being expended to prepare them for their course of study. Nevertheless, it was pointed out that the CIMH would continue to seek approaches to remedy the situation.

3.31. The Principal informed the Council of new and continuing initiatives the CIMH was involved in including its leadership role in the WMO Global Campus which has resulted in the programme being funded by the WMO. The Principal also noted that the WMO Global Campus Calendar which facilitated the sharing of course calendars and course information across WMO RTC as well as the greater meteorology, hydrology and climate training institutions and universities globally.

3.32. The Principal informed the Council of the achievements of the CIMH internship programme and the very positive feedback it continued to receive regionally and internationally. Several cutting edge projects have been developed through the programme that had been transformed to operational services. Examples of the work performed by the interns were shared.

3.33. The Principal informed the Council of the CIMH Weather and Water Summer School programme. The Principal informed the Council that the CIMH held its Summer School in Saint Lucia marking the first time the programme was held outside of Barbados. Feedback from the Saint Lucia Meteorological Service and the participating students was extremely positive. The Principal invited other countries to indicate their interest in hosting the school.

3.34. The Principal noted the progress of the Instruments Section in servicing the needs to Member States. He noted the support currently being given to Anguilla to support the operation of the meteorological equipment at the international airport which allowed the airport to meet the requirements of its regulator. The Principal also noted the significant assistance provided to St. Kitts and Nevis to significantly enhance the regular reporting of many of the stations in its network. The Principal also noted the significant investments being made to the region through various regional entities to strengthen hydro-meteorological and climate observation and early warning networks across the region and the critical role CIMH was playing to optimize these investments.

3.35. The Principal noted the steady increase in funding received by September 30, 2019 over the years. In particular, he noted that by September 30, 2019, the CIMH has received approximately 73 percent of the approved budget for FY2019 which represented a significant achievement for an institution that in FY2018 it had received only 39 percent of its funding at the same point in the year. The Principal further noted that several Member States were actively working to liquidate their arrears and this had resulted in a noticeable decline in total arrears. The Principal noted that the increasing percent of subventions being received allowed the CIMH to liquidate its PAYE arrears to the Government of Barbados. The Principal encouraged the Members to continue to stay current while chipping away at their respective arrears.

3.36. The **Council:**

(i) **Noted** the Principal's Report

(ii) **Commended** the Principal on the many projects that the Institute has been bringing to the Region.

3(c) CIMH Board of Governors' Report

3.37. Body Chairman of the CIMH Board of Governors presented to the Council, the following decisions that were made at the 56th meeting of the Board, which took place on 11-12 November 2019.

1. With reference to *Doc 3.2 - Report of the Appointments and General Purposes Committees*:

   (i) The BoG **decided** that the Principal explore the development of a Physical Development Plan for the CIMH. The plan should consider updating the existing infrastructure as well as the addition of new infrastructure such as dormitories. The cost for developing the physical development plan should be made available to the next meeting of the BOG.

   (ii) The BoG **decided** that the Principal should provide estimates for fencing the perimeter of the CIMH so that a decision on follow up actions can be at the next meeting of the BoG.

2. With reference to *Doc 4.3 - Finances of the Institute*:

   (i) The BoG **decided** to activate the Finance Committee and task it with assisting the CIMH to maximize the returns on its investments.

3. With reference to *Doc 4.7 Staff Matters*:

   (i) The BoG **reaffirmed** that the CIMH should proceed with improving its fiduciary capability with the contracting of a Procurements Specialist, Finance Specialist and Human Resources Specialist. The BOG **further noted** the need to transform the management and administration of the CIMH and **directed** the Principal to cost the transformation. The BoG **urged** Members to review the report of AshThom Consultancy Inc. to risk-inform their decision on the future direction of CIMH.

4. With reference to *Doc 4.10 CIMH Alumni Association*:

   (i) The BoG **decided** that the CIMH should continue exploring the feasibility of establishing a CIMH Alumni Association **recognizing** the significant benefits that could be derived from the establishment of such an association. The BoG **urged** Members to fully support the initiative by establishing national focal points to interface between the CIMH and its alumni.

5. With reference to *Document 5.1 – Estimates of Expenditure for the Financial Year 2020*:

   (i) The BoG **agreed** to the Estimates of Expenditure of USD X,XXX,XXX (BBD X,XXX,XXX), an increase of 5.39 percent, to be presented to the Caribbean Meteorological Council.

3.38. The **Council:**

(i) **Noted** the decisions and recommendations emanating from the BoG-LVI meeting.

4 STATUS OF ACTIONS FROM THE PREVIOUS SESSION

4.1. Following every session of the Council, the CMO Headquarters produces a single document containing an Action Sheet that allows the Council to follow-up on the actions taken on the decisions of its previous session, and to discuss any further actions if required. A summary of the decisions of CMC58 (St Kitts and Nevis, 2018) was presented to Council, giving the status of actions taken to implement these decisions of Council, and indicating areas where action as proposed had not materialized.

4.2. Council discussed the need for Member States to review and complete any outstanding matters in regards the implementation of the ICAO-mandated *Quality Management System* (QMS) for meteorological services to aviation, taking particular note of deadlines set by the *International Civil Aviation Organization* (ICAO).

4.3. The **Council:**

(i) **Noted** the Status of Actions from CMC58.

5 SPECIAL CMO AND WMO ISSUES

5.1. The Coordinating Director briefed the Council on the following special CMO and WMO-related issues in connection with the following topics:

(A) Outcome/Highlights of the 18th ***World Meteorological Congress***, 2019
   (1) Major Governance Reform of the WMO
   (2) New Strategic Plan and Priority Areas for 2020-2023
   (3) Election Results
   (4) Budget and Financing for 2020-2023
   (5) Other Highlights

(B) Outcomes/Highlights of the 71st Executive Council (EC) of the WMO

(C) WMO Integrated Global Observing System – Pre-Operational to Operational Phase

(D) Disaster Risk Reduction and Regional Severe Weather Forecasts and Warning Systems
   - Tropical Cyclone Programme
   - Global Multi-hazard Alert System (GMAS)
   - WMO Catalogue of Hazardous Events

(E) The Global Framework for Climate Services (GFCS)
   - Change in Governance

(F) Reception of new Geostationary Satellite Imagery in CMO Member State

(G) Issues emerging from the WMO Technical Commission sessions in 2019.

(a) Outcomes/Highlights of the 18th World Meteorological Congress

5.2. The 18th World Meteorological Congress (CG-18) was held at the International Conference Centre in Geneva, Switzerland, under the chairmanship of the outgoing President, Mr David Grimes of Canada. CMO Member States represented at the Congress session were: Barbados (*Ms Sonia Nurse*), Guyana (*Dr Garvin Cummings*), Jamaica (*Mr Evan Thompson*), and Trinidad and Tobago (*Mr Ezekiel Sampson*), along with the British Caribbean Territories (BCT). Saint Lucia had proxy-representation for a portion of the session. The Coordinating Director of the CMO, as the *Permanent Representative of the BCT with WMO*, led a strong BCT delegation to the Congress,

comprising *Dr. David Farrell*, Principal of the CIMH, *Mr Glendell De Souza* of the CMO Headquarters, and *Mr Shawn Boyce* of the CIMH. The involvement of this team, as part of the CMO contribution to the WMO on behalf of all CMO Member States, was designed to increase the regional input to the session and to facilitate the critical follow-up actions. Dr Arlene Laing of the BCT served on the Nominations Committee; the Drafting Group on the Alliance for Hydromet Development, Country Support Initiative; and the Drafting Group on the Secretary General's Contract. She was also one of seven new female PRs who were invited to speak at the Gender Working Breakfast.

5.3. Council noted that Congress voted to make a major change in the governance structure of the WMO. The reform was intended to enable the WMO to have a stronger focus on extreme weather, water resources, the ocean, coordinated climate services, environmental degradation, urbanization, and public health; while harnessing technological advances from satellites, supercomputing and data integration to translate science into services for society. To that end, the eight technical commissions,

- Commission for *Basic Systems* (CBS)
- Commission for Instruments and Methods of Observation (CIMO)
- Commission for Aeronautical Meteorology (CAeM)
- Commission for Agricultural Meteorology (CAgM)
- Commission for Atmospheric Sciences (CAS)
- Commission for *Climatology* (CCl)
- Commission for *Hydrology* (CHy)
- Joint WMO-IOC Commission for *Oceanography and Marine Meteorology* (JCOMM).

were to be transformed into three new bodies:

- Commission for Observation, Infrastructure and Information Systems (Infrastructure Commission)
- Commission for Weather, Climate, Water and Related Environmental Services (Service Commission)
- Research Board on Weather, Climate, Water, and the Environment

Council noted that Dr Arlene Laing has been asked to serve on the Research Board.

5.4. Council was informed that the new structure was established to support a holistic and interdisciplinary approach to services and applications, to further the seamless Earth System prediction, and to provide integrated scientific advances serving society. Each commission would comprise a set of standing committees that would tackle specific issues and provide opportunities for wider participation by Members. Nominees for the two Commissions would be chosen from among experts and focal points whose information, including curriculum vitae (CVs), were in the WMO Community Platform, **https://community.wmo.int/**. Therefore, Members are **urged** to enter the information for their National Focal point, so that their particular expertise may be easily discovered. The transition to these two commissions would take place over two years, at the end of which Congress would hold an Extraordinary Session of Congress from 31 May to 4 June 2021. Among other matters, decisions were expected to be made about how operational hydrology fits within the WMO structure.

5.5. Council noted that the WMO Congress adopted a new strategic plan and related budget, with the new governance structure aligned to the Strategic Plan. Details of the WMO governance reform are available at **https://public.wmo.int/en/governance-reform**. The Plan, emphasize the following overarching priorities:

1) Enhancing preparedness and reducing loss of life, critical infrastructure and livelihood from hydrometeorological extremes;
2) Supporting climate-smart decision making to build or enhance adaptive capacity or resilience to climate risk;
3) Enhancing socioeconomic value of weather, climate, hydrological and related environmental services.

5.6. Council noted the five Long Term goals for the period 2020-2030, of which Goals 1 and 4 are of particular interest to the CMO Headquarters, which aligned its strategic objectives to those WMO goals, and the NMHSs of CMO Member States, which are the beneficiaries of these long-term goals.

- *Goal 1*: Better serve societal needs: delivering, authoritative, accessible, user-oriented and fit-for-purpose information and services
- *Goal 2*: Enhance Earth system observations and predictions: Strengthening the technical foundation for the future
- *Goal 3*: Advance targeted research: Leveraging leadership in science to improve understanding of the Earth system for enhanced services
- *Goal 4*: Close the capacity gap on weather, climate, hydrological and related environmental services: Enhancing service delivery capacity of developing countries to ensure availability of essential information and services needed by governments, economic sectors and citizens
- *Goal 5*: Strategic realignment of WMO structure and programmes for effective policy- and decision-making and implementation

5.7. Council was informed of the very critical activity at every Congress of the election and appointments of the Officers of the Organization. Every four years, the Congress elects the President and three Vice-Presidents, along with 27 other members of the WMO Executive Council; and also appoints the Secretary-General of the WMO. Officers of the WMO are elected by the Congress to serve in their *personal capacities* for the benefit of the entire Organization. The Secretary-General, ***Professor Dr Petteri Taalas*** of Finland, ran unopposed and was re-appointed for a second term. Congress then elected: **President**: Professor ***Gerhard ADRIAN***, (Germany); **First Vice-President**: Professor: ***Andrea Celeste SAULO*** (Ms), (Argentina); **Second Vice-President**, Dr ***Albert Asinto Eleuterio MARTIS***, (Curaçao and Sint Maarten); **Third Vice-President,** Dr ***Agnes KIJAZI*** (Ms), (United Republic of Tanzania).

5.8. The Congress elected a further 27 members to the Executive Council who, along with the President and Vice-Presidents and six Regional Presidents (ex-officio), make up the total 37-member Council. The Coordinating Director, *Dr Arlene Laing*, as the Permanent Representative of the British Caribbean Territories, was elected to the Executive Council.

5.9. Congress applauded the contribution of CIMH to the WMO Global Campus, which was endorsed by Congress, in the development of a coordinated and collaborative network of institutions that work together to meet the growing education and training needs of WMO Members, building upon the existing network of WMO Regional Training Centres (RTCs) and other educational and training institutions partnering with the WMO Education and Training Programme.

5.10. Council noted the landmark "*Geneva Declaration – 2019: Building Community for Weather, Climate and Water Actions.*", adopted by Congress, with the aim of strengthening links between the public, private and academic sectors. Accompanying the declaration was the initiation of the WMO Open Consultative Platform, a mechanism to facilitate an open and constructive dialogue between the public, private and academic sectors on matters of weather, climate, water, and related matters.

The 18th WMO Congress in June 2019, agreed to review international data resolutions and discuss emerging data issues at the 2020 WMO Data Conference. The decision was motivated by, among other things, the challenge of balancing open data sharing in an era where the private sector role in weather, climate, and water was expanding.

(b) Outcomes/Highlights of the 71st Executive Council (EC) of the WMO

5.11. The 71st Executive Council was held from 17-19 June 2019, following the 18th WMO Congress and chaired by the new President of WMO, *Prof Gerhardt Adrian* of Germany. The 2019 session of the Executive Council began the implementation of the priorities decided by the 18th Congress. EC71 approved the setup of new panels to streamlines its work in several areas, which were:

a. Climate Coordination Panel
b. Hydrological Coordination Panel
c. Executive Council Panel of Experts on Polar and High-mountain Observations, Research and Services
d. Capacity Development Panel

5.12. the Permanent Representative of the BCT, Dr Laing nominated *Dr David Farrell, Principal of the CIMH and BCT Hydrological Adviser* to serve on the Capacity Development Panel because of the high priority being given to Education and Training in the new panel. *Dr Arlene Laing* began serving the Executive Council as a member of the *Young Scientists Award Selection Committee.*

(c) WMO Integrated Global Observing System – Pre-Operational Phase

5.13. Council recalled that for the last several years, significant discussions have been held on the *WMO Integrated Global Observing System* (WIGOS), an all-encompassing approach to the improvement and evolution of WMO's global observing systems, which was needed in all countries to consolidate progress in meteorological research, numerical modelling, and computer and communication technologies. Closely tied to WIGOS is the implementation of the *WMO Information System* (WIS). WIGOS, together with WIS, form the basis for the provision of accurate, reliable and timely weather, climate, water and related environmental observations and products by all Members and WMO Programmes, which would lead to improved service delivery. Both WIGOS and WIS were very essential to all technical and scientific activities of Meteorological Services in the Caribbean and worldwide.

5.14. Council noted that WIGOS was set to become operational from 2020, after a *Pre-operational Phase* in 2016-2019. As with all Member States of WMO, CMO Member States should be prepared for implementation activities at the regional and national levels. It was expected that all Member States and their partners shall benefit from a fully operational system from 2020. In the Caribbean region, the focus was on getting the Meteorological and Hydrometeorological Services fully ready in the first instance, while efforts continue to bring partner institutions and organizations on board as contributors to WIGOS. WMO recognized that significant capability gaps and other challenges remain. Those would need to be addressed during 2020-2023, in order for the system to fully serve all WMO application areas and help Members exploit the full potential of partnership agreements. High priority would be given to activities that would assist Members in developing and implementing their national WIGOS plans, with special emphasis on the Least Developed Countries, Landlocked Developing Countries and Small Island Developing States where the needs were the greatest.

5.15. Council recalled discussions of the concept of *Regional WIGOS Centres* (RWCs), as a vital part of the implementation of WIGOS. The Executive Council has recognized the critical role that RWCs would play in advancing the implementation of WIGOS at the regional level by providing regional coordination, technical guidance, assistance and advice to Members and partner

organizations, through regional WIGOS performance monitoring and incident management. Along with representatives from the United States and Canada, the CMO Headquarters and the Trinidad and Tobago Meteorological Service were exploring the possibility of collaborating on a virtual RWC for RA IV. A Concept note and decision letter for RWC in RA IV were being prepared for presentation to the RA IV Management Group, for approval in January 2020.

(d) Disaster Risk Reduction and Regional Severe Weather Forecasts and Warning System

5.16. The Council recognized that activities within the WMO *Tropical Cyclone Programme* (TCP) were among the most important to the Caribbean and other tropical basins. The most critical regional activity under the TCP is the WMO *Hurricane Committee*, serving the *North Atlantic and Caribbean Basin*. The Hurricane Committee has at its core, *the US National Hurricane Center*, which was one of WMO's primary *Regional Specialized Meteorological Centres* (RSMCs) for tropical cyclones. Most Meteorological Services in CMO States were represented on Hurricane Committee which, along with the relevant regional and national disaster management community, work continuously towards the reduction of disaster risks by tropical cyclones, particularly in terms of loss of lives. The 2019 session of the Hurricane Committee met in Curacao in March. *Dr Jamie Rhome,* Storm Surge Specialist*, NOAA Hurricane Research Division,* presented his ground-breaking improvements in storm surge modelling, based on research conducted in the Dominican Republic and Haiti as part of a WMO Coastal Inundation Forecast Demonstration Project (CIFDP).

5.17. Council noted that the WMO Congress supports the establishment of a Global Multi-hazard Alert System framework for compiling information from existing or planned national and regional systems and boost impact-based forecasting services. Congress also endorsed an earth-system research approach and measures to strengthen early warnings against hazards like floods and tropical cyclones and to ensure that their authoritative weather, climate, and water information was part of humanitarian operations. Also noted was the WMO coordinated catalogue of hazardous weather, climate, water, and space weather events, adopted by the 18th Congress to support "a consistent, robust and efficient implementation of key operational WMO activities such as supporting MHEWS or the Climate Watch System (CWS) and seamless interactions between regional and national data for data recording of such events". These efforts support monitoring of the implementation of international initiatives such as the Sendai Framework for Disaster Risk Reduction 2015−2030, the Paris Agreement on climate change, and the United Nations Framework Convention on Climate Change (UNFCCC) Warsaw International Mechanism for Loss and Damage associated with climate change impacts, and the 2030 Agenda for Sustainable Development with its 17 Development Goals (SDGs).

(e) The Global Framework for Climate Services (GFCS)

5.18. Council recalled that the ***Global Framework for Climate Services*** (GFCS), a UN-led initiative spearheaded by WMO, was being implemented throughout the world to guide the development and application of science-based climate information and services in support of decision-making. Via Resolution 20 (Cg18), the governing structure for the GFCS was changed from an *Intergovernmental Board on Climate Services* (IBCS), which was accountable to the WMO Congress, to the Climate Coordination Panel (CCP) which reports to the WMO Executive Council. The IBCS was rescinded via Resolution 21 (Cg18). The new CCP included the Partner Advisory Committee (PAC), the mechanism for stakeholder engagement in GFCS. Membership for RA IV (North America, Central America and the Caribbean) had been through the British Caribbean Territories (BCT), Canada, Costa Rica and the USA. *Dr. David Farrell*, the BCT/CMO representative on the Management Committee was heavily involved in the management of the GFCS, including the drafting of the new management structure. The CCP was expected to become active in 2020.

5.19. The priority areas for the GFCS are (i) Agriculture and food security (ii) Disaster risk reduction, (iii) Energy (iv) Health and (v) Water. The GFCS implementation in the Caribbean is through the Caribbean Institute for Meteorology and Hydrology via various projects and partnerships, which served as examples for other regions of the world.

(f) Reception of new Geostationary Satellite Imagery in CMO Member States

5.20. Council recalled that the new generation of Geostationary Operational Environmental Satellite (**GOES-16**) was successfully launched in November 2016. GOES-16 became the operational **GOES-East** weather satellite positioned at 75.2 degrees West, providing coverage over the Atlantic Ocean from the west coast of Africa, North and South America and the Caribbean. Its sister satellite, **GOES-17**, covers the Americas and parts of the Pacific and both were equipped with new lightning mapping capability that allows forecasters to track lightning over the entire hemisphere. This was important because intensification in lightning activity may indicate a storm was becoming increasingly severe.

5.21. Council was informed that CMO Headquarters and CIMH continue to be directly involved with WMO and the US National Weather Service in coordinating the operational use of the GOES data among CMO Member States. Due to the vast data volume and faster satellite transmission than the previous systems, Meteorological Services in the region have either installed or are exploring their options among three pathways to receive the new satellite data and/or imagery, namely:

1. Direct readout from the GOES ReBroadcast (GRB);
2. Various commercial data services via the Internet;
3. Data via GEONETCast-Americas - the western hemisphere component of a near real-time global network of satellite-based data dissemination systems.

5.22. Council recalled that in 2018, the Cayman Islands installed a full GOES ReBroadcast (GRB) ground station, the first such system in the Anglophone Caribbean. The National Weather Service of the Cayman Islands indicated a willingness to share its GOES imagery with the NMHSs of other BCT Members. Additionally, Trinidad and Tobago Meteorological Service has received the approval of the Cabinet of the Government of Trinidad and Tobago to acquire a GRB ground station to be located in Trinidad, approval was also given to the Tobago office to procure a GRB system.

(g) Issues emerging from the WMO Technical Commission sessions in 2018-2019

5.23. Council was informed of an Extraordinary Session of the ***Commission on Hydrology*** **(**CHy**)** held in Geneva, Switzerland on 13-14 February 2019 where the impact of the proposed WMO governance reform on hydrology was robustly debated. Further, during the "*Hydrology Assembly*" at the 18th Congress, WMO was challenged to find the best mechanism for engaging with the operational hydrological community. During the two-year transition period to complete the governance reform, the Hydrological Coordination Panel of the Executive Council has been tasked to develop a Plan of Action and draft Declaration to be considered at the Extraordinary Session of Congress in 2021. Council also discussed the role of operational hydrology within CMO, which has only one Member State, Guyana, with a fully-fledged hydrological and meteorological service. Consideration of the role of hydrology in the Organization was warranted given the shifting emphasis of WMO and NMHSs to encompass service delivery and a holistic approach that is expanding to include environmental services, impacts-based forecasting, multi-hazard early warning systems, energy, and water management. The need for National Meteorological Service to be able to access hydrology expertise was noted in the Terms of Reference being developed for the consultancy to draft model legislation for National Meteorological Services.

5.24. The **Council**:

(i) **Noted and discussed** the key issues emanating from 18th Congress of the World Meteorological Organization and the 71st Executive Council

(ii) **Urged** CMO Member States to ensure that their NMHSs complete activities in preparation for the Operational Phase of WIGOS starting in 2020;

(iii) **Agreed** that the proposed concept of establishing a joint *Regional WIGOS Centre* (RWC) for the English-speaking Caribbean involving collaboration between the CMO Headquarters and the Meteorological Service of Trinidad and Tobago should be explored with authorities in Trinidad and Tobago and the WMO Secretariat, and collaborating National Meteorological Services in US and Canada, then brought back to Council for its further consideration;

(iv) **Urged** Member States to **complete the process** for reception of GOES-16 weather satellite data and products;

(v) **Continued** its strong support for the *Global Framework for Climate Services* and to urge Member States to actively participate in GFCS projects and activities;

(vi) **Noted** and **supported** the important work of the regional Hurricane Committee;

(vii) **Noted** the important issues emerging from the 2019 sessions of WMO Commission on Hydrology;

(viii) **Discussed** the role of operational hydrology in the CMO and **requested guidance** from the CMO Headquarters and the CIMH on options for increasing the hydrology component of CMO

(ix) **Urged** Member States to implement the actions requested by the 18th World Meteorological Congress in 2019.

(x) **Encouraged** CMO Member State to contribute to Global Multi-Hazard Alert System framework, the WMO Catalogue of Hazardous Events, and contribute events to the CIMH Climate Impacts Database.

(xi) **Encouraged** CMO Member States to take advantage of resources available through the Alliance for Hydromet.

(xii) **Urge** Member States to actively participate in the WMO Open Consultative Platform.

6 FINANCIAL REPORTS

6(a) Status of Refundable Balance

6.1. Council was reminded that the annual contribution to the WMO due from the British Caribbean Territories (BCT) is paid by the CMO Headquarters on behalf of the British Government. This contribution is included in the annual budget of the CMO Headquarters and hence, in the individual CMO Member State's contribution to the CMO Headquarters. A percentage (73%) of this amount is refunded to the CMO by the UK Department of Transport upon submission of an invoice with the accompanying annual audited Financial Statements of the CMO Headquarters. Therefore, this amount is refunded to the Member States that are also Member States and Territories of the WMO.

6.2. By Members' consent, these funds are held by the CMO Headquarters Unit to assist Members in attending important Meteorological/Hydro-meteorological Meetings, participating in

training opportunities, and purchasing spares. During 2019, a few Member States accessed these funds very effectively in pursuit of these objectives. Apportionment of any refund received was based on the assumption that all Member States are meeting the annual contributions to CMO on a regular basis. In reality, however, some Member States were in arrears of contributions to the CMO Headquarters. Therefore, although the Refundable Balance reports the amount available to the Member State, access to draw-down was linked to their financial status with the Organization and may be restricted.

6.3. In keeping with a decision made during the 47th session of the Council (2007), each session of the Council is provided with both the current status of the Refundable Balances held at the CMO Headquarters on behalf of CMO Member States, as well as, the amount available for draw-down by each Member State.

6.4. The current status of the Refundable Balances held at the CMO Headquarters on behalf of CMO Member States at 31 August 2019, as well as, the amount available for drawdown, is shown below:

CARIBBEAN METEOROLOGICAL ORGANIZATION
REFUNDABLE BALANCES
AS AT AUGUST 31, 2019

	BALANCE (TTD)	BALANCE (USD*)	AVAILABLE FOR USE (USD*)
BRITISH CARIBBEAN TERRITORIES			
Anguilla	121,078	17,860	17,860
BVI	106,362	15,689	15,689
Cayman Islands	238	35	35
Montserrat	62,095	9,160	9,160
Turks and Caicos Islands	197,312	29,105	29,105
	487,085	71,849	71,849
CMO MEMBERS OF WMO			
Antigua and Barbuda	18,665	2,753	-
Barbados	43,522	6,420	6,420
Belize	28,957	4,271	3,233
Dominica	19,558	2,885	-
Guyana	20,505	3,025	3,025
Jamaica	223,338	32,944	5,000
Saint Lucia	16,058	2,369	2,369
Trinidad and Tobago	-	-	-
	370,603	54,667	20,047
TOTAL	**857,688**	**126,516**	**91,896**

* USD equivalent calculated at rate of exchange at September 01st, 2019

6.5. The **Representative of Guyana**, queried the methodology used to decide on the quantum available for use by a Member State that is in arrears. The Council was reminded that at CMC47 (St. Vincent, 2007) the Coordinating Director explained that while refundable balances were

calculated for accounting and auditing purposes, there was only a disbursement in cases where countries made contributions on a regular basis. The method of calculation used to calculate the quantum of the refundable balance, which was available to a Member State that was in arrears, was left to the discretion of the Headquarters Unit.

6.6. Council was reminded that the 57th session of Council (Antigua and Barbuda, 2017) approved a new basis for apportioning the amount refunded by the UK Department of Trade, which became effective from 2018.

6.7. The **Council**:

(i) **Noted** the status of the Refundable Balances Account, as well as the new basis to be used for apportionment of reimbursements, which became effective from 2018;

(ii) **Requested** the Headquarter Unit to produce three proposals for objectively quantifying the refundable balance available to Member States that are in arrears. The proposal shall be presented to the next session of Council for review and approval.

6(b) CMO HQ - Auditor's Report

6.8. The financial statements for fiscal 2018 were audited by the Auditor General's Department of Trinidad and Tobago during May 2019. The audited financial statements for 2018 were presented to Council by the Finance and Administrative Officer.

6.9. **The Council**

(i) **Reviewed** and **accepted** the audited Statement of Accounts for 2018, noting with desire that the CMO Headquarters received an unqualified audit report;

(ii) **Reaffirmed** the continued use of the Auditor General's Department of Government of the Republic of Trinidad and Tobago for the provision of audit services for the Headquarters of the CMO.

6(c) Statement of Contributions and Arrears (CMO HQ & CIMH)

6.10. Each year, the Coordinating Director of the CMO and the Principal of the CIMH are challenged to hold the operating budgets of their institutions to a minimum with the hope that all Member States would meet their annual contributions towards these budgets in a timely manner.

6.11. The Council has repeatedly urged Member States to make regular payments toward the current approved budget and to establish a plan to liquidate arrears in a phased manner. Notwithstanding these pleas, CMO HQ and CIMH continues to experience delays in remittances, part payment and in some cases, non-payment of current contributions by some Member States, hampers the implementation of programmes and activities planned for Organization.

6.12. Several Member States have been making a concerted effort to meet their current contributions to the CMO Headquarters and the CIMH; however, the timeliness of payment must be addressed. The uncertainty associated with these delays often impacts the scheduling and implementation of planned projects and activities.

6.13. There has been a persistent shortfall of contributions remitted to the CMO Headquarters and CIMH, which averages 25% and 30% of the approved annual budget respectively. The implications arising from delays and non-payment of contributions may soon begin to impact the operations of the Headquarters Unit, since monies held by the CMO for Member States which operate Rawinsonde and radar stations, as well as the Refundable Balances, have been classified as "*restricted cash*" in the Statement of Financial Position at the end of 2018 and are therefore not available to the Headquarters for use in operations. In light of the delays in receipt of remittances and the consequent shortfall in annual contributions, it is imperative that arrangements be put in place to ensure the availability of funds to meet operating expenses of the Headquarters on a timely basis in the absence of overdraft facilities with the banks to meet any temporary deficit in cash flow.

6.14. The Auditor General of Trinidad and Tobago has continued to raise concerns over the state of arrears in the Report on the Financial Statements of the CMO Headquarters Unit, and as seen in CMC59 Doc 6(b).

6.15. The **Council**

(i) **Examined** the **Statement of Contributions and Arrears** to the CMO Headquarters at 15 October 2019 and **proposed** that Members should at least consider making semi-annually payments to both Organs to address this situation and to avoid any negative impact on the operations of the Organization.

(ii) **Called** on all Member States to make every effort to pay their full contribution for the current year, and for those Members in arrears to set up an internal mechanism to pay off arrears.

(iii) **Granted approval** for **negotiations** between the CMO Headquarters and the Government of Jamaica aimed at reaching an agreement **for a one-time partial debt swap.** A proposal shall be presented to the next session of the Council for approval.

7 CMO STRATEGIC PLAN

7.1. Council recalled that the CMO Headquarters developed and presented a draft Strategic Plan to the 58th Session of the CMC and urged Member States to provide input to the Plan during the year. A revised Strategic Plan was presented to the 59th Session of the CMC and revisions were requested concerning the additional position being requested by the CMO Headquarters Unit to carry out the Strategic Objectives and the Terms of Reference for that position.

7.2. **The Council**:

(i) **Discussed** the CMO ***Strategic Plan 2020-2023*****,** shown in the **ANNEX III**;

(ii) **Requested** the CMO Headquarters Unit revise the ***Strategic Plan 2020-2023*** after requested amendments were made. The revised Plan is to be submitted with associated costing by 2 December 2019; including a governance structure

(iii) **Decided** to review the revised Strategic Plan by 16 December 2019 and to provide a final decision to the CMO Headquarters by 20 January 2020.

8 CMO BUDGETS (HEADQUARTERS UNIT, CRN AND RADAR, CIMH)

8(a) CMO HQ Budget Estimates for 2019

8.1. Budget estimates for the operating costs for the CMO Headquarters Unit and contributions to the Caribbean Rawinsonde and Radar Networks for 2020 were presented to the Council.

8.2. It was noted that although Trinidad and Tobago, the home of the CMO Headquarters Unit, continued to experience pressure on its foreign exchange reserves the anticipated decline of the local currency has not been reflected in the official exchange rates listed at the commercial banks. This relative stability of foreign exchange rates was factored into the estimates of expenditure for 2020 which is predicated on a USD rate of TTD 7.00 to USD 1.00 while the XCD rate has been adjusted to TTD 2.62 to XCD 1.00.

8.3. The new Contribution Formula approved at CMC57 (Antigua and Barbuda, 2017) and effective from 2020 will be applied in the assessment of contributions due from Member States. In accordance with the new Contribution Formula, three additional radars in the region (Barbados, Cayman Islands and Guyana) would now receive some support from Member States as part of the Caribbean Radar Network.

8.4. The CMO Headquarters continued to occupy the present premises despite the expiration of the lease in February 2017, no provision for the cost of rental are included in the estimates of expenditure for 2020

8.5. At TTD X,XXX,XXX, or USD XXX,XXX, the overall estimates of expenditure proposed for 2020 was 2.5% higher than the approved budget for 2019. This increase is driven by capital expenditure necessary for the upgrade of computer hardware and software.

8.6. **The Council:**

(i) **Approved** the budget of **TTD X,XXX,XXX.00, equivalent to USD XXX,XXX.00, a reduction of 5.3% from the 2019 budget**, and as detailed in **ANNEX IV,** with Member contributions as indicated in **ANNEX V**;

(ii) **Approve** temporary drawdowns from the restricted cash balances held for Member States operating the Caribbean Rawinsonde and Radar Networks, should the need arise in 2020;

(iii) **Urge** Members to give priority to meeting annual contributions, as well as liquidating any arrears of contribution due to the Organization;

(iv) **Also Urge** Members to inform the CMO Headquarters of their transfer of funds, including the amount and date, in order to address difficulties in properly identifying the origin of funds within the banking system.

8(b) CIMH Budget Estimates for 2020

8.7. The Chairman of the Board of Governors informed the Council that the CIMH presented the Estimates of Expenditure for the financial year 2020 to the Board of Governors for its consideration. The Board approved the Estimates of Expenditure of BBD X,XXX,XXX.00 or USD X,XXX,XXX.00, an increase of 5.39 percent.

8.8. The Council:

(i) **Approved** the Estimates of Expenditure for 2020 of **BBD X,XXX,XXX.00** or **USD X,XXX,XXX.00**, as presented by the Board of Governors. Member States' contributions based on that figure as indicated in **ANNEX IV**.

9 ANNUAL MEETING OF THE DIRECTORS OF METEOROLOGICAL SERVICES

9.1. The Caribbean Meteorological Council considered the Report of the Annual Meeting of Directors of Meteorological Services, held on 13 November 2019, presented by Mr Glendell De Souza, Science and Technology Officer of the CMO Headquarters. The Report provided the Council with a summary of the deliberations and recommendations of the Directors on a wide range of technical and scientific topics, which would have an impact on future costs, policy decisions, training opportunities and service delivery. The following two items were drawn to the attention of Council:

1. TRAINING

The CIMH was tasked with reviewing the duration of the Senior-level Meteorological Course during the 2018 Meeting of Directors of Meteorological Services, in an effort to reduce the course duration to a period of 9-12 months. The presentation of the results of the review did not find favour with some of the Directors. Therefore the Meeting recommended that a subcommittee be formed with persons of Services which would like to have the course reduced to 9-months, and those who found the reduction to 15-months acceptable along with persons from the CIMH to find an equitable solution which would be acceptable to all parties and report back to the 2020 Annual Meeting of the Directors of Meteorological Services.

2. OPERATIONAL MATTERS

Transition to Table Driven Code Forms - Re BUFR

The Meeting was reminded that Meteorological Services were to transition from the tradition alphanumeric code forms for synoptic observations to table driven code forms since November 2010. However, an examination of the required data folder on the server in the Regional Telecommunications Hub in Washington indicated that only three Meteorological Services of CMO Member States were transmitting their synoptic observations (surface and upper-air) in BUFR format. Meteorological Services of CMO Member States that are making synoptic observations and have not transitioned to TDCF were urged to do so as soon as possible.

9.2. The Council:

(i) **Reviewed** and **amended** the draft of the DMS2019 Report;

(ii) **Noted** that human and financial resources would be needed to have National Meteorological Services compliant in encoding and decoding meteorological information in the required code form;

(iii) **Also Noted** the intended formation of a subcommittee in early 2020 to review the length and form of the SLMT course.

10 CMO WEATHER RADAR NETWORK

10.1. Council recalled that the CMO Weather Radar Network comprised of six S-band Doppler radars, namely, the US-made radar in Jamaica, installed in 1999; and five German-made radars in Belize, Barbados, the Cayman Islands, Guyana and Trinidad and Tobago. This network, along with other pre-existing radars in other Caribbean islands, provided the Caribbean with a modern sophisticated tool that complements other surface, upper-air and satellite-based weather observing platforms as part of the regional early weather warning system.

10.2. The radars in the CMO Member States are critical regional infrastructure, with a significant impact on weather surveillance, forecasts and warnings in the Caribbean. The reliance on the

system had been growing within and outside of the region and, under the auspices of the *World Meteorological Organization* (WMO), plans had been in place to integrate, in stages, the data from these radars with all other radars in the entire Caribbean basin as part of a larger weather surveillance system. For a CMO-wide or the larger Caribbean-wide radar network to properly function, all radar-operating States needed to work steadily to ensure reliability of their individual radar operations.

10.3. Council noted that radar data availability continued to be an issue for two of the CMO radars in 2019. The easternmost of the radars, Barbados, which had a major outage in November 2016 that was only resolved briefly in November 2017, again had major issues that took the radar out of operations through 2018 and to-date. For a brief period in May 2019, the radar had mechanical functionality but that was short-lived. The project to replace the radar in Jamaica with a new S-band, dual-polarized Doppler radar has advanced towards a scheduled installation completion by August 2020. The contract for the replacement radar and a new tower was awarded in 2019, with funding provided by the World Bank through a Pilot Program for Climate Resilience (PPCR) Project. The current radar was out of service for about 20 months, first due to a defective part that needed to be sourced and then because of a software issue with the operations computer. The new radar would be in the same location as the current radar. Consideration has been given to making the old radar available for research at the University of the West Indies Mona campus in Jamaica.

10.4. Council was also informed that the Bahamas has been implementing its own radar project, with part of the network completed in 2019, in time to monitor the record-breaking major Hurricane Dorian. The network when complete would cover the entire Archipelago, as well as portions of the Turks and Caicos Islands. Council noted that the discussions between the Bahamas and CMO Headquarters suggested that once these radars materialized, consideration would be given to integrating them into the regional composite.

10.5. The session once again discussed the availability of radar on the websites of the National Meteorological Services, including data from the radar composite image developed by the Barbados Meteorological Service. Council **urged** Services utilizing the composite to liaise with the Barbados Meteorological Service to facilitate proper access and use. The wider use of weather radar data by national television media was also ***encouraged***. Recognizing that the radar composite generated by Barbados had become a primary tool in the region, Council once more ***urged authorities in Barbados*** to provide formal and long-term support for the regional radar composite, so that it would be accepted as an input into the WMO Integrated Global Observing System (WIGOS).

10.6. Council was reminded that, through participation in the NOAA *Multi-Radar Multi-Sensor* (MRMS), the full volume radar data from the Cayman Islands and Belize were being assimilated into the numerical weather models of the *NOAA/National Centers for Environmental Prediction* (NCEP). This program benefits the region by improving the initial conditions in the NOAA models, which would utilized by many Meteorological Services in the Caribbean. MRMS develops specific products for transportation, hydrometeorology, and severe weather. The original data received from individual radars were not shared outside of NOAA. The CMO HQ has been working with the MRMS project leaders to identify other potential collaborators as well as a mechanism by which CMO Member Services could receive training on the use of MRMS products in operations.

10.7. Council also noted that in addition and complementary to, the primary purpose of supporting severe weather forecasting and warnings, the CMO Radar Network has considerable potential for other scientific applications. The Council also considered approaches for better utilizing of Caribbean radars and archived data, including:

- Setting up easy access to the full data archives; more usage would increase benefit to the region. For example, an archive of high-resolution radar rainfall estimates is valuable for understanding rainfall variability on the scale of small watersheds and provides improved

flash flood guidance and knowledge of climatological extremes. An archived dataset with the combined point accuracy of rain gauge data and the superior resolution of the full radar data would be a valuable regional resource.

- Maintaining effective radar scanning strategies to facilitate observation of the vertical structure of storm systems. Such strategies allow, for example, the monitoring of indicators for damaging surface winds and flash floods.

10.8. Council recalled that previous sessions of the CMC recognized that the CMO Member States operating radars could benefit from a working consultative process that would enable radar technicians and related IT personnel to share experiences and technical information. That knowledge exchange would minimize individual radar down-time and keep network operations at an optimal level. Such a mechanism would also assist management in planning preventative and other maintenance issues, and would enable management to be in a better position to meet their current and future regional and international obligations with regards to the provision of radar data. Therefore, the CMO Headquarters proposed to the 55th Council Session that it would establish a ***CMO Operational Radar Working Group*** to carry out these tasks and Council approved the proposal to establish the *Operational Radar Working Group*. Plans to establish the Working Group in 2017 were put on hold because one of the radars had a prolonged period out of service for technical reasons. Given the protracted nature of the outages, the Headquarters Unit decided to implement the Working Group, rather than wait for another extended period and asked for Council to approve the updated Terms of Reference and the initiation of the Working Group activities.

10.9. Council was informed that at the time when the Caribbean weather radar network was planned the technique of dual-polarization was in an emerging state. Today, the majority of radars being installed are equipped with dual-polarization capability, i.e., having both horizontally and vertically polarized beams. Dual-polarization was now the operational standard in the US National Weather Service, after a series of upgrades. Indeed, the Cayman Islands radar, installed in 2013, has dual-polarization and the new radar to be installed in Jamaica would be a dual-polarized radar. The CMO Headquarters sought the support of the Council to pursue funding for a capital project, with internationally-funded and tendered process, to obtain the necessary equipment to upgrade our radars to dual polarization. As a precursor to that activity, the CMO Headquarters has been coordinating with the CREWS Caribbean Project to conduct a feasibility study of the CMO Radar Network.

10.10. The advantages of dual-polarization, compared with current weather radars, are:

- the effective removal of non-meteorological echoes, typically called clutter;
- significantly better quantitative rainfall estimates;
- the differentiation between very heavy rain and hail, which will improve flash flood watches and warning; and
- the potential to increase lead time for flash flood hazard warnings, because of greater confidence in polarimetric radar data.

10.11. **The Council**:

(i) **Noted** the status of the weather radars in the CMO Member States;

(ii) **Approved** the updated Terms of Reference (**ANNEX VI**) for the Operational Radar Group and initiation of the Group activities;

(iii) **Reiterated** its call for the Meteorological Service operating radars to fully publicize their websites; for all Services to provide a link on their websites to relevant radars and composite loops, and to work towards the greater use of live radar data by national television stations in the region;

(iv) **Encouraged** the Meteorological Service operating radars to participate in the NCEP Multi-Radar Multi-Sensor (MRMS) activities for the benefit of the region and the wider meteorological community;

(v) **Encouraged** the archiving data from CMO radars at CIMH and access to the full set of radar data for flash flood guidance, climate services, and other scientific applications;

(vi) **Discussed** and **provided guidance** on the matters related to upgrading the weather radars;

(vii) **Discussed** and **decided** to retain the current plan for the storage and funding of radar spare parts.

11 OTHER PROJECT UPDATES AND PROPOSALS

11(a) WMO Severe Weather Forecasting Programme (SWFP)

11.1. Council had, for several years, recognized that there would always be areas that could be improved in any weather warning system, particularly for episodes of severe weather that may not always be the result of a tropical cyclone and could occur at any time of year. Council recalled that, in November 2015, it endorsed a proposal by CMO and partners to implement a WMO ***Severe Weather Forecasting Demonstration Project*** (SWFDP) in parts of the Caribbean, with an aim, among others, to foster greater collaboration among National Meteorological Services and Disaster Management Agencies. Since that time, significant strides have been made towards the implementation of the SWFDP.

11.2. The Regional WMO Management structure established a *Regional Subproject Management Team* (RSMT) for the development and implementation of the SWFDP. The Coordinating Director co-chairs the RSMT with an expert from France. Other CMO representatives on the RMST include Ms Kathy-Ann Caesar of the CIMH and Mr Keithley Meade of Antigua and Barbuda, until his retirement in 2019. Mr Dale Destin, Director (Ag) of the Antigua and Barbuda Meteorological Service, has indicated his willingness to succeed Mr Meade on the RSMT. It was recalled that the WMO Severe Weather Demonstration Project was being developed along the following lines:

(i) The SWFDP would cover all the islands from Trinidad in the south to Puerto Rico in the North, with special arrangements for Haiti;

(ii) The Météo-France Centre in Martinique would serve as the *Regional Forecast Support Facility* (RFSF) for the Project;

(iii) The CIMH would provide technical and training support for the SWFDP.

11.3. Council recalled that the SWFDP implementation in the Eastern Caribbean was made possible by seed funding from Canada through its CREWS (Climate Risk and Early Warning Systems) Project. The SWFDP was being developed in four phases: 1) Overall Planning; 2) Implementation plan development and execution; 3) Demonstration and 4) Operational (no longer a project).

11.4. A satellite meteorology workshop, held in July 2019 at CIMH, also supported training for the SWFDP, helping forecasters from participating Member States to develop and improve their skill in the use of satellite products for severe weather forecasting. Additional training was scheduled to be conducted in December 2019, as a part of a Caribbean Weather Forecasting Initiative to support the EUREC4A field study

11.5. Council was informed that, during 2019, the *Regional Subproject Management Team* reviewed and revised its *Training Plan* and its *Regional Sub-Project Implementation Plan* (RSIP) for the SWFDP and examined the progress made at the *Regional Forecast Support Facility* (Météo-France Martinique), including the preparation of the web platform for data/products sharing, to produce severe weather guidance and to ensure real-time coordination. A pre-operational Demonstration (testing) Phase was initiated in 2019, with the development of a Web-based platform for data/products sharing. National Meteorological Services of Member States were provided with a license and access to the platform.

11.6. In its deliberation on this matter, it was disclosed to Council that the *Regional Subproject Management Team* had a side-meeting in conjunction with the Regional Hurricane Committee Meeting, held in Curaçao in March 2019, to examine progress made at the at the *Regional Forecast Support Facility* (Météo-France Martinique), The *Regional Subproject Management Team* met by video-conference in May 2019 with the WMO Secretariat to resolve issues regarding the test-phase, the mid-to-long-term training strategy and plan, research and development needs, observations challenges and other matters.

11.7. Council was informed that the RSMT held a virtual meeting in May 2019 to review its *Regional Sub-Project Implementation Plan* (RSIP) and discuss matters arising from the meeting in Curacao. One critical issue was the responsibility of the *Regional Forecast Support Facility* when a tropical cyclone is in the domain. The *Regional Specialized Meteorological Center* (RSMC)–Miami is responsible for tropical cyclone forecast and warning services. While the RFSF Martinique has clear responsibility outside of the hurricane season, the distinction of what is non-tropical cyclonic severe weather is not always clear when a tropical cyclone is in the domain. Therefore, it is necessary to develop procedures for distinguishing areas of responsibility for each regional centre in cases where that distinction is ambiguous.

11.8. Council also recognized that maximizing the benefits of the SWFP, requires a better understanding of the needs of each country for forecasting and warning of severe weather and to determine the gaps in capability and the necessary resources, services and training needed to improve that capability.

11.9. Council noted that the Coordinating Director developed an internship project to determine the severe weather warning needs and capabilities of participating States and initial recommendations for resolving ambiguity in responsibilities between the RSMC and the RFSF during hurricane season. CMO Headquarters hosted an intern, Ms Richeda Speede, with funding from the Caribbean Catastrophic Insurance Risk Facility (CCRIF); and supervision by the Coordinating Director and the Science and Technology Officer. WMO provided funding for the intern to visit the RFSF in Martinique. A written report and recommendations were submitted to the WMO and CCRIF.

11.10. Council recalled that the WMO Expert Group on the SWFDP identified the *Caribbean Meteorological Organization* (CMO), through its Headquarters and other Organs, as the regional entity to support SWFDP in the operational phase.

11(b) Building Resilience to High-Impact Hydro-meteorological Events through Strengthening MHEWS in Small Island Developing States (SIDS) in the Caribbean

11.11. Council recalled the presentations from CMC58 about the Climate Risk and Early Warning System (CREWS) Caribbean Project, co-funded by the CREWS Initiative, and Environment and Climate Change Canada (ECCC). The aim of the CREWS-Caribbean project was to strengthen and streamline regional and national systems and capacity related to weather forecasting, hydrological services, multi-hazard impact based warnings and service delivery for enhanced decision-making in CARICOM countries.

11.12. The implementing partners are the World Meteorological Organization (WMO), the Global Facility for Disaster Reduction and Recovery (GFDRR), the United Nations Office for Disaster Risk Reduction (UNDRR), and the World Bank Group (WBG). The primary regional implementing partners are the CIMH, the Caribbean Disaster and Emergency Management Agency (CDEMA),, and CMO Headquarters Unit. The Project has three components: Component 1) Development of regional strategy for EWS; Component 2) Institutional Strengthening and streamlining of early warning and hydro-meteorological services; and Component 3) Support for Piloting High Priority National Activities.

11.13. The CMO Headquarters and the WMO are developing a Letter of Agreement (LoA) for the partial delivery of the CREWS-Caribbean Project Component 2 - *Institutional Strengthening and streamlining of early warning and hydro-meteorological services.* This sub-project would help create an enabling environment for National Meteorological and Hydrological Services (NMHS) of CMO Member States through the development of their National Strategic Plans (NSPs) and Model Legislation that can be used by all NMHSs and their Governments to formally establish the legal mandate for their services. The proposal for the consultancy to draft the meteorological bill was developed in collaboration with the Organization of Eastern Caribbean States (OECS), with support from the CIMH. The project was tentatively scheduled to start in early 2020.

11(c) Caribbean Weather Forecasting Initiative

11.14. Through a partnership between the Caribbean Meteorological Organization (CMO) and the University of Leeds, a *Caribbean Weather Forecasting Initiative,* would support *EUREC^{4}A-ATOMIC*, an international field study that would be led by France and Germany; with CIMH as one of the lead institutions. The field campaign would be held 20 January to 20 February 2020 and based out of Barbados. The Initiative was supported by a grant from the Natural Environment Research Council (NERC), United Kingdom, and the WMO Climate Risk and Early Warning Systems (CREWS) Caribbean Project.

11.15. Council noted the benefits to the National Meteorological Services in the Caribbean**,** which would gain enhanced capability in understanding local weather, such as localized storms, through training workshops and a weather forecast test-bed. A knowledge exchange and training workshop before the EUREC^{4}A field campaign would bring together researchers and forecasters to introduce the particular science and weather to be studied in EUREC^{4}A. During the forecast testbed, the participants would work in dispersed teams, collaborating via online communication systems to deliver weather forecasts for mission planning. The testbed participants would evaluate the forecasts using near real-time information gathered during the project. A follow-up workshop was planned to consolidate information learned during the forecast testbed.

11.16. Council was advised that the project would be partially funded through an agreement between WMO and CMO Headquarters Unit, as it supports the Severe Weather Forecast Programme by developing collaboration practice among regional forecasters and helping forecasters to understand the strengths and limitations of high-resolution weather models.

11(d) Caribbean Symposium 2019: Operational Hydro-meteorology Leadership Summit

11.17. Council noted that, in response to challenges articulated by Directors of NMHSs, the CMO Headquarters Unit co-organized a symposium focused on operational hydro-meteorology in the Caribbean. The symposium was motivated by requests from Directors for guidance in dealing with various issues, including growing demands for new weather and climate services and the data requirements that underpin those services. With co-sponsorship from Varysian Ltd, a UK Hydromet.

networking company, the CMO Headquarters created a forum for Met Directors to learn and to share best practices in:

(i) data collection, management, sharing, and integration for decision-making;
(ii) how NMHSs can invest, improve, and work collaboratively, with public sector, private sector, and academic partners, on hydro-meteorological infrastructure and services.

11.18. The symposium was also an opportunity to understand data policies and practice from the Caribbean perspective, in advance of the WMO Data Conference in 2020. Council recalled the WMO Geneva Declaration 2019 (Resolution 80 (Cg-18)): Building Community for Weather, Water and Climate Actions. Recommendations from the symposium would contribute to the WMO Open Consultative Platform by identifying and promoting good practice in public-private cooperation models in the Caribbean context.

11.19. Council was asked to note that the Met. Directors found the symposium very valuable and wish to have follow-up symposia in subsequent years.

11(e) Lightning Detection System

11.20. Council recalled that, in the past, the CMO Headquarters indicated its interest in establishing a ground-based *Lightning Detection System* in the region in partnership with the Meteorological Service of France [Météo-France]. The CMO Headquarters has studied this system in great detail and was of the opinion that such a system was very necessary in the Caribbean. Over the years, the CMO Headquarters reported to the Council, the results of a demonstration period of a long-range lightning detection system that showed its tremendous value to the prediction of severe weather in the region.

11.21. Council noted that, in the various publications and presentations, it had been shown how ground-based systems use triangulation from sensors at multiple locations to determine location of the lightning flash. Therefore, for this higher resolution to be achieved, it would be necessary to install some lightning sensors along the island chain to allow for adequate triangulation using the commonly known phenomenon “lightning sferics”.

11.22. Over the years, the CMO Headquarters has received several proposals from a number of lightning-detection suppliers. Council noted that the CMO Headquarters had proposed that it should consider a capital project approach, in which international funding could be sought, in the same way as was done for the CMO Radar Project, through an internationally-tendered process, in which the equipment purchased and installed under such a project would be owned and operated by the CMO for the benefit of all CMO Member States and the region in general.

11.23. Council recalled that, at its 57th session in 2017, it endorsed the concept of a *CMO Lightning Detection Network* (CLDN). However, it was felt that more information was required as to the cost of, and a sustainability model for the system. It was also suggested that before a final decision could be made on CLDN, the *Geostationary Lightning Mapper* (GLM), which had just become available on the new GOES satellites, should be evaluated during 2018 and 2019 prior to deciding on the CLDN. Studies conducted over North America that compared the GLM with the Vaisala's National Lightning Detection Network and Earth Networks Total Lightning Network, provided guidance for how to proceed. For operational forecasting, it is optimal to have lightning observations from both the GLM and a ground-based network of sensors. The GLM provides high quality observations over data sparse regions (e.g., the ocean) and while ground-based networks are excellent at locating cloud-to-ground flash strikes. Some Member States have began exploring setting up sensors, which can become part of a regional network. Council was asked to approve the initiation of a project to develop a CMO Lightning Detection Network.

11.24. **The Council:**

(i) **Noted** the progress made towards the WMO *Severe Weather Forecasting Demonstration Project* (SWFDP) in the Eastern Caribbean and **strongly supported** regional participation in its implementation;

(ii) **Also Noted** the developments regarding the CREWS-Caribbean project to strengthen the National Meteorological and Hydrometeorological Services of CMO Member States through the development of model legislation and National Strategic Plans and to **strongly supported** these critical activities;

(iii) **Further Noted** the initiation of the *Caribbean Weather Forecasting Initiative* to advance forecaster skill and allow regional forecasters to have a knowledge exchange with researchers and contribute to an international field study;

(iv) **Noted** the recent operational hydro-meteorology symposium for Directors of National Meteorological Services and other key stakeholders, which identified best practices in data management, sharing and integration for decision-making as well as development of public, private, and academic partnerships to enhance weather and climate services in the Caribbean;

(v) **Noted** the recent developments in connection with an operational ground-based lightning detection system.

12 OTHER MATTERS

12(a) Human Resources Committee

12.1. With the retirement of two members of the Human Resources Committee formed in 2018 and the absence of the third member, a new HR committee was formed for the Organs of the CMO. The Chair of that Committee is the Chair of the Board of Governors of CIMH, the Representative from Trinidad and Tobago, and the Representative from St Vincent and the Grenadines. The term for the HR Committee was decided to last for three years.

12.2. The Council recalled the outstanding matters associated in relation to the CIMH Principal's terms of employment, which had lingered for several years. In 2018, to resolve the matter, the then Chairman of the Council invited Mr Denzil Jones, a former Chair of the HR Committee to meet with Council and resolve the matter expeditiously before the closure of the session. The meeting was suspended and a sub-committee, which comprised of the Chairman, the Coordinating Director, the Coordinating Director-Designate, Chair of the HR Committee, Chair of the CIMH Board of Governors, and Mr Jones, met with the Principal. After deliberations the sub-committee presented its recommendations and decisions to Council and Council approved two new allowances for the Principal and

> "**Requested** the delivery of information about the scale of salary for Dean and Deputy Principal of UWI Cave Hill to the Chair of the Board of Governors of CIMH, to be relayed to Council in 2019:"

12.3 Council examined the salary scales that were deemed to be most relevant, those of the Deputy Principal and Medical Professor of the UWI Cave Hill, with the latter being the highest salary scale among professors. Council also reviewed supporting documents and the historical account from the Principal and others who were present for the deliberations during previous Council Sessions. After deliberating for some time, Council made a decision to increase the salary of the Principal of CIMH, based on the scale of the Deputy Principal. The HR Committee was directed to work with the Principal on the matter of retroactive remuneration.

12(b) Unpaid Leave for Retired Coordinating Director

12.4. Council was informed that the retired Coordinating Director requested a waiver of Item 4(a)(1) of his contract and approval of payment for 79 days of unused leave accrued during his final contract period.

12(c) Saint Lucia Geo-Information Centre (GIC)

12.5. Council was informed of a new project being implemented in Saint Lucia by agreement between the Government of Saint Lucia and the Government of Italy. The installations are being implemented by the Caribbean Community Centre for Climate Change (CCCCC). The project includes the installation of an X-band radar, which has a radius of 120 km and would be cited within line of sight of the Hewanorra Airport in Vieux Fort, Saint Lucia. Council noted that the Saint Lucia Meteorological Service appeal for assistance from CMO with the maintenance of the radar and its application for their monitoring and forecast services. It was noted that staff from Saint Lucia Meteorological Service would be included in the Operational Radar Working Group approved by Council.

12.6. **The Council:**

(i) **Approved** the **new Human Resources Committee**

(ii) **Decided** that **HR committee members should have a term of three years**

(iii) **Noted** its appreciation for the great contributions of the Principal to the Organization

(iv) **Decided** that the **salary of the Principal should be pegged to the salary scale of the Deputy Principal of the University of the West Indies, Cave Hill**

(v) **Directed** the HR Committee to negotiate with the Principal on the matter of retroactive payments and report to Council on the agreement.

(vi) **Approved** the payment of salary for unused leave accrued by the retired Coordinating Director

(vii) **Noted** the information provided by Saint Lucia on the GIC and their request for assistance with regards to radar maintenance.

13 DATE AND VENUE OF CMC60 (2020) AND CMC61 (2021)

13.1. Council invited Member States to indicate their willingness to host the next sessions of the CMC. St Vincent and the Grenadines have expressed an interest in hosting the Council for its 60th Session in 2020. The Cayman Islands have indicated their willingness to host in 2021. Members that have not hosted in recent times were invited to seek authorization to do so, and to extend an invitation to the Council for the meeting in the year 2022.

Close of Meeting

13.2. There being no other business, the Meeting ended at 1653LST with an exchange of courtesies.

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A G E N D A

1. OPENING OF SESSION AND ELECTION OF CHAIRMAN

2. ADOPTION OF AGENDA AND PROCEDURAL MATTERS

3. CMO EXECUTIVE REPORTS
   - (a) Coordinating Director's Report
   - (b) CIMH Principal's Report
   - (c) CIMH Board of Governors' Report

4. STATUS OF ACTIONS FROM PREVIOUS SESSION

5. SPECIAL CMO AND WMO ISSUES
   - (a) Outcomes/Highlights of the 18th World Meteorological Congress - Major Governance Reform of the World Meteorological Organization (WMO)
   - (b) Outcomes/Highlights of the 71st Executive Council (EC) of the WMO
   - (c) WMO Integrated Global Observing System – Pre-Operational Phase to Operational Phase
   - (d) Disaster Risk Reduction and Regional Severe Weather Forecasts and Warning Systems
   - (e) The Global Framework for Climate Services (GFCS)
   - (f) Reception of new Geostationary Satellite Imagery in CMO Member States
   - (g) Issues emerging from the WMO Technical Commission sessions in 2019

6. FINANCIAL REPORTS
   - (a) Status of Refundable Balances
   - (b) CMO HQ - Auditor's Report
   - (c) Statement of Contributions and Arrears (CMO HQ & CIMH)

7. THE CMO STRATEGIC PLAN

8. CMO BUDGETS (Headquarters Unit, CRN and Radar, CIMH)
   - (a) CMOHQ Budget Estimates for 2020
   - (b) CIMH Budget Estimates for 2020

9. ANNUAL MEETING OF THE DIRECTORS OF METEOROLOGICAL SERVICES

10. CMO WEATHER RADAR NETWORK
    - Status and operations of CMO Radar Network Operations
    - Establishment of the CMO Operational Radar Working Group

11. OTHER PROJECT UPDATES AND PROPOSALS

(a) Severe Weather Forecast Demonstration Project (SWFDP)

(b) Climate Risk and Early Warning Systems (CREWS) Caribbean Project

(c) EUREC4A Caribbean Weather Forecasting Initiative

(d) Caribbean Symposium 2019: Operational Hydro-meteorological Leadership Summit

(e) Lightning Detection System

12. OTHER MATTERS

13. DATE AND VENUE OF CMC60 (2020)

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ANNUAL MEETING OF THE CARIBBEAN METEOROLOGICAL COUNCIL
ANGUILLA
14TH – 15TH NOVEMBER 2019

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ANNEX III

STRATEGIC PLAN 2020-2023

STRENGTHENING CAPACITY, ADDING VALUE, AND BUILDING RESILIENCE IN THE METEOROLOGICAL AND HYDROMETEOROLOGICAL SERVICES OF THE CARIBBEAN

CMO HEADQUARTERS UNIT

1. Introduction

The availability and integration of weather, water, climate, and socio-economic Information into policy making and societal action are critical to building resilience and realizing sustainable development goals in the Caribbean. The centre pieces for national and regional policy and action are the UN 2030 Agenda for Sustainable Development, the Paris Agreement on climate change, and the Sendai Framework for Disaster Risk Reduction. As governments, organizations and regional bodies align their development activities within these frameworks, the organs of the CMO and the National Meteorological and Hydrometeorological Services (NMHSs) in particular, have enormous roles to play in supporting implementation. Caribbean governments, organizations, and regional bodies will increasingly rely on information from NMHSs as they pursue their sustainable development goals on land, at sea and in the air. The CMO Headquarters advocates for and works to procure the resources to allow the National Services to meet their mission. The concomitant decisions at all levels will continue to be contingent upon a better understanding of the changing threat levels from natural hazards, weather, water and climate extremes and climate change.

Climate services are needed at the national and regional levels for economic sectors, ,food production, water, health, and energy, among others, will be vital in building climate-resilient economies. To address these growing demands for actionable scientific information, the NMHSs of CMO Member States will need to be strengthened through legal mandates, targeted investments, scientific and technical development, and strategic partnerships.

The consequences of high-impact weather, water and climate extremes are devastating for the safety of people, national economies, environments, and food and water security. Extreme hydrometeorological[1] events have accounted for more than 90% of the world's natural disasters. during 1998-2017[2] (United Nations Office for Disaster Risk Reduction (UNISDR, 2018). For the Caribbean, prominent recent examples are Hurricanes Irma and Maria (2017) and Dorian (2019). With an expected increase in the frequency and intensity of some weather and climate extremes (according to the Intergovernmental Panel on Climate Change, IPCC), threats to the population and the economies will increase. The combination of coastal erosion from intense hurricanes and sea level rise, linked with climate change, create additional vulnerability to Caribbean countries, which have a large percentage of their population and critical economic infrastructure in coastal areas.

2. Addressing the Gaps

DATA INTEGRATION INTO REGIONAL AND GLOBAL INFORMATION SYSTEMS

All CMO Member States collectively contribute to the meteorological and hydrological infrastructure and facilities of the region. While this collective system is a public good that benefits all, the contribution and service performance among the Members continues to be uneven. For example, observation data are vital for a variety of applications, from flood and drought forecasts to routine decision-making, but only a limited set of station data are actually integrated into regional and global information systems. This may be due to technical limitations and/or failure to prioritize this obligation to the regional and global observation network and information system.

Observations and forecasts have value when used in decision-making. This entails integrating weather, climate, and water information with other environmental and socio-economic information in a decision-support system and continuous communication with decision-makers. Impact-based forecasting is

[1] Hydrometeorological hazards are of atmospheric, hydrological or oceanographic origin.

[2] CRED-UNISDR, Economic losses, poverty and disasters 1998-2017, Geneva 2018

facilitated by such systems, an example of which is the DEWETRA at CIMH on which several forecasters have been trained. NMHSs are facing substantial development needs and capability gaps in providing the weather, climate, water and related environmental information and services to meet national, regional and global requirements. The regional radar network, in particular, requires specialized knowledge and has costly maintenance issues. These typical challenges for the Member services centre around maintaining sustainable infrastructure, human resources, and the ability to benefit from the advances in science and technology.

Such deficiencies are often present in countries that are particularly vulnerable to natural disasters, which jeopardize effective protection of life and property and they slow down socioeconomic recovery. Narrowing the capacity gaps by sustaining government support, international cooperation, catalyzing investment and targeted assistance is more important than ever in view of the increasing intensity of weather-, climate- and water-related extremes.

INSTITUTIONAL STRENGTHENING

In order for National Meteorological and Hydrometeorological Services of CMO Member States to continue to be leaders in preserving and expanding knowledge and delivering information to help society make better decisions, their operations need to be underpinned and guided by comprehensive legislation Further, in discharging its functions, an must necessarily enter into a variety of partnerships and interact with individuals and agencies from many sectors of society. Legislation is necessary to underpin those interactions and provide mechanisms for cost recovery or revenue generation from services rendered. However, among the CMO Member States, only the Cayman Island has legislation for its National Weather Service. The remainder lack a legal mandate for their National Meteorological or Hydrometeorological Services.

In response to this need, the CMO Headquarters, in collaboration with the Organization of Eastern Caribbean States (OECS), with support from the CIMH, developed a proposal for the drafting of model legislation for National Meteorological Services of CMO Member States. The legislation is intended to define the roles, responsibilities, and extent of the NMS' authority and provide a solid basis for defending the NMS, and by extension the Government, from litigation. This initiative will be supported by the WMO through the *Climate Risk and Early Warning Systems (CREWS) Caribbean* Project and will be a primary focus for the next Strategic period.

The CMO Headquarters Unit will also support the development of Strategic Plans for the NMSs in several CMO Member States as another critical component of institutional strengthening. This activity will be funded by the WMO through CREWS Caribbean Project.

As another institutional strengthening activity, the CMO Headquarters had embarked on an initiative to assist in upgrading meteorological services in the Turks and Caicos Islands to include forecasting capabilities. That activity was described in its Operational Plan for 2015-2019 and continues as priority of this Strategic Plan.

RECOMMENDATIONS FROM REVIEW OF 2017 EARLY WARNING SYSTEMS

The desire for having at least one senior forecaster in all CMO offices was recently noted in the WMO Climate Risk and Early Warning Systems (CREWS-Caribbean) review of Early Warning Systems (EWS) in the Caribbean in the wake of the catastrophic 2017 Hurricane Season. That EWS review found several issues, including the importance of having redundancy in communication systems. For example, the destruction of communication systems in Dominica by Hurricane Maria meant that there were no systems in place to prepare and communicate warnings of a subsequent tropical cyclone threat. While some Member States have emergency communication systems, others have begun addressing this deficiency, e.g., the Cayman Islands tested a new emergency satellite communication system in

September 2018. The EWS review also found inadequate monitoring of hazards, such as coastal flooding and flash-flooding and highlighted the need for Quality Management Systems (QMS) for hydrometeorology; not only for warnings but for downstream development. The CMO Headquarters Unit and the CIMH have experience in helping the National Meteorological Services develop QMS for aviation services—experience which can be applied for all areas of hydrometeorology.

SEVERE WEATHER IMPACT-BASED FORECASTING, WARNINGS, AND COLLABORATIONS

While the Caribbean has a well-established regional hurricane forecast warning system, no program exists to facilitate regional collaboration and information exchange for non-tropical cyclone severe weather events, which are also deadly and destructive and can occur any time of year. Motivated by that need, the WMO, in partnership with the CMO, Météo-France, and NOAA (with initial funding from Canada) initiated a *Severe Weather Forecast Demonstration Project* (SWFP) for the Eastern Caribbean with special arrangements for Haiti. The SWFP will utilize forecast models from global centres and regional models of the CIMH and disseminate information to disaster management offices and other stakeholders. The SWFP will be advancing impact-based forecasting in the region, a goal that is in common with the Weather and Climate Ready Nations Program being implemented by the CIMH.

CATALOGUING HAZARDOUS EVENTS

The assessment of climate risk entails having knowledge of climate extremes**,** their current and potential variability under different future climate scenarios. By cataloguing and archiving extreme weather and climate events with the WMO Regional Climate Centre at CIMH, Member States can then link the events to any associated loss and damage and contribute to Article 8 of the Paris Agreement on “averting, minimizing and addressing loss and damage”. Those activities are synergistic with the CIMH's activities and commiserate with resolutions of the 18th World Meteorological Congress on Cataloguing Hazardous Events and the Global Multi-hazard Alert System (GMAS). The CMO Headquarters unit will be facilitating and encouraging Member States to contribute to archiving hazardous events with the RCC at CIMH.

3. Overarching Priorities

This Strategic Plan is focussed on addressing the most pressing developments and needs during 2020-2023, as part of fulfilling the long-term UN Sustainable Development Goals out to 2030. The Plan, which articulates expected outcomes and clear benefits to Members, will be focussed on the following priorities:

a) Enhancing disaster preparedness and reducing loss of life and property from extreme hydrometeorological events and severe weather.
b) Supporting climate-smart decision making to build resilience and adaptation to climate risk.
c) Supporting the strengthening and maintenance of observation networks and information services as critical components of disaster risk reduction and sustainable development frameworks.
d) Enhancing the socioeconomic and national security value of weather, climate, hydrological, and related environmental services.

These priorities are aligned with the WMO strategic priorities and long-term goals (Goals 1 and 4) as well as the strategic priorities of development partners. Additionally, these goals are supportive of CIMH initiatives, such as impact-based forecasting and reliable observation networks.

4. Structural alignment at CMO Headquarters

In order to effectively support the strategic priorities and achieve the desired outcomes, the CMO Headquarters will be enhancing its staff with the addition of Project Development Officer. This position was approved by Council several years ago but hiring has been delayed because of inadequate financial resources to support the position.

Among the duties of the Project Development Officer is to assist in planning, implementing, and evaluating projects for the benefit of the CMO Members and assist with CMO activities in projects implemented by other organizations. .The Officer will also be responsible for the coordination of resource mobilization activities of the CMO Headquarters, to support CMO Members, and where appropriate, and feasible, at the request of the Caribbean Institute for Meteorology and Hydrology (CIMH).

5. Strategic Priorities, Goals, and Outcomes for NMHSs

a) ENHANCE DISASTER PREPAREDNESS AND REDUCING LOSSES OF LIFE AND PROPERTY FROM EXTREME HYDROMETEOROLOGICAL EVENTS AND SEVERE WEATHER.

Ultimate Outcome 1 *Support for delivery of authoritative, accessible, user-oriented and fit-for-purpose information and services to reduce the disaster risk of hydrometeorological extremes.*

- **Intermediate Outcome 1** Enhanced capability of Members to develop, deliver, and utilize accurate and reliable weather, climate, water and related environmental impact-based forecasting services to mitigate against extreme hydrometeorological events.

  Focus in 2020-2023
  - Support implementation of impact-based forecast and warning products and services
  - Strengthen national capacity in multi-hazard early warnings through enabling legislation that clarifies the roles and responsibility of NMHSs
  - Transition the SWFP in the Eastern Caribbean from demonstration phase to operations.
  - Support Members' production and delivery of authoritative national climate information products and services.
  - Support the enhancement and increase in weather services via uptake of modern technology in service delivery and quality management principles.
  - Providing guidance on the adoption of international standards, quality control mechanisms and recommended practices in a holistic manner for all service areas based on best national practices**.**

- **Immediate Outcome 1.1** Strengthened national multi-hazard early warning/alert systems to better enable effective responses to the associated risks.

- **Immediate Outcome 1.2** Supported the implementation of the WMO Severe Weather Forecast Programme (SWFP) for the Eastern Caribbean -a prototype for regional coordination and collaboration on early warnings for non-tropical cyclone severe weather.

- **Immediate Outcome 1.3** Broadened provision of policy- and decision-support for drought and flood monitoring and prediction services.

- **Immediate Outcome 1.4** Enhanced value and innovations in the provision of impact-based decision-support to mitigate weather, climate, and water-related hazards.

  Focus in 2020-2023
  - Support the enhancement and increase in weather services via uptake of modern technology in service delivery and quality management principles.
  - Support the development and adoption of international standards, quality control mechanisms and recommended practices in a holistic manner for all service areas based on best national practices**.**

- **Immediate Outcome 1.5** Support for the implementation of redundant communication systems to sustain warning systems in the event of multiple hazards and/or serial extreme events.

  Focus in 2020-2023
  - Provide NMHSs with guidance for the implementation of redundant communications systems which should be used in RA IV (North and Central America and the Caribbean)

b) SUPPORT CLIMATE-SMART DECISION MAKING TO BUILD RESILIENCE AND ADAPTATION TO CLIMATE RISK.

NHMSs will be supported in the development of national climate services, following the successful example of the CIMH-led Caribbean Outlook Forum (CariCOF) and Consortium for Early Warning Information System Across Climate Time Scales (EWISACTS) at the regional level. The CMO Headquarters will facilitate and seek resources to help NMHS plan strategically for building resilience and adaptation to climate risk at the national level.

Focus in 2020-2023
- Support Members' production and delivery of authoritative national climate information products and services in the priority areas of EWISACTs to adapt and respond to climate variability and change. Facilitate and encourage participation of NMHSs in a climate service information system enabling all Members to access, and add value to, the best available regional climate information products and methodologies.

Ultimate Outcome 2 *Climate services and information integrated into policy and decision-making framework for building socioeconomic resilience and reducing climate risk.*

- **Intermediate Outcome 2** Enhanced capability of Members to develop, access and utilize accurate, reliable climate, water and related environmental services to best support the policy-making and actions that mitigate against climate risks and build socioeconomic resilience.

  - **Immediate Outcome 2.1** Strengthened capability to provide climate services through investments and/or via public-private partners.

  - **Immediate Outcome 2.2** Broadened provision of policy- and decision-supporting climate information and services.

  - **Immediate Outcome 2.3** Supported the expansion of NMHS contributions to the Regional Climate Centre database for climate extremes, as called for by WMO Resolution 9 (Cg-17).

c) SUPPORT THE STRENGTHENING AND MAINTENANCE OF OBSERVATION NETWORKS AND INFORMATION SERVICES AS CRITICAL COMPONENTS OF DISASTER RISK REDUCTION AND SUSTAINABLE DEVELOPMENT FRAMEWORKS.

Ultimate Outcome 3 *Enhanced observations and integrated information services for impact-based forecasting and decision-support for both routine activities and high-impact events*

- **Intermediate Outcome 3** An integrated observational network optimized to ensure effective national coverage and accessibility for risk monitoring and numerical weather prediction. High quality fit-for-purpose measurements feeding a continuous data exchange underpinned by best practices in data management and data processing mechanisms.

  - **Immediate Outcome 3.1** Optimized acquisition of observational data through the WMO Integrated Global Observing System (WIGOS).

    Focus in 2020-2023
    - To encourage and support international exchange of data, along with strengthened monitoring of compliance within WMO RA IV
    - Provide advice on the development of data management systems and practices through WMO Information System (WIS) to help ensure that all observational data and key products are properly archived.

  - **Immediate Outcome 3.2** Improved and increased access to, exchange, and management of current and past observational data and derived products through the WMO Information System (WIS).

    *Focus in 2020-2023**:***
    - To help facilitate international exchange of data, along with strengthened monitoring of compliance.
    - Assist in the development of data management systems and practices through WMO Information System (WIS) to help ensure that all observational data and key products are properly archived

  - **Immediate Outcome 3.3** Initiation of an operational radar working group to facilitate sharing of expertise and ensuring the maintenance and functioning of the Caribbean Radar Network.

    Focus in 2020-2023
    - Creation and operationalization of the operational radar working group

  - Immediate Outcome 3.4 Members are using information services that facilitate integration of observations, numerical models, and tools to support impact-based forecasting and collaboration with disaster management and other core partners.

    Focus in 2020-2023
    - Advance the use of information technology to support impact-based forecast and warnings.
    - Support the development of guidance material to facilitate integration of externally-sourced observations into the impact-based forecast process.

d) ENHANCE THE SOCIOECONOMIC AND NATIONAL SECURITY VALUE OF WEATHER, CLIMATE, HYDROLOGICAL, AND RELATED ENVIRONMENTAL SERVICES.

Focus in 2020-2023

- Assist NMHSs with guidance in the assessment of the economic benefits and enhancement of socioeconomic benefits of their services.
- Support the enhancement in the communication skills of NMHSs and uptake of modern technology in service delivery.
- Help NMHSs to become more visible by amplifying their news, events, and triumphs
- Facilitate the establishment of principles and guidance for successful public-private-academia engagement to improve and expand services and develop markets for services.
- Enable dialogue based on collaboration and mutual reinforcement. Expand on dialogue started during the Caribbean Symposium 2019: Operational Hydro-meteorology Leadership Summit.

Ultimate Outcome 4 *Enhanced service delivery capacity of Members to ensure availability of essential information and services needed by governments, economic sectors, and citizens*

- **Intermediate Outcome 4** Improved access to regional and global monitoring and prediction systems and utilization of weather, climate and water information and services that brings tangible benefits to Members.

  - **Immediate Outcome 4.1** Addressed the needs of Members to enable them to provide and utilize essential weather, climate, hydrological and related environmental services.

    Focus in 2020-2023

    - Improve understanding of the specific capacity needs of each Member with respect to technical, institutional and human resources, to enable them to *provide adequate we*ather, climate, and hydrological services, in particular for protection of life, property and economic productivity.
    - Assist in the mobilization of resources involving development agencies and national governments and assisting NMHSs to develop long-term strategies and operational plans to address the identified capacity needs.

  - **Immediate Outcome 4.2** Assisted in the development and sustaining of core competencies and expertise.

    Focus in 2020-2023

    - Support Members to understand and acquire the qualification and competencies required for effective service delivery, focused on WMO standards and recommendations.
    - Coordinating with the WMO on new integrated weather service delivery, such as the marine service delivery training initiative to which the CMO Headquarters contributed in 2019.

  - **Immediate Outcome 4.3** Scaled-up effective partnerships for investment in sustainable and cost-efficient infrastructure and service delivery.

    Focus in 2020-2023

    - Coordinate the strengthening and development of partnerships and alliances among all Members to share knowledge, technology and expertise.
    - Facilitate the sharing of best practices in partnerships by NMHSs in the Caribbean, with public sector, private sector, and academia.

- Explore formation of strategic development partnerships and alliances with appropriate intergovernmental and nongovernmental organizations, the private sector, and academia.
- Provide leadership in promoting the principles on which global meteorology is built, emphasizing authoritative voice, common standards, data and product sharing among NMHSs of Member States.

6. Monitoring indicators for Service to NMHSs

IMMEDIATE OUTCOME	MONITORING INDICATORS
1.1 STRENGTHENED NATIONAL MULTI-HAZARD EARLY WARNING/ALERT SYSTEMS TO BETTER ENABLE EFFECTIVE RESPONSE TO THE ASSOCIATED RISKS.	1.1.1 NUMBER OF MEMBERS PARTICIPATING IN A COMMON ALERTING PROTOCOL (CAP) FOR WARNINGS AND ALERTS 1.1.2 NUMBER OF MEMBERS WITH A MHEWS INTEGRATED IN A NATIONAL DISASTER RISK REDUCTION MANAGEMENT SYSTEM
1.2 SUPPORTED THE IMPLEMENTATION OF THE WMO SEVERE WEATHER DEMONSTRATION PROJECT (SWFP) IN THE EASTERN CARIBBEAN, A PROTOTYPE FOR A REGIONAL EARLY WARNING SYSTEM FOR NON-TROPICAL CYCLONE SEVERE WEATHER.	1.2.1 NUMBER OF FORECASTERS TRAINED IN THE SWFP CONCEPT 1.2.2 NUMBER OF MEMBERS PARTICIPATING IN THE SWFP 1.2.3 AT LEAST ONE VERIFICATION MEASURE IMPLEMENTED FOR SEVERE WEATHER FORECASTS 1.2.4 USERS FEEDBACK ON THE USEFULNESS OF SEVERE WEATHER FORECASTS
1.3 BROADENED PROVISION OF POLICY- AND DECISION-SUPPORTING DROUGHT AND LONG-TERM FLOOD MONITORING AND PREDICTION SERVICES.	1.3.1 NUMBER OF MEMBERS PROVIDING NATIONAL FLOOD AND DROUGHT MONITORING AND PREDICTION SERVICES 1.3.2 NUMBER OF MEMBERS MAKING USE OF RCCS AND/OR RCOFS 1.3.3 USER/STAKEHOLDER ASSESSMENT OF THE RELEVANCE, USEFULNESS AND TIMELINESS OF OUTLOOKS/ALERTS FOR EXTREME CLIMATE EVENTS
1.4 ENHANCED VALUE AND INNOVATIONS IN THE PROVISION OF IMPACT-BASED DECISION-SUPPORT TO MITIGATE WEATHER, CLIMATE, AND WATER-RELATED HAZARDS.	1.4.1 NUMBER OF MEMBERS USING (A) WEB APPLICATIONS AND (B) SOCIAL MEDIA IN WARNING DELIVERY 1.4.2 NUMBER OF MEMBERS WITH QMS FOR HYDROMETEOROLOGY AND EWS. 1.4.3 NUMBER OF MEMBERS USING ONLINE PLATFORMS FOR INTEGRATING WEATHER, WATER, AND CLIMATE HAZARDS WITH SOCIO-ECONOMIC DATA 1.4.4 NUMBER OF MEMBERS WITH AGREEMENTS BETWEEN NMHSS AND PRIVATE SECTOR/ACADEMIA ACTORS ON(A) EWS SERVICE DELIVERY AND (B) MAINTENANCE OF

IMMEDIATE OUTCOME	MONITORING INDICATORS
	NETWORKS FOR EWSS
1.5 SUPPORT FOR THE IMPLEMENTATION OF REDUNDANT COMMUNICATION SYSTEMS TO SUSTAIN WARNING SYSTEMS IN THE EVENT OF MULTIPLE HAZARDS AND/OR SERIAL EXTREME EVENTS.	1.5.1 NUMBER OF MEMBERS WITH BACKUP COMMUNICATION AND POWER SYSTEMS 1.5.2 A REVISED REGIONAL EWS WITH BACKUP ASSIGNMENTS FOR FORECAST AND WARNINGS
2.1 STRENGTHENED CAPABILITY TO PROVIDE CLIMATE SERVICES THROUGH INVESTMENTS AND BY PUBLIC-PRIVATE PARTNERS.	2.1.1 NUMBER OF MEMBERS WITH BASIC SYSTEM FOR DELIVERING CLIMATE SERVICES 2.1.1 NUMBER OF MEMBERS WITH QMS FOR SELECTED SERVICES (AVIATION, MARINE, HYDROMETEOROLOGY, EWS)
2.2 BROADENED PROVISION OF POLICY- AND DECISION-SUPPORTING CLIMATE INFORMATION AND SERVICES.	2.2.1 NUMBER OF MEMBERS MAKING USE OF RCCS AND/OR RCOFS 2.2.2 NUMBER OF MEMBERS ORGANIZING NCOFS 2.2.3 NUMBER OF USERS ACCESSING CLIMATE SERVICES THROUGH WEB PLATFORMS OR OTHER METHODS OF SERVICE DELIVERY (E.G., MAIL-IN REQUESTS) 2.2.4 USER/STAKEHOLDER ASSESSMENT OF THE RELEVANCE, USEFULNESS AND TIMELINESS OF CLIMATE INFORMATION
2.3 SUPPORTED THE EXPANSION OF CONTRIBUTIONS TO THE REGIONAL CLIMATE CENTRE DATABASE FOR CLIMATE EXTREMES, AS CALLED FOR BY WMO RESOLUTION 9 (CG-17).	2.3.1 NUMBER OF MEMBERS CONTRIBUTING TO THE WEATHER AND CLIMATE IMPACTS DATABASES OF THE WMO RCC AT CIMH
3.1 OPTIMIZATION OF THE ACQUISITION OF OBSERVATIONAL DATA THROUGH THE WMO INTEGRATED GLOBAL OBSERVING SYSTEM (WIGOS).	3.1.1 PERCENTAGE OF THE REGIONAL EARTH SYSTEM COVERED BY OBSERVATIONS (ESPECIALLY HYDROSPHERE) 3.1.2 NUMBER OF MEMBERS COMPLYING WITH WMO OBSERVATION STANDARDS 3.1.3 NUMBER OF MEMBERS IMPLEMENTING NATIONAL OBSERVING SYSTEM WIGOS
3.2 IMPROVED AND INCREASED	3.2.1 NUMBER OF MEMBERS WITH NATIONAL NETWORK

IMMEDIATE OUTCOME	MONITORING INDICATORS
ACCESS TO, EXCHANGE AND MANAGEMENT OF CURRENT AND PAST OBSERVATIONAL DATA AND DERIVED PRODUCTS THROUGH THE WMO INFORMATION SYSTEM (WIS).	MONITORING AND DATA MANAGEMENT SYSTEMS ESTABLISHED 3.2.2 NUMBER OF MEMBERS IMPLEMENTING DATA EXCHANGE POLICIES, AS PER WMO RESOLUTIONS 40, 25 AND 60.
3.3 INITIATION OF AN OPERATIONAL RADAR WORKING GROUP TO FACILITATE SHARING OF EXPERTISE AND ENSURING THE MAINTENANCE AND FUNCTIONING OF THE CARIBBEAN RADAR NETWORK.	3.3.1 APPROVED TERMS OF REFERENCE FOR THE RADAR OPERATIONS WORKING GROUP 3.3.2 INITIAL MEETING/WORKSHOP HELD 3.3.3 ONLINE PLATFORM INITIATED FOR COLLABORATION, TROUBLESHOOTING, AND INFORMATION EXCHANGE
3.4 MEMBERS ARE USING INFORMATION SERVICES THAT FACILITATE INTEGRATION OF OBSERVATIONS, NUMERICAL MODELS, AND TOOLS TO SUPPORT IMPACT-BASED FORECASTING AND COLLABORATION WITH DISASTER MANAGEMENT AND OTHER CORE PARTNERS.	3.4.1 NUMBER OF MEMBERS USING ONLINE PLATFORMS, SUCH AS DEWETRA, FOR INTEGRATING OBSERVATIONS, MODEL FORECASTS, WITH HYDROLOGICAL AND SOCIO-ECONOMIC DATA FOR DECISION SUPPORT AND COLLABORATION. 3.4.2 NUMBER OF MEMBERS WITH AGREEMENTS BETWEEN NMHSS AND PRIVATE SECTOR/ACADEMIA ACTORS ON(A) SERVICE DELIVERY AND (B) MAINTENANCE OF NETWORKS
4.1 ADDRESSED THE NEEDS OF MEMBERS TO ENABLE THEM TO PROVIDE AND UTILIZE ESSENTIAL WEATHER, CLIMATE, HYDROLOGICAL AND RELATED ENVIRONMENTAL SERVICES.	4.1.1 NUMBER OF NMHSS WITH STRATEGIC PLANS 4.1.2, NUMBER OF NMHSS WITH LEGAL BASIS FOR THEIR OPERATION 4.1.3 NUMBER OF NMHSS WITH ENHANCED HUMAN AND TECHNICAL CAPACITY TO PROVIDE A RANGE OF SERVICES.
4.2 DEVELOPED AND SUSTAINED CORE COMPETENCIES AND EXPERTISE.	4.2.1 NUMBER OF NMHS STAFF TRAINED AT WMO TRAINING CENTRES AND/OR FELLOWSHIPS 4.2.2 NUMBER OF NMHSS WHOSE STAFF HAVE ADEQUATE (TO BE DEFINED) LEVEL OF CORE COMPETENCIES TO MEET NATIONAL AND INTERNATIONAL MANDATE
4.3 SCALED UP EFFECTIVE PARTNERSHIPS FOR INVESTMENT IN SUSTAINABLE AND COST-EFFICIENT INFRASTRUCTURE AND SERVICE DELIVERY.	4.3.1 NUMBER OF NMHSS RECEIVING INTERNATIONAL CAPACITY DEVELOPMENT ASSISTANCE 4.3.2 NUMBER OF MEMBERS BENEFITING FROM CATALYZED DEVELOPMENT PROJECTS

IMMEDIATE OUTCOME	MONITORING INDICATORS
	4.3.3 NUMBER OF MEMBERS WITH LEGAL BASIS FOR PUBLIC-PRIVATE PARTNERSHIPS 4.3.4 NUMBER OF MEMBERS WITH SOCIOECONOMIC BENEFIT ANALYSIS CONDUCTED IN THE PAST X YEARS

7. Strategic Priorities for the CMO Headquarters Unit

The CMO Headquarters Unit has a strong leadership role to play in the region and, as such, needs to develop its own capacity and resources in order to successfully serve its Member States. Over the next five years the Headquarters Unit aims to:

- Add a Project Development Officer to help fulfill the Strategic objectives outlined above
- Build the visibility of the organization regionally and globally, through such activities as:
    - Re-designing the CMO website to serve as a hub for news about hydro-meteorology in the Caribbean
    - Sharing a Communications Specialist with CIMH
- Increase the percentage of subventions collected from Member States
    - Increase communicating of the organization's service to Member States
    - Seek opportunities to share expertise to aid governments of Member States and increase exposure of the organization
- Develop more projects with regional and international partners
- Increase the number of interns hosted by the Headquarters
- Advance the professional development of its Staff Members
- Investigate a suitable Performance Management System for the Headquarters Unit

8. Risks and Outcomes

The hiring and retention of a Project Development Officer is at risk from inadequate financial resources. A reduction in financial support can also adversely affect the ability of the Headquarters to expand services to its Member States.

Outcomes

Ultimate Outcome 1 Enhanced capacity and resources to successfully serve CMO Member States.

- Intermediate Outcome 1 Enhanced capability to discover new potential resources and to develop successful proposals, and implement multiple projects
    - Intermediate Outcome 1.2 Improvement in workforce competence

9. Monitoring indicators for CMO Headquarters

IMMEDIATE OUTCOME	MONITORING INDICATORS
1.1 ENHANCED CAPABILITY TO DISCOVER NEW POTENTIAL RESOURCES AND TO DEVELOP SUCCESSFUL PROPOSALS, AND IMPLEMENT MULTIPLE PROJECTS	1.1.1 NUMBER OF PROPOSALS SUBMITTED 1.1.2 NUMBER OF PROPOSALS APPROVED 1.1.3 NUMBER OF PROJECTS IMPLEMENTED
1.2 IMPROVEMENT IN WORKFORCE COMPETENCE	1.2.1 NUMBER OF STAFF MEMBERS TRAINED IN A NEW AREA OF EXPERTISE

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TERMS OF REFERENCE FOR CMO OPERATIONAL RADAR GROUP (CORG)

The maintenance of the Caribbean Radar Network and management of the radar data requires skilled technicians, with the knowledge to implement calibration, preventative maintenance, and effective repairs in a timely manner. The CMO Operational Radar Group (CORG) is a mechanism for collaboration and exchange of knowledge and expertise on radar maintenance matters.

Function

1. The CORG will be charged with the responsibility of developing mechanisms for the sharing of operational weather radar data and scan schedules and strategies;
2. The CORG is charged with the development of a maintenance plan including mechanisms for the sharing of maintenance experiences. The Appendix notes recommendations from a journal article and related survey of radar operators in Europe.
3. The group will be an advisory committee to CMO and Directors of Meteorology and will make recommendations on methods to improve the use of radar and standardization of practices, including appropriate scan strategies.
4. The group shall serve as a clearinghouse for operational weather radar data information.
5. It will assist Members to meet their obligations to non-forecast offices, by establishing methods and processes for the production and dissemination of radar imagery and information to the non-forecast offices.

Responsibility of CORG Members

- Members of the CORG must keep abreast with all technical material issued by the WMO under the WMO Integrated Global Observing System (WIGOS).
- Members should be aware of the warning system operations at the regional and local levels.
- Members shall keep their radar metadata updated on the WMO Weather Radar Database at **http://wrd.mgm.gov.tr/default.aspx?l=en**

Composition of CORG

- Membership of CORG will be restricted to personnel from Meteorological Services that host a radar site within a CMO Member State.
- CORG will be comprised of a minimum of six (6) and maximum of twelve persons who are responsible for maintenance and operational usage of the radar.
- The Principal of the Caribbean Institute for Meteorology and Hydrology shall nominate one (1) person for membership on CORG.
- Météo-France will be invited to participate in all meetings of CORG.
- The Chairman and Vice-Chairman will be elected from the members of CORG, who are nominated by the Directors of National Meteorological Services.
- The Chairman will demit office after a period of two (2) years. The Vice-Chairman will supersede the Chairman and a new Vice-Chairman shall be elected from the members of the Radar Group.
- The Science and Technology Officer, CMO will serve as CORG coordinator and Secretary.

Meetings and Exchange of Information

- Normal communication between the members of CORG will be through electronic mail and teleconferencing.
- The initial meeting of the nominated members of CORG will be either virtually or at the CMO Headquarters in Port of Spain, Trinidad and Tobago.

- Meetings of the CORG will be held at the CMO Headquarters or another agreed location every two (2) years, unless funds allow for annual meeting.
- The Chairman of the Radar Group will submit a written report to the Annual Meeting of the Directors of Meteorological Services.

Data archiving and sharing

- The CORG will need to collaborate with IT personnel in each radar operating Member State to ensure archiving and availability of the radar data for multiple scientific uses, including climate services.

Appendix

Excerpt from "*Maintenance keeps radars running*" (Saltikoff et al. 2017):

> "... different countries operating the same type of radars to join forces to maintain a common spare part pool. Exchange of knowledge, and sometimes even spare parts, is already happening within the community.
>
> It is clear that within the European operational weather radar community each member has its own maintenance procedures, which are quite diverse. However, it is also true that many common requirements apply, providing the opportunity for closer cooperation and discussion on operational radar maintenance practices in Europe and beyond. Our analysis of the OPERA radar maintenance survey has highlighted several take-home messages for radar operators at large:
>
> - It is extremely important to take infrastructure, maintenance, and monitoring into account when purchasing a new radar. It is recommended that these aspects are explicitly budgeted. This will avoid a lot of frustration of having a radar network but not being able to use it to its full potential.
>
> - Monitor the radar constantly, invest in infrastructure, recruit wisely, and work together to exchange information, as happens in the OPERA community.
>
> - Annual operative costs of a radar network are typically on the order of 5%–10% of the radar purchase price. During the lifetime of a system (typically 10–20 years) the operator can hence pay as much for the running costs as for the hardware purchase. Despite this, the policies and practices of radar maintenance have not yet been discussed very widely in the international radar community.
>
> Platforms for collaboration between radar operators, such as the OPERA network, enable members not only to exchange knowledge and expertise on weather radars but also to benefit by pooling resources in areas of common interest. Such networks provide a useful template for cooperation between the wider meteorological radar community on its radar maintenance matters..."

Reference

Saltikoff, E.; Kurri, M.; Leijnse, H.; Barbosa, S.; Stiansen, K. Maintenance keeps radars running. Bull. Am. Meteorol. Soc. **2017**, 98, 1833–1840.