CARIBBEAN METEOROLOGICAL ORGANIZATION

REPORT OF THE

ANNUAL MEETING OF DIRECTORS OF METEOROLOGICAL SERVICES

GEORGE TOWN, GRAND CAYMAN, CAYMAN ISLANDS

23 NOVEMBER 2022

INTRODUCTION

1.1 At the kind invitation of the Government of Cayman Islands and the Cayman Islands National Weather Service, the 2022 Meeting of Directors of Meteorological Services was held at the Cayman Islands Airport Authority Conference Facility, Owen Roberts Airport, Grand Cayman, on Wednesday, 23 November 2022, under the Chairmanship of Dr Arlene Laing, Coordinating Director of the Caribbean Meteorological Organization (CMO).

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

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

STATUS OF ACTIONS FROM THE PREVIOUS MEETING
(Agenda Item 2)

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

2.2 In this regard, there was only one action item to be considered from the decisions of the virtual meeting of 2021 Meeting of the Directors of Meteorological Services (DMS2021) (Guyana) on which results were prepared by the CMO Headquarters. The Science and Technology Officer gave the status of actions taken to implement the decision to the Meeting.

TRAINING
(Agenda Item 3)

3.1 **Ms Kathy-Ann Caesar**, Chief Meteorologist, Caribbean Institute for Meteorology and Hydrology (CIMH) gave a presentation that spanned training courses' results for 2022, new Senior Level Meteorological Technician update, returning to face to face, and decisions of the World Meteorological Organization (WMO) Technical Commissions. The Meeting was informed that virtual classes negatively affected students' performance. The main challenges encountered were students having to work while attending courses, students having inadequate supporting equipment, sub-optimal student attendance and engagement. A few students were dismissed for cheating. The Meeting was also informed that physical classes have returned in full and deemed as absolutely necessary if the students were to be successful. Students were underperforming in mathematics and there were suggestions to change the entry level requirements.

3.2 The main highlights of the presentation were the completion and graduation of students from the following WMO vocational training courses offered at CIMH:

- **Entry Level Technicians Course No.92/22 (Online)**
  10 students attended but only 8 graduated– 1-Barbados, 1-Grenada, 1-Jamacia, 1-Sint.Maarten, 2- St. Vincent and the Grenadines, 2- Trinidad and Tobago.

Two students from the Cayman Islands were withdrawn.

- **Meteorology for Geography Educators Course No. 03/22 (Online)**
  10 Participants: 2 Antigua & Barbuda, 2 Barbados, 1 Dominica, 1 Jamaica, and 4 Trinidad and Tobago. The results are pending but only 6 completed the course.

The following are ongoing courses:

- **Mid-Level Technicians Course No.48/22**
  13 students: 2 Anguilla, 3 Barbados, 2 Belize, 2 Grenada, 2 Guyana, 1 Jamaica, 1 the Turks and Caicos. 1 Withdrawal

- **Senior Level Meteorological Technicians' Course (SLMT) 24/22 – Non-degree**
  9 students: 2 Barbados, 1 Belize, 1 Dominica, 1 Saint Maarten, 1 Saint. Lucia, 5 Trinidad and Tobago. 3 Withdrawals

OPERATIONAL MATTERS
(Agenda Item 4)

A. AERONAUTICAL METEOROLOGY, EARLY WARNING SERVICES, CLIMATE SERVICES AND MATTERS OF IMPORTANCE TO MEMBERS OPERATIONS

4.1 The Meeting was informed that the recently-held Second Sessions of the WMO *Commission for Weather, Climate, Water and Related Environmental Services and Applications* (SERCOM-2) and of the *Commission for Observation, Infrastructure and Information Systems* (INFCOM-2) made several recommendations and took decisions relevant to operational meteorology, linked to improved and modernized service delivery.

B. TECHNICAL GUIDE ON TROPICAL CYCLONES

4.2 The Meeting was informed that a new "Guide No. 1 Tropical Cyclones" under Resolution 16 (Cg-18)) - Guide(s) on the Support of NMHSs to their National Multi-Hazard Early Warning procedures, Coordination Mechanisms, Systems and Service- was developed by the Expert Team on Multi-Hazard Early Warning Technical Guidance. Further, the Expert Team included RA IV Experts Mr. John Tibbetts, of the Cayman Islands and Dr. José Maria Rubiera Torres, of Cuba. Directors were made aware that "Guide No.1 — Tropical Cyclone" provided practical guidelines for Multi-Hazard Early Warning Systems (MHEWS) operations, along with effective and institutional support to national disaster risk management mandates. Directors were also encouraged to implement the recommendations provided in Guide No.1 — Tropical Cyclone.

C. BUFR MIGRATION

4.3 The Meeting recalled WMO recommended that global exchange of observations be done in the Binary Universal Form for the Representation of meteorological data (BUFR). Additionally, the Meeting was shown that as of October 31, 2022, **only two (2) CMO Member States were reporting their surface observations in BUFR,** based on international monitoring maps. The Meeting was further reminded that CMO Members' commitment was still required to complete the migration to BUFR to meet various new requirements from WMO's projects and initiatives, including the WIGOS.

4.4 The Meeting acknowledged that the challenges affecting BUFR migration required strong national and regional coordination and capacity-building, including refreshed training on BUFR implementation to tackle the regional BUFR issue. Apart from training, an actual culture change was needed with significant efforts devoted to BUFR understanding and implementation. The Meeting was provided with several recommended actions to enable Members to implement migration to BUFR. These included**:**

- Establishing a migration strategy, including installation of available BUFR software with the goal that BUFR reports are generated directly from measured data where possible, instead of by converting/reformatting TAC reports;
- Strengthening and establishing Members working relationships with other Members who have already implemented BUFR capability with a view towards getting assistance for implementing BUFR;
- Making sure all surface observation reporting is made available in BUFR format, in full compliance with WMO Manual on Codes;

- Establishing parallel dissemination of TAC and BUFR as soon as possible, but only after providing all NWP centers with advanced warning;
- Undertaking BUFR training for staff to facilitate the completion of migration activities.

D. TRANSITION TO ICAO METEOROLOGICAL INFORMATION EXCHANGE MODEL (IWXXM)

4.5 The Meeting was informed that ICAO Meteorological Information Exchange Model (IWXXM) became a standard in the WMO Manual on Codes through the fast-track procedure, on November 15, 2021. The Meeting was further informed that the amendment mandated all Members to use IWXXM for the provision of information regarding observations and forecasts, and reports. Members were urged to download and implement the CMO provided software for the exchange of aviation meteorological information in IWXXM format and to identify a Focal Point with responsibility for IWXXM transition within their NMHS. Members were also encouraged to strengthen working relationships with Members who have already implemented IWXXM capability.

E. COMMON ALERT PROTOCOL (CAP)

4.6 The Meeting was informed that the WMO continues to maintain an international Register of Alerting Authorities to record the Authoritative Sources of warnings, as identified by WMO Members' Permanent Representatives. The Meeting was further informed that to date, only six (6) CMO Members have registered Alerting Authorities in the WMO register. Additionally, the Meeting took note that the WMO has requested that CAP messages from Members should be routed through the Register of WMO Members Alerting Authorities.

4.7 The Meeting was reminded that WMO was seeking to expand the initiative to fast-track CAP and SERCOM-2 recommended the adoption of amendments to the *Technical Regulations, Volume 1, General Meteorological Standards and Recommended Practices* (WMO-No. 49) that encourages *Members to apply the Common Alerting Protocol (CAP) of the International Telecommunication Union (ITU) for the dissemination of warning information*."

4.8 Additionally, the Meeting was reminded that WMO Severe Weather Information Centre (SWIC) 2.0 website provides official weather warnings in CAP format issued by WMO Members, as a Geographical Information System (GIS)-based map display, ensuring the attribution of NMHSs and WMO as authoritative sources of warnings and alerts.

4.9 The Meeting was presented with the following recommended actions to facilitate the implementation of CAP format early warning messages:

a) WMO Permanent Representative (PR) of CMO Members should register their NMHSs as alerting authorities in the WMO Register;
b) CMO Members were encouraged to implement CAP, in line with the WMO CAP initiative, by seeking assistance through the WMO CAP fast-track initiative;
c) CMO Members PRs with existing CAP messaging or other warning formats should ensure these messages are routed through the Register of WMO Members Alerting Authorities; and
d) CMO members should register their CAP or warning messages URL Feeds with SWIC 2.0.

F. TRANSITION TO REGIONAL BASIC OBSERVING NETWORK (RBON)

4.10 The Meeting was informed that the WMO decided on a transition plan to RBON, involving the following phases:

- Phase 1 (2022) — Transition of existing RBSN, and RBCN stations to RBON
- Phase 2 (2023) — Design and evolution of RBON at the regional level

The Meeting took note that for Phase 1, the WMO Secretariat on June 07, 2022 automatically transitioned all regions RBSN, and RBCN stations to RBON and invited Members to:

I. Check the compliance of their RBON stations with the RBON technical regulations and take the following actions to ensure compliance with the RBON provisions:

- Upgrade stations or take steps in order for these stations to become compliant with RBON provisions; and
- Remove the remaining non-compliant stations from the RBON composition if it is not practical to have them upgraded.

II. Commit additional observing stations during phase 2 of the RBON transition plan in 2023 to address the high-priority regional challenges;

III. Promote or contribute to possible pilot activities on regional data exchange of certain types of observations, with an initial focus on radar observations and hydrological observations.

4.11 The Meeting was informed that the following CMO Members stations were not on the RBON network of stations: Anguilla, British Virgin Islands, Montserrat, St Kitts and Nevis, St Vincent and the Grenadines and Turks and Caicos. The Meeting was reminded that a key requirement for RBON stations in phase 1 of the RBON transition plan was the international exchange of the data in real-time or near-real-time. Another key RBON requirement is a 4-year operations commitment with a 10-year commitment recommended. The Meeting was provided with the following recommended actions:

- Members were urged to examine their RBON stations in OSCAR/Surface to make sure that all RBON stations were properly registered;
- Members were also urged to monitor the performance of RBON stations to maintain their conformance with RBON requirements;
- Members that were not on RBON, were encouraged to commit their observing stations during phase 2 of the RBON transition plan in 2023 and designate their stations as RBON stations, as a high priority.

G. WIGOS, OSCAR/SURFACE, WDQMS STATUS

4.12 The Meeting was reminded that their NMHSs are required, to implement and operate their observing systems in accordance with WMO standards and recommendations. The Meeting was further reminded that WIGOS transitioned to operational status in January 2020 with an initial WIGOS Operational Phase spanning the period 2020-2023. The Meeting was informed that by the end of 2020-2023, members were expected to attain the following deliverables, among others at the regional, and national levels:

- Nominated national focal points for OSCAR/Surface, WIGOS and WDQMS;
- Members were actively updating and maintaining their station(s)metadata in the OSCAR/Surface database, for which observations are exchanged internationally;
- RBON network was implemented in all Member States;
- GBON network was fully implemented in Member States who accepted GBON network membership;
- National WIGOS Implementation Plans was adopted and approved;
- National WIGOS governance mechanism was in place;
- New National WIGOS Station Identifiers system and policy for issuing IDs was defined, adopted and implemented by Members;
- WIGOS Data Quality Monitoring System (WDQMS) monitoring was fully operational;
- National processes for acting on issues and incidents received from the WDQMS were in place;
- WIGOS metadata compliance was being achieved;
- Regional WIGOS Centre was established and functional; and
- All Members had affiliated themselves with the RWC.

4.13 The Meeting recalled the discussion during the 2018 Meeting of Directors of Meteorological Services on the *WIGOS Data Quality Management System* (**WDQMS)** web tool, which is hosted at ECMWF. Members were informed that their surface land stations that are exchanging observations via the Global

Telecommunication System (GTS)/WMO Information System (WIS) were among the stations providing the input to the WDQMS webtool monitoring function. Further the WDQMS webtool generates routine daily performance reports based on at least two performance indicators:

- Data quality
- Data availability

4.14 The Meeting was informed that checks with WDQMS indicate most of CMO Members' surface pressure observations 'availability' on the WDQMS performance maps were not at the required level. The Meeting was provided with the following recommended actions**:**

- Members should evaluate the performance of stations under their responsibility on a daily basis by reviewing the automated quality monitoring reports received from the WIGOS Monitoring Centres (global NWP centres) which are displayed in the available WDQMS web tool outputs;
- Members should check the performance concerning the three main categories: data availability, timeliness, and accuracy regarding the WDQMS performance targets;
- Members were encouraged to check their station metadata in OSCAR/Surface for the reporting schedule and make sure it matches their operational practice.

H. WMO CLIMATOLOGICAL STANDARD NORMALS (CLINO) 1991–2020

4.15 The Meeting was reminded that the WMO publishes a consolidated global **Climatological Standard Normals (**CLINO) data set based on Members' submissions. Further, this publication underpins many national, regional and global climate and weather applications as well as national and international norms and statistics. The Meeting was informed that the deadline to provide their 1991-2020 CLINO was 31 December 2022. The Meeting was made aware that checks on the status of CMO Members' submissions of CLINO 1991-2020, showed only eight (8) members had already submitted their CLINO 1991-2020, as of 31 October 2022. To advance members submissions, the following recommendations were suggested to the Meeting:

- Members who have not already submitted, should as a matter of urgency complete and submit their CLINO 1991-2020 to the WMO by December 31, 2022.

I. WMO ANNUAL STATE OF THE CLIMATE REPORT

4.16 The Meeting was reminded that on 5 August 2022, WMO announced the launch of the content preparation process for the Annual State of the Global Climate report for 2022 and requested Members to provide a year-to-date climate summary for inclusion in a provisional statement. The year to date report was released during COP27 (November 2022), with the final statement scheduled to be published in March/April 2023. The Meeting was made aware that only 5 CMO Members were listed as contributors to the provisional statement of the Annual State of the Global Climate thus far. Those members were Barbados, British Caribbean Territories, Cayman Islands, Grenada, and Trinidad and Tobago. The Meeting was urged to continue to populate their year-to-date statements and develop a concise but informative overview for submission to the WMO Annual State of the Global Climate Report, 2022.

J. MODERNIZATION OF THE WMO STATE OF THE CLIMATE MONITORING

4.17 The Meeting was made aware that INFCOM-2 approved the "Guidance On the Use of Climatological Standard Normals and Other Baselines in Monitoring the State of the Climate", as a means of modernizing the WMO State of the Climate monitoring. Members were encouraged to adhere to the recommendations and:

1. Use Climate Normals (CLINO), updated every 10 years for all climate applications in order to provide a single approach for all climate information and to allow a much wider range of data to be used consistently.

2. Calculate climate indicators, to the extent possible, using the most recent CLINO period to compute climate anomalies, which should be accompanied by a more in-depth analysis of trends and extremes to properly reflect the long-term changes**.**

OUTCOMES AND HIGHLIGHTS FROM WMO TECHNICAL COMMISSIONS AND OTHER MEETINGS
(Agenda Item 5)

A. GLOBAL BASIC OBSERVING NETWORK (GBON)

5.1 The Meeting was informed that WMO initiated the following GBON activity: Implementation of GBON in accordance with Manual on the WMO Integrated Global Observing System (WMO-No. 1160). Technical Regulations for GBON comes into force on January 01, 2023. In line with this, on September 08, 2022, WMO assigned and published on its dedicated web tool, the initial GBON composition of stations with "Pending Approval" status to be submitted to Cg-19 for adoption. Further, the stations were selected based on closeness to GBON requirements and data availability reports (green or orange) on WDQMS tool. Directors were informed that the GBON expected frequency of observations is hourly for surface and 12-hourly for the upper-air and that BUFR format is the recommended reporting method. Directors were urged to review the status of their stations on the GBON Network using the WMO GBON Webtool and to take the following necessary actions, required by members:

- NFP for OSCAR/Surface must remove any of their stations assigned to GBON; if not NFP is not in agreement;
- NFP must conduct a national gap analysis against GBON requirements using WMO guidelines and template;
- Members must set national targets for GBON and develop a national GBON contribution plan;
- Members must ensure an NFP for OSCAR/Surface is nominated and has authority to designate GBON stations;
- Members must designate additional stations to be committed to GBON in OSCAR/Surface.

Finally, Directors were informed that GBON compliance will come into effect after June 2023.

B. REGIONAL WIGOS CENTRE

5.2 The Meeting was reminded that the RA IV Infrastructure Committee agreed on an update of a RA IV WIGOS Centre Concept and a Roadmap for the establishment of the RA IV Regional WIGOS Centre. The original Concept and Roadmap had been approved by the RA IV Management Group (MG) in January 2020. At the 31st Meeting of the RA IV MG, held in hybrid mode on 22nd June 2022, the updated Concept and Roadmap for the RA IV RWC were approved and the MG agreed to reactivate the implementation of the RA IV RWC. The Meeting heard that preliminary steps to reactivate implementation would involve engaging and enlisting Members NFPs focal points for WDQMS, WIGOS, and OSCAR/Surface, in order for these NFPs to become familiar with their roles, guidance material, and RWC functional tools. The Meeting was also informed that the following two sessions were scheduled to give momentum to the RWC implementation process. Directors were urged and encouraged to send only persons that would be directly involved in the implementation of the RWC to the:

1. Hybrid Workshop for RA IV Regional WIGOS Centre (RWC) in Costa Rica, December 13-15, 2022.
2. Regional conference with practical workshops on WIGOS, Systematic Observation Financing Facility (SOFF), & possibly BUFR, in Jamaica, February 6-9, 2023.

C. ACTION PLAN FOR "EARLY WARNING FOR ALL"- MANDATE FROM UNITED NATIONS SECRETARY-GENERAL

5.3 The Meeting was asked to recall that on World Meteorological Day 2022, the United Nations Secretary General António Guterres tasked the WMO with developing an Action Plan for his "Early Warning for All Initiative". Directors were informed that since then, the WMO has urged Members to use this as opportunity to reaffirm their roles as the single authoritative voice and delivery of early warning services as

their core mandate. Directors were also informed that the WMO viewed the "initiative" an opportunity for Members to leverage, scale up financing and accelerate and enhance current developments, including the Global Basic Observational Network through the Systematic Observations Financing Facility (SOFF); as well as scaling up Multi-Hazard Early Warning Systems (MHEWS) through the CREWS initiative to bridge the capacity gap in life-saving EWS for vulnerable countries, among other. The Meeting was further informed that the initial WMO Action Plan was announced at COP27, which showed that Members NMHSs have a key role in implementing the Action Plan Initiatives at the national level, including technical implementation, building on the standards and the guidance provided by WMO as relevant authoritative providers. Directors were made aware that the 5-Year Action Plan Overview indicates that for the plan to be successful, all NMHSs/countries must:

- Regularly review and report on the accuracy and timeliness of their services;
- Achieve GBON compliance;
- Have updated registries of alerting authorities;
- Issue warnings in Common Alerting Protocol (CAP) format;
- Have multi-hazard forecast and monitoring systems; and
- Have national plans, strategies and legislation for their NMHSs.

D. SYSTEMATIC OBSERVATIONS FINANCING FACILITY (SOFF)

5.4 The Meeting recalled the launch of the Systematic Observations Financing Facility (SOFF), which focuses on supporting Small Island Developing States (SIDS) and Least Developed Countries (LDCs) in filling the large gaps in basic weather and climate data. SOFF provides long-term technical and grant-based financial assistance to Members to acquire and internationally exchange basic weather and climate data and is vital for accelerating implementation of GBON. The Meeting was informed that during its initial three-year implementation period, SOFF will prioritize support to 55 SIDS and LDCs and that members should seek to engage and be involved in initial phase of the SOFF implementation process.

E. WMO INTEGRATED PROCESSING AND PREDICTION SYSTEM (WIPPS)

5.5 The Meeting was made aware that INFCOM adopted the WMO Integrated Processing and Prediction System (WIPPS) as the new name and acronym of future Global Data-processing and Forecasting System (GDPFS). WIPPS's role is to ensure that WMO Members have access to advanced Numerical Weather Prediction (NWP) products and services. In keeping with this, INFCOM proposes to redefine certain mandatory products for short to long-range numerical prediction as "core data" products to ensure commitment to the free and unrestricted exchange of data. Directors were informed that a draft list of "core data" has been developed and INFCOM has recommended the draft list of core data be included in the Manual on the GDPFS (WMO-No. 485) in alignment with the WMO Unified Data Policy.

F. WMO INFORMATION SYSTEM 2.0 (WIS 2.0) IMPLEMENTATION

5.6 The Meeting was asked to recall that the WMO endorsed the WMO Information System 2.0 (WIS 2.0) implementation plan to replace the Global Telecommunication System (GTS) (WMO EC-73). Directors were informed that the WIS 2.0 implementation plan has a one-year pilot phase in 2023, with several countries collaborating in building the WIS 2.0 infrastructure, where each volunteering Member has a different role in the WIS 2.0 framework and will implement a specific component. WIS 2.0 will then go into pre-operational phase in 2024 and operational phase in 2025. Members were encouraged to start implementing WIS 2.0 during the pilot phase by contacting the WMO Expert Team on WIS 2.0 implementation.

G. CLIMATE DATA MANAGEMENT OUTLOOK AND FUTURE WORK

5.7 The Meeting was informed that the WMO has embarked on a project entitled WMO OpenCDMS Project which aims to develop a reference open-source climate data management system to support members. The WMO OpenCDMS Project has a timeline for full development, implementation and training up to 2026. Directors were further informed that in parallel to the work within the WMO OpenCDMS Project and to meet their national needs, the National Meteorological Service of Belize developed a Climate Data

Management System (SURFACE), which they shared with international community, through source code on OpenCDMS code repository https://github.com/opencdms/surface. Directors were informed that due to the mature state of the SURFACE CDMS, there is ongoing work within the WMO OpenCDMS project, such that the project team is currently working with Belize to integrate SURFACE CDMS as part of the OpenCDMS project and to develop a new production-ready system called OpenCDMS SURFACE. This new system is expected to be presented at Cg 19, June 2023. Further, the OpenCDMS SURFACE will be integrated into WIS 2.0, as part of the WIS 2.0 pilot project.

IMPACTS OF WEATHER DURING 2021

(Agenda Item 6)

6.1 This report on the impacts of extreme weather events during 2022 draws from CMO Members presentations that provided a snapshot of experiences and impacts from Member States... Based on Members presentations, the recurring hazard was extreme rainfall leading to severe and at time devastating flooding, landslides, casualties and economic losses.

6.2 The **Turks and Caicos, Cayman Islands and Belize** reported direct impacts from tropical storms/hurricanes, while **Trinidad and Tobago Grenada, and Guyana** reported impacts from potential tropical cyclones and the Inter-Tropical Convergence Zone (ITCZ). **Belize** reported that hurricane Lisa made direct landfall with measured sustained winds of 74 mph and gust to 92 mph; rainfall between 5-9 inches; storm surge of around 3-5 feet. There were no fatalities but approximately 500 houses were completely destroyed, while approximately 5,000 houses were partially destroyed with damages to the housing sector estimated at US$10 million with 6,500 families affected. Estimated infrastructural and other damages (public roads, buildings, utilities, agriculture, fisheries, tourism) totaled US$100 million. **Cayman Islands** reported storm surge around 2-4 feet, wave heights between 11-14 feet, and 2-4 inches of rainfall during the passage of hurricane Ian. **Turks and Caicos** (TCI) reported that hurricane Fiona impacted the TCI as a Category 3 hurricane with the eastern most islands receiving the greatest impacts.

6.3 Other members that were not directly affected by hurricanes also reported impactful weather events. **Jamaica** reported that heavy rainfall over a 2-day period resulted in several rivers overflowing their banks and a family of 4 persons washed away in a car resulting in 2 deaths. **Saint Lucia** presented that on November 6th, an upper level trough produced approximately 6 inches of rainfall in some locations, which left destruction totaling approximately U.S. $2.3 Million. **St Vincent and the Grenadines** reported that strong winds associated with the passage of a tropical wave on July 31st down utility poles, damaged houses and other infrastructure. **Trinidad and Tobago** experienced many severe weather events that led to flooding, including a prolonged rainfall event spanning two (2) days, October 5 -6, 2022 which resulted in one fatality. A key lesson learnt from the impacts presentation from **Barbados** was that Members NMHS's needed to invest in running their own high resolution numerical weather prediction tools/models that will enable sufficient impact-based forecasting responses in generating early warning messages.

SCIENTIFIC PRESENTATION

(Agenda Item 7)

7.1 The Barbados Meteorological Service delivered a presentation highlighting the implementation process of their Impact-based Forecasting System (IBF) and lessons learnt during the process. The BMS shared best practices in transforming early warning systems into impact-based forecast and warning services and demonstrated that IBF at its most basic form is the translation of hazard jargon into clear information about the likely impact. The BMS impact-based forecasts explicitly considers vulnerability specific locations, the timing and location of livelihood activities, such as farming, marine/coastal activities and fishing, which expose people directly to hazards, such as floods, dust, thunderstorm, winds, lightning and waves, so that impact-based forecasts are tailored to those at risk.

OTHER MATTERS PRESENTATION
(Agenda Item 8)

Implementation of Quality Management Systems for Aviation Weather Services Provision

8.1 The Meeting discussed the important role that CMO Member States NMHSs play in the provision of aviation weather services to enable air navigation safety, security, efficiency and regularity and their obligation to quality assure the aviation weather information and services provided by Member States. The discussion focused at length on the status of the implementation of Quality Management Systems for the provision of aviation weather services in the line with the requirement by the World Meteorological Organization (WMO) and the International Civil Aviation Organization (ICAO).

8.2 Council is informed that International Organization for Standardization (ISO) Certification in aviation meteorological services is one of the ICAO Standards and Recommended Practices. It prescribes that each Contracting State should provide meteorological services certificated by the ISO to improve the safety, regularity, and efficiency of international air navigation. The ICAO and WMO require all NMHSs to comply with the ISO 9001 QMS and to be certified by an approved organization. The current standard is ISO9001:2015.

8.3 A large part of the discussion was on the barriers hindering successful QMS implementation and certification and the implications for Member States and the region as a whole. The recurring obstacles in the discussion was lack of resources, including financial constraints, lack of understanding and support by management, unavailability of trained QMS personnel/companies, and high cost of QMS certification.

Non-compliance Ramifications

8.4 Council is made aware that non-compliance in the implementation of ISO 9001:2015 QMS standard, which provides quality assurance of the process and procedures that produce the data and information needed by airlines; jeopardizes the ability of the Member NMHSs to provide trusted information and can ultimately affect the future operations of the region's NMHSs if international airlines resort to alternative weather providers. More directly, non-compliance will affect the category status of Member States airports and their ability to receive many international airlines and this will impact revenue generation.

8.5 The negative ramifications will undeniably affect cash inflows of airports, civil aviation authorities, airlines, the aviation sector as a whole, and by extension tourism, trade, transportation and economic sustainability of the region. Government intervention and support is required.

Compliance Benefits

8.6 Implementing ISO 9001:2015 standard is critical for Member States NMHSs quality assurance, continuous improvement, and maintaining competitive advantage. It will contribute to the safe operation of aircraft through continued improvement in meteorological operation and services. Implementing the QMS means the NMHSs will be using a systematic approach, measuring performance to objective standards, and making changes as needed to ensure quality. The QMS supports risk-mitigation and helps to ensure that the organization is prepared for inquiries or investigations. The QMS helps to develop a high level of staff competency through its focus on human resources planning and staff training and strategic development.

8.7 More importantly, meeting ICAO Annex 3 QMS requirements avoids:

1. The need for the Member State to "register a difference" with the ICAO, as Member States are required by the Chicago Convention of 1944 to notify the ICAO council when they depart from an ICAO international standard;
2. Prepares the Member State NMHS for ICAO safety audits;
3. Avoids potential cost-recovery difficulties due to non-compliance.

Action Items:

i. CMO should embark on a process to incorporate a program of actions including baseline assessments of Member States QMS status that leads to a regional project to facilitate QMS certification of members in the shortest possible time.

ii. In line with action item 1, the CMO should conduct a survey to map the status of the implementation of QMS for aviation weather services among Member States to determine:
- Members with QMS established and certified;
- Members with QMS established but not certified;
- Members with Quality Manual developed but QMS not established;
- Members with QMS trainers trained but Quality Manual not established;
- Members with QMS certified auditors and any other;
- Members with QMS establishment and implementation not started

iii. Based on feedback from the mapping survey, the CMO should coordinate mechanisms that aims to build a regional team to provide technical guidance for implementing QMS for aviation weather services incompliance ISO 9001:2015 Standard, through sharing of knowledge, experiences and best practices by Member States who have advanced implementation of QMS for their aviation weather services.

Caribbean CREWS Presentation

8.8 Ms Haleh Kootval of Caribbean Crews presented on the "Strategic Roadmap for Advancing Impact-based Multi-Hazard Early Warning Systems and Services" in the Caribbean, which incorporates strengthening hydro-meteorological and early warning services in the Caribbean. Ms Kootval, in her presentation, indicated the following:

- Early and actionable information is critical for alleviating fiscal shocks from multiple hazards;
- Regional roadmap investments can deliver twice the benefits per dollar spent than parallel national investments;
- Regional ownership of the roadmap requires collaboration and resourcing at all levels;
- Private sector integration is a key;
- Phased approach offers a framework for achieving results in a more sustained and effective way;
- Prioritize building and retaining capacity at all levels;
- Advancing policy and regulatory environment in concert with technical advances;
- Further harmonizing activities for strengthening the regional MHEWS;
- Further synchronizing regional & international cooperation for high-quality and actionable information;
- Data policy development– crucial for service delivery;
- People-centered – focus on impact;
- Integrating climate-related health impacts into MHEWS;
- Inclusive approach for all gender and vulnerable groups

Integrating Private Sector on Multi-hazard early warning Systems Governance and Actions

8.9 Mr Carlos Villamil, Director of OTT Hydromet Latin America and the Caribbean, delivered a presentation entitled "*The role of the private sector in monitoring, observing and predicting hazards in the Caribbean".* The presentation highlighted capacity building activities of OTT in the region, including regional training attended by technical staff of regional NMHSs during implementation of regional projects in which OTT is the provider of instrumentation. It also focused on OTT's advocacy in global, regional and national forums including speaking engagements and providing advice on strengthening national observing

systems, while promoting public-private-engagements at the regional and national levels to understand donor expectations, piloting innovative ways to collaborate and ensure the sustainability of observation networks of Members. The presentation also placed emphasis on how to overcome challenges such as limited government budgets, dependence on sporadic donor funding, limited technical resources and lack of professional, empowered staff, limited ability to deliver services to decision makers and technology mismatch with capacity that often led to operational constraints. Mr Villamil stressed that public-private-partnership enables sustainable delivery of hydromet services and ended by calling on Directors to:

- Open the communication lines;
- Jointly explore how they can collaborate with OTT, and
- Enter into engagements either bilaterally or with the support of WMO, UNDP, UNDRR, World Bank or any other relevant institution.

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

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

GEORGE TOWN, GRAND CAYMAN, CAYMAN ISLANDS, 23 NOVEMBER 2022

AGENDA

1. INTRODUCTION AND ADOPTION OF AGENDA
2. STATUS OF ACTIONS FROM THE PREVIOUS MEETING
3. TRAINING
4. OPERATIONAL MATTERS
    a) Technical Guide on Tropical Cyclones
    b) BUFR Code Transition
    c) Transition to the ICAO Meteorological Information Exchange Model (IWXXM)
    d) Common Alerting Protocol
    e) Transition to Regional Basic Observing Network (RBON)
    f) WIGOS/OSCAR Surface /WDQMS Status
    g) WMO Climatological Standard Normals (CLINO) 1991–2020
    h) WMO Annual State of the Climate Report
5. OUTCOMES AND HIGHLIGHTS FROM WMO TECHNICAL COMMISSIONS AND OTHER MEETINGS
    a) Global Basic Observing Network (GBON)
    b) Regional WIGOS Center
    c) Action plan for “Early Warning for All”- mandate from United Nations Secretary-General
    d) Systematic Observations Financing Facility (SOFF)
    e) WMO Integrated Processing and Prediction System (WIPPS), formerly GDPFS
6. THE IMPACTS OF WEATHER DURING 2022
7. SCIENTIFIC PRESENTATION
    IBF Implementation Process/Lessons Learned within CAP
8. OTHER MATTERS

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ANNUAL MEETING OF DIRECTORS OF METEOROLOGICAL SERVICES
CAYMAN ISLANDS

23 NOVEMBER 2022

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