



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

REPORT OF THE ANNUAL MEETING OF DIRECTORS OF METEOROLOGICAL SERVICES

RODNEY BAY, SAINT LUCIA

19 NOVEMBER 2025

INTRODUCTION

1.1 The 2025 Annual Meeting of the Directors of Meteorological Services (DMS2025) was hosted by the Government of Saint Lucia at the Harbor Club Hotel, Rodney Bay, Saint Lucia on Wednesday, 19 November 2025. The Meeting was chaired by Dr. Arlene Laing, Coordinating Director of the CMO Headquarters.

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

(Agenda Item 2)

2.1 The CMO Headquarters produced a single document as an Action Sheet that provided the Meeting with the opportunity to follow-up on or asked questions about actions taken to implement the decisions taken at the previous meeting and to discuss any further actions if required.

2.2 The Science and Technology Officer (STO), Mr. Kenneth Kerr delivered a presentation containing the status of actions taken to implement decisions of DMS2024 (The Virgin Islands (UK), 2024). After seeking the Chair's permission, Mr. Kerr focused the report on Action Items 2, 3, 5, and 6, and informed the meeting that the other matters would be addressed under the Operations session.

2.3 With respect to **Action Item 2** (integration of the WRF-based PN Tool into real-time operations), the meeting was informed that Barbados and Trinidad and Tobago continue to test their systems. Belize attempted integration of the tool but encountered technical challenges that were yet to be resolved.

2.4 Regarding **Action Item 3** (closing GBON gaps), the meeting was informed that the Cayman Islands was in the process of implementing new stations and anticipates completion by early 2026, which would allow it to close its GBON gap. It was further reported that Turks and Caicos Islands (TCI) was working with Belize to integrate SURFACE CDMS with its automatic weather station, which would assist TCI in becoming GBON compliant.

2.5 On **Action Item 5** (WIS 2 engagement and CO-WET), the meeting was informed that implementation had commenced and that Trinidad and Tobago and Belize were actively engaged at the regional expert team level for WIS 2 and have contributed ideas and perspectives on the way forward for CO-WET. However, the Terms of Reference for the CMO group have not yet been finalized. It was anticipated that this will be completed in the first quarter of 2026.

2.6 With respect to **Action Item 6** (participation in the Belize piloting of SURFACE/CDMS), the meeting was informed that during Q1 2025, four countries—Dominica, Turks and Caicos Islands, Jamaica, and Cayman Islands—participated in the pilot. However, only two countries, Dominica and Turks and Caicos Islands, continued its participation to date. It was also noted that Jamaica had also engaged in the process of integrating SURFACE through CLIMSA, with training originally scheduled for the first week of December; however, this activity had to be postponed to early February 2026 due to Hurricane Melissa.

2.7 Additionally, under **Action Item 8** (submission of year-to-date climate summaries), the meeting was informed that only five Members—Barbados, Belize, Dominica, St. Vincent and the Grenadines, and Trinidad and Tobago—were reflected in the report, compared to eight Members in the previous year. It was noted that submissions were made for both the Cayman Islands and St. Vincent and the Grenadines on the same day, however only St. Vincent and the Grenadines was captured in the report.

2.8 Finally, the meeting was informed that, at the global level, 146 of the 193 World Meteorological Organization (WMO) Members had nominated as requested a Focal Point for radio frequency matters,

demonstrating strong interest in the initiative. However, ten (10) of CMO' Members had not yet nominated a Focal Point for radio frequency matters to the WMO.

TRAINING (Agenda Item 3)

3.1 Ms. Kathy-Ann Caesar, Chief Meteorologist and Senior Lecturer of the Caribbean Institute for Meteorology and Hydrology (CIMH), delivered a presentation on the meteorological training offered at the Institute during the period 2024–2025.

Overview of Meteorology Training Programme (2024–2025)

3.2 The meeting was informed by Ms. Caesar on the scope and outcomes of training delivered over the past year. The Meteorology Section remains the primary provider of training at CIMH, supported by academic, technical, and internship staff. Training activities included entry-level, mid-level, senior-level meteorological technician programmes, aeronautical meteorological technician courses, continuing professional development, undergraduate and postgraduate university programmes, workshops, outreach, and in-country training.

Entry-Level and Mid-Level Meteorological Technician Training

3.3 The meeting was informed that the Entry-Level Meteorological Technician (ELMT) course concluded with nine students, resulting in three credits, five passes, and one conditional pass. During the course significant challenges were identified in mathematical competencies, particularly in the early stages of the course. Remedial measures (extra classes, tutoring, and weekend sessions) were implemented, with partial success.

3.4 The Mid-Level Meteorological Technician (MLMT) course had low enrolment (four students), raising concerns about efficiency given the high lecturer-to-student ratio. As a result, it was decided that the MLMT course will not be offered in 2026 as future offerings will occur biennially, with the next course scheduled for 2027.

Senior-Level Meteorological Technicians (SLMT) and Bridging Course

3.5 The meeting was informed that the SLMT course concluded with ten students with the following outcomes: one distinction, three credits, four passes, and two conditional passes. Further, the bridging course (covering mathematics, physics, and general meteorology) continues to be a useful screening tool, particularly in identifying weaknesses in physics and mathematics. It was noted that students flagged during the bridging course largely continued to experience challenges, validating the importance of the intervention.

University Meteorology Degree and Postgraduate Programmes

3.6 Ms. Caesar informed the meeting that undergraduate enrolment fluctuated, with only four students joining the 2024–2025 intake. Further, performance of graduating students remained strong, including one first-class honours graduate. However, persistent difficulties with calculus continue to affect progression rates. To address this, the CIMH successfully developed and obtained approval for a new course: METE 1400 – Mathematical Methods for Meteorology, which will replace Calculus B and Physics Mathematical Methods. This course will be piloted in the next academic year.

Aeronautical and In-Country Training

3.7 The meeting was informed that CIMH conducted Aeronautical observer training in the Cayman Islands and Turks and Caicos Islands, with strong performance by participants and that refresher and competency-based training remains available upon request.

3.8 During the discussion, questions were raised regarding the availability of refresher training to support compliance with aviation audits, whether such training could be delivered online or in a hybrid format, and concerns about the minimum number of participants required for a course to proceed.

3.9 In response, the meeting was informed that refresher training can be organized upon receipt of a written request, that hybrid delivery combining online and face-to-face components is feasible, and that the recommended minimum class size is four participants, with a maximum of ten. It was further noted that grouping countries together for training was encouraged to improve cost-effectiveness, and that CIMH will work with Members to align training schedules with audit timelines. There was a call by the CIMH for proper coordination between countries and CIMH to maximize training efficiency.

Extended On-the-Job Training (OJT)

3.10 The meeting was informed that the standard On-the-Job Training (OJT) recommendation was two months for observers and a minimum of three months for forecasters, which can be extended to five months; however, duration may vary based on student performance and prior operational exposure.

Outreach, Workshops, and Stakeholder Engagement

3.11 The meeting was informed that CIMH conducted 12 outreach activities during the reporting period, reaching approximately 6,000 students through a combination of in-person and virtual engagements aimed at increasing youth participation and public awareness of meteorology and climate sciences. It was further reported that the Severe Weather Forecasting Workshop was successfully delivered, with participation from over 55 attendees, and that CIMH continues to support CDEMA through the provision of weather briefings and interpretive services for key stakeholders.

Funding and Student Stipends

3.12 It was pointed out by Ms. Caesar that there was growing concerns regarding the adequacy of the current student stipend (USD 1,000 / BBD 2,000), particularly in light of rising housing and living costs in Barbados, and the resulting challenges faced by both international and Barbadian students.

3.13 During the discussion, Members expressed concern that the stipend level remained unchanged for decades, noting that CIMH recommendation letters significantly influence national approvals, and highlighted inconsistencies in stipend-related guidance over time. There was a call for standardized student stipends.

3.14 In response, it was reported that the Board of Governors had discussed the possibility of increasing the stipend, with one proposed option being to align CIMH stipend recommendations with those of the University of the West Indies to ensure greater coherence. It was also noted that CIMH has, on occasion, provided short-term loans to students in emergency situations, although this approach is not sustainable, and that financial counselling for students has been introduced and will continue.

Mental Health and Counselling Services

3.15 Mental health concerns, particularly for students living away from home, and adjusting to a new cultural environment in Barbados were highlighted. The meeting was informed that CIMH has expanded its counselling services in response to increased demand, with six cases addressed over the past year involving issues such as stress, bereavement, illness, and behavioural concerns. It was noted that early intervention has proven effective in supporting student wellbeing and retention.

3.16 Directors were urged to remain closely engaged with their students to provide ongoing support especially for mental health needs not covered by insurance and as an effective engagement to protect the investment in students. The meeting further noted the importance of addressing cultural adjustment challenges for students studying abroad, and Directors were asked, where appropriate, to discreetly inform CIMH of any known student issues prior to enrolment to enable timely and effective support.

OPERATIONAL MATTERS (Agenda Item 4)

PURPOSE AND STRATEGIC CONTEXT

4.1 Mr. Kenneth Kerr, Science and Technology Officer at CMO Headquarters presented on the Operational Matters under the theme “**Empowering the CMO’s NMHSs, Investing in People, Enhancing Operational Resilience and Innovation in Weather, Climate & Early Warning Services.**”

4.2 It was emphasized that investment in meteorological services represents an investment in people, resilience, safety, and regional preparedness, with a central theme of enhancing operational resilience and innovation in weather, climate, and early warning services.

A. ICAO Amendment 82 and New Regulatory Requirements

4.3 The Science and Technology Officer (STO) informed the meeting of significant updates arising from the amended ICAO Annex 3, now the 21st Edition of *Meteorological Service for International Air Navigation*, released under Amendment 82. It was noted that by November 2025, States are required to use quantitative volcanic ash concentration information, which will necessitate updates to standard operating procedures, revisions to SIGMET thresholds, and targeted training for forecasters.

4.4 The amendments also introduce clearer distinctions between meteorological authorities, which are responsible for regulatory oversight, and meteorological service providers, which are responsible for service delivery and quality management. In addition, **ICAO now requires the exchange of meteorological data in IWXXM format**, a requirement that presents technical challenges for many States that lack Aeronautical Message Handling System (AMHS) capability. While only a few States currently meet these requirements, the meeting was informed that regional translation support from ICAO Regional OPMET Centres (ROC), such as ROC London, may help to bridge this gap.

4.5 In light of these developments, Directors were urged to prioritize compliance with ICAO and WMO standards by addressing national governance arrangements and clearly delineating responsibilities between meteorological authorities and service providers. Directors were also encouraged to initiate or accelerate the transition to IWXXM data exchange formats, and to support the necessary updates to SOPs, operational documentation, and forecaster training to ensure readiness for the new requirements.

4.6 With respect to Quality Management System (QMS) readiness, the meeting heard that compliance with the mandatory ICAO standards for National Meteorological and Hydrological Services remains uneven across the region. Only a small number of Members currently operate fully integrated QMS frameworks, while others remain in prolonged stages of partial implementation or have not yet transitioned to ISO 9001:2015 standards.

4.7 To address these gaps, CMO will host a **regional QMS Lead Auditor certification workshop in early 2026**, aimed at building internal capacity, strengthening regulatory compliance, and preparing Members for the anticipated 2026 updates to international standards. The meeting noted that the region has a valuable window of opportunity to make measurable improvements before full compliance timelines are enforced.

4.8 Directors were therefore urged to take decisive action to advance QMS implementation, particularly in States that remain partially compliant or have not yet commenced the process, in order to enhance operational resilience and ensure alignment with evolving international regulatory requirements.

B. Early Warnings for All Implementation & Artificial Intelligence

4.9 The Science and Technology Officer brought to the attention of the meeting that the *World Meteorological Organization* (WMO) had amended its Technical Regulations to strengthen global early warning capabilities under the *Early Warnings for All (EW4All)* initiative. These amendments introduce a

new Section 6 on Early Warnings, which will take effect on 1 January 2027, with full implementation required by December 2029.

4.10 The amendments formalize expectations for all Members to adopt standardized early warning practices, including the full use of the **Common Alerting Protocol (CAP)** for hazard messaging, clearer communication procedures, and improved coordination between National Meteorological and Hydrological Services and national disaster management agencies. The changes are intended to enhance the consistency, timeliness, and reach of warnings, ensuring that populations receive accurate, actionable information.

4.11 The meeting was shown the impact of CMO Headquarters' continued efforts to strengthen regional early warning capabilities through a series of virtual and in-person CAP workshops designed to support Members in adopting standardized, all-hazards alerting systems. As a result of these sustained capacity-building activities, and facilitated access to innovative tools such as the **WMO WIS2 CAP Composer configured on CMO WIS 2.0 node**, Saint Lucia, Grenada, and Dominica now have configured CAP portals, alongside St. Maarten. This has led to Saint Lucia issuing its first official CAP alerts in 2025, while Grenada and Dominica were undertaking testing and validation exercises.

4.12 The meeting further noted that the Caribbean region has made significant progress in CAP implementation, with **ten Members now operating CAP as their national alerting platform**, supported by regional training initiatives and the establishment of a Caribbean CAP hub enabling multi-channel dissemination. However, the Science and Technology Officer pointed out that shortened operational hours in some services, limited the ability to provide continuous, 24/7 early warning coverage.

4.13 Members were urged to advocate at the national level for continuous service provision and to strengthen institutional arrangements to ensure compliance with EW4All obligations. Directors were further encouraged to fully implement early warning standards by prioritizing complete adoption of CAP, ensuring 24/7 alerting capability, working toward full compliance with WMO early warning amendments by 2029, and continuing to utilize the regional CAP hub while participating in additional training opportunities.

4.14 With respect to Impact-Based Forecasting and Warning Services (IBFWS), the meeting was informed that this approach is a core component of EW4All and continues to expand across the region. While most Members have partially implemented impact-based forecasting, only one Member, Barbados, was currently assessed as having comprehensive implementation aligned with WMO recommended practices. Ten Members reported partial implementation, while five have not yet commenced.

4.15 Directors were also reminded of WMO recommendations for the adoption of standardized hazard event cataloguing to support impact-based forecasting and situational awareness. While many States currently catalogue hazards only partially, the meeting noted that a fully compliant regional severe weather database already exists through CIMH and CMO Headquarters, offering an efficient and standardized alternative to developing national systems from scratch.

4.16 Directors were invited to strengthen impact-based forecasting and hazard event cataloguing practices, make greater use of existing regional tools and databases, and continue working with CMO to advance toward full implementation of IBFWS, with technical and capacity-building support available.

4.17 The meeting was informed that the **WMO had formally adopted an Artificial Intelligence (AI) implementation strategy** aimed at enhancing forecasting, observational capabilities, and warning systems. Members were encouraged to actively explore AI applications and assess their potential impact on national operations and to engage in local or joint initiatives with academia, the private sector, and public institutions. The goal is to identify areas where AI can optimize operations, enhance services, and provide tangible benefits tailored to each Member's specific needs, positioning AI as a strategic tool for the future of meteorological services.

C. WIGOS Implementation - OSCAR/Surface, Regional WIGOS Centre, WDQMS, GBON, & SOFF

4.18 It was highlighted by the Science and Technology Officer that the delivery of meteorological services was intrinsically linked to the quality and availability of observational data. The meeting was informed that the WMO was developing the next-generation **OSCAR (Observing Systems Capability Analysis and Review – Surface)** platform. Originally scheduled for deployment in 2026, Directors were informed that the implementation had been extended to 2027 due to ongoing challenges.

4.19 Members were encouraged to participate in the current OSCAR-Surface survey and to review and correct existing metadata to ensure accurate data transfer into the new system, since accurate metadata was critical, as the new platform will directly rely on existing entries and “garbage in, garbage out” remains a central principle. National focal points must be actively trained and engaged to ensure that data management and reporting meet WMO standards.

4.20 The meeting was informed that the Regional WIGOS Center (RWC), through daily monitoring of the **WIGOS Data Quality Monitoring System (WDQMS)**, was actively supporting member states in meeting their WIGOS obligations. Over the year, the RWC continued to track incidents related to CMO Member States, such as missing observations, incorrect metadata, and underperforming stations via the WMO Incident Management System.

4.21 Case studies, including Belize, Jamaica and Saint Lucia were presented and illustrated the consequences of delayed responses and metadata misalignment, emphasizing the need for proactive national focal point engagement. Peer-to-peer collaboration and direct intervention by the RWC yielded significant improvements, notably in **Jamaica** and **Saint Lucia**, where station compliance improved from underperforming levels to over 80% availability.

4.22 The meeting was informed that the CMO Headquarters in collaboration with CREWS and WMO plans to host a **capacity-building workshop in Costa Rica in 2026** to train WDQMS focal points in metadata management, observation quality monitoring, and operational compliance, strengthening national capabilities to sustain high-quality data collection.

4.23 The meeting was also informed on the status of **GBON Compliance** during which and automated observing was put forward as a solution to close GBIN compliance gaps. It was demonstrated that most member states were progressing toward the 24-hour hourly observation requirement, however some remain noncompliant due to limited operational hours overnight.

4.24 It was recommended that innovative solutions, such as **Montserrat’s integration of AWS data with WIS2**, would allow continuous observation reporting even when offices are closed, offering a model for other states to achieve full compliance.

4.25 Directors of NMHSs that were not compliant with GBON were urged to transition their automatic weather stations into a GBON station integrated with WIS 2.0 to meet GBON hourly data exchange standards. This approach facilitates modernization and compliance with current technological standards without losing valuable historical station information.

4.26 Alternatively, NMHSs should seek a GBON exemption under WMO Article 9, by making a formal request to the WMO Secretary-General, clearly explaining the operational limitations that prevent full compliance with the GBON requirements. This step is essential for stations facing constraints that hinder their ability to meet the standard GBON protocols.

4.27 On the financial and operational support side, the **Systematic Observations Financing Facility (SOFF)** remains critical. The meeting was informed that of the eleven (11) CMO members that were eligible for SOFF funding, eight (8) were engaged in the SOFF readiness phases and three (3) were either in the investment pipeline or phase. Belize had progressed furthest, while Guyana and Antigua are actively moving into the investment pipeline.

4.28 Directors were advised to maintain close engagement with SOFF advisors and complete national GBON contribution plans to unlock funding and ensure alignment with WMO requirements, emphasizing the need to match global progress in observation infrastructure.

D. WIS 2.0 TRANSITION AND STRENGTHENING NATIONAL CAPACITY IN WIGOS & WIS 2.0

4.29 The meeting recalled that the **WMO Information System 2 (WIS2) became operational in January 2025**, marking the formal transition away from the Global Telecommunication System (GTS), supported by a WMO transition guide that requires full migration by Members.

4.30 The Science and Technology Officer informed the meeting that full transition entailed two critical functions: the **publication of data through WIS2 and the real-time retrieval of data via WIS2**; however, while Members were currently publishing data, most continue to rely on GTS for data retrieval, which is not sustainable.

4.31 Members were advised that their existing systems already had the capability to retrieve data through WIS2 and were urged to review the guidance provided, particularly the steps outlined for accessing data. It was noted that unlike the legacy system, which pushed data to users, WIS2 requires users to actively retrieve data, underscoring the need for operational readiness.

4.32 A regional overview of current WIS usage highlighted real-time data access capabilities but also revealed gaps in data exchange for some Members, prompting concern and the need for follow-up. Directors were therefore encouraged to begin testing real-time data retrieval through WIS2, establish standard operating procedures for data retrieval, and work collaboratively to complete full migration.

4.33 Directors were urged to address gaps in individual country WIS2 performance to begin retrieving and not only publishing data using WIS2.

E. Capacity Development as the Foundation for Modernization

4.34 The presentation concluded with the Science and Technology Officer underscoring that modern meteorological services depend not only on technology but on skilled personnel. To this end, the meeting was informed of a suite of upcoming regional capacity building and operational readiness workshops to be hosted by the CMO Headquarters, including **Leadership and Management Training for Senior Management of RA IV Caribbean Members** in December 2025 in Trinidad & Tobago, and workshops in Quarter 1 of 2026 on **Strengthening Knowledge Exchange and Mutual Understanding between NMHSs, NDRMOs, and the Media**, also in Trinidad and Tobago, and a Regional WIGOS Centres (RWCs) Functions and Tools targeting National Focal Points for WDQMS, and OSCAR-Surface, as well as a WIS 2.0 and QMS internal auditor certification training workshops to equip staff with the competencies required for evolving global standards.

4.35 During the discussions Directors requested that CMO Headquarters provide quarterly reports to the Directors on their NMHSs compliance with WMO programmes to ensure consistent monitoring, data quality and under performance.

OUTCOMES / HIGHLIGHTS FROM WMO TECHNICAL COMMISSIONS, THE 79TH SESSION OF THE EXECUTIVE COUNCIL, WMO EXTRAORDINARY CONGRESS 2025 AND RELTAED MEETINGS (Agenda Item 5)

A. REGIONAL BASIC OBSERVING NETWORK (RBON) DEVELOPMENTS

5.1 The meeting was informed by the Science and Technology Officer that recent WMO discussions confirmed that the Regional Basic Observing Network (RBON), with GBON at its core, was moving into an accelerated implementation phase, with significant implications for Region IV (RA IV).

5.2 The meeting was further informed that assessments presented at a WMO workshop in mid-2025 showed that the Caribbean remains at an early stage of readiness compared to other regions. However, a key milestone in the design of the RA IV RBON was the recent adoption of a **new sub-regional configuration for upper-air stations in the Caribbean**, which was approved during WMO RA IV 19th session (27-29 March 2025, El Salvador). Further, a dedicated RA IV workshop was planned for early 2026, underscoring the urgency for Member States to actively engage.

5.3 Directors were encouraged to participate in the process, since limited regional representation in RBON governance structures heightens the risk of commitments being made without full alignment to Caribbean capacities and priorities. Directors were strongly encouraged to engage directly, respond to surveys, and ensure national focal points participate fully to shape a realistic, regionally appropriate observing network that maximizes shared resources and addresses identified gaps.

B. WMO INTEGRATED PROCESSING AND PREDICTION SYSTEM (WIPPS)

5.4 The meeting was informed that WMO was rapidly integrating artificial intelligence (AI) into the **WMO Integrated Processing and Prediction System (WIPPS)** and broader operational workflows. While global initiatives initially focused on least developed countries, advocacy at WMO level helped ensure that Small Island Developing States and middle- and high-income Caribbean countries are not excluded from support mechanisms.

5.5 The meeting noted that the pace of AI development and integration into operational meteorology presents both opportunity and risk and that without proactive engagement, Caribbean NMHSs may fall behind.

5.6 Members were encouraged to develop project concepts, engage with public and private sector partners, contribute where possible to WMO trust funds, and invest in staff upskilling. Further, early engagement was essential to ensure AI tools are adapted to regional needs and contribute meaningfully to forecasting, service delivery, and resilience.

C. CLIMATE MONITORING AND STATE OF THE CLIMATE REPORTING

5.7 In the area of climate monitoring and State of the Climate reporting, the meeting was informed that WMO had updated its methodology for submitting national climate information, including the use of an online platform that allows recent climate data to be entered and transmitted efficiently to WMO. This development had growing implications for meteorological services, as State of the Climate reports were increasingly informing global policy discussions, including Conference of the Parties (COP) negotiations.

5.8 Given that these reports are now directly influencing national and international decision-making, it was pointed out that this was placing greater expectations on meteorological services to provide authoritative, timely, and science-based climate information.

5.9 The meeting noted that meteorological services were expected to play a central role in ensuring that nationally determined contributions (NDCs) are grounded in robust climate science and actionable data. As such, NMHSs must strengthen partnerships with key national sectors and be prepared to provide climate trend analyses and expert support to national delegations before and during COP engagements, a practice already evident in some Caribbean countries.

5.10 The Science and Technology Officer stressed that all Caribbean meteorological services were encouraged to build and sustain the capacity required to deliver credible climate products and demonstrate their strategic value at the national and international levels.

D. GLOBAL GREENHOUSE GAS WATCH (GGW) – IMPLICATIONS FOR CARIBBEAN NMHSs

5.11 The Meeting was informed that the Extraordinary WMO Congress approved the implementation of the Greenhouse Gas Watch, marking a significant expansion of coordinated atmospheric monitoring. While

many Caribbean NMHSs face capacity constraints in instrumentation, personnel, and analytical capabilities, participation in the GGW remains possible through collaboration with national environmental, land-use, and AFOLU agencies.

5.12 It was highlighted that a critical requirement of the GGW was compliance with WMO data standards and exchange through national WIS2 nodes, which were typically managed by NMHSs. Further, engagement in training and coordination was essential to ensure national data streams can support the global system and that NMHSs retain a central role in climate-related governance.

E. WMO STATEMENT ON WEATHER MODIFICATION

5.13 The meeting was informed that WMO published a position paper/guidance reaffirming its long-standing neutral position on weather modification, neither promoting nor discouraging its use. The guidance advised Members choosing to engage in such activities to proceed with caution, ensuring rigorous scientific evaluation, transparency, and adherence to ethical standards. The guidance reinforces the need for strong governance frameworks and evidence-based decision-making, particularly given increasing public and political interest in weather modification technologies.

F. WMO RADIO FREQUENCY COORDINATION

5.14 During the meeting the growing risks to meteorological observing systems arising from radio-frequency interference, particularly from the expansion of 5G and other telecommunications services were highlighted.

5.15 The meeting was informed that WMO emphasized that interference is already affecting meteorological radars and other sensors, leading to degraded observation quality. This degradation poses a direct risk to forecast accuracy, early warning effectiveness, and ultimately to aviation safety and disaster risk reduction. These impacts are not theoretical; evidence is emerging across multiple regions that critical meteorological systems are being compromised.

5.16 Based on this, WMO has articulated clear technical positions and policy guidance on radio-frequency coordination, including specific guidance related to 5G deployments. Members were advised to carefully review these positions, which were provided in the supporting documentation and annexes, and to use them as authoritative references in national discussions. The guidance is intended to help Members clearly articulate the operational and safety consequences of spectrum encroachment on meteorological services.

5.17 Members were strongly encouraged to engage proactively with national regulators, telecommunications authorities, and other relevant agencies to advocate for the protection of critical frequency bands.

5.18 During the discussion, close coordination with ICAO and the use of joint WMO–ICAO guidance were emphasized as essential to strengthening national and regional advocacy. Protecting radio-frequency spectrum for meteorological use was underscored as a shared responsibility that is fundamental to sustaining reliable observations, safeguarding early warning systems, and ensuring the continued provision of high-quality services to aviation and disaster management communities.

5.19 The meeting was reminded of CMO Headquarters' membership in the Caribbean Telecommunications Union (CTU) Spectrum Management Task Force and its advocacy for protection of radio frequencies used for meteorological applications. CMO Headquarters offered to provide information from the regional ICAO office on radio frequency positions to the CTU Spectrum Management Task Force.

IMPACTS OF WEATHER IN 2025 (LOSSES & DAMAGES), CHALLENGES & BEST PRACTICES (Agenda Item 6)

6.1 The 2025 hurricane and wet season across the Caribbean, which featured the catastrophic passage of category 5 Hurricanes Melissa and the associated losses, damages and fatalities inflicted on Jamaica also presented a mix of minor to moderate weather impacts, highlighting both the strengths and vulnerabilities of national disaster preparedness systems.

6.2 While most countries were largely spared from direct hurricane strikes, localized weather phenomena, including upper-level troughs and tropical waves produced intense rainfall, flooding, landslides, and infrastructure disruptions in several communities. These events underscored the continuing importance of timely forecasts, community awareness and compliance with advisories, and coordinated multi-agency response efforts.

6.3 **Anguilla:** Anguilla reported a relatively mild 2025 hurricane and wet season, with the most notable event being the near passage of Hurricane Erin, which resulted in moderate localized impacts. Recorded effects included the collapse of a wall and a radio tower, along with approximately five inches of rainfall, but no widespread damage or severe flooding.

6.4 The season was also marked by persistent heat stress, which generated public concern and highlighted the growing relevance of heat advisories. Overall rainfall totals were concentrated between May and October, consistent with seasonal expectations, while average maximum temperatures remained elevated.

6.5 Operational challenges centered on reliance on external forecasting support, primarily from Antigua and Barbuda, and the vulnerability this creates during communication or system failures. Additional concerns included inconsistent access to forecast information via websites during storm events, limited public reliance on official information sources, and emerging air quality issues related to Saharan dust.

6.6 Best practices included strong coordination with disaster management agencies, effective use of WhatsApp for rapid information exchange, and targeted stakeholder communication during hazard events. The need for greater forecasting self-reliance, expanded advisory services (including heat and air quality), and strengthened official communication channels was emphasized.

6.7 **Antigua and Barbuda:** Antigua and Barbuda reported that its primary hazard during the 2025 season was Tropical Storm Jerry, which brought sustained winds of up to 45 mph, gusts near 60 mph, and intense rainfall totals of three to ten inches, with some areas receiving over five inches in just three hours.

6.8 While external flooding was observed, the most significant impacts occurred internally, including severe flooding of the Meteorological Office due to roof drainage failure. This resulted in water intrusion, ceiling collapse, damage to office spaces, and the temporary abandonment of the facility during the peak of the event, highlighting critical infrastructure vulnerabilities.

6.9 The meeting was informed of major challenges related to aging and non-resilient infrastructure, the absence of a fully developed business continuity plan, and operational strain associated with issuing tailored forecasts for multiple countries under time pressure.

6.10 Despite these constraints, several best practices were showcased, including the use of an in-house media centre to disseminate warnings independently of mainstream media, multilingual (English and Spanish) severe weather communication, partnerships with the private sector to support outreach, and direct briefings to Cabinet during Tropical Storm Erin. T

6.11 These practices demonstrated enhanced visibility, policy engagement, and communication effectiveness, while reinforcing the urgent need for a climate-resilient, purpose-built meteorological facility to support future service delivery and Early Warnings for All.

6.12 **Barbados:** The meeting was informed that Barbados experienced one significant high-impact weather event during the latter part of the 2025 wet season, marked by intense flash flooding associated with mesoscale instability rather than a well-defined synoptic system. The event produced rainfall totals of up to nine inches within 12 hours, resulting in widespread flooding across several districts, damage to roads and property, losses to agriculture and livestock, vehicles and homes being inundated, and one reported fatality.

6.13 Observations from the national water-level sensor network and real-time public reports confirmed the rapid onset and severity of flooding, with two distinct rainfall peaks identified during the afternoon and overnight periods. Impact-Based Forecasting and Warning Services (IBFWS) were activated ahead of the event, with a Flash Flood Watch issued on Saturday 15 November 2025 and escalated to a Warning on Sunday 16 November 2025, as thresholds were exceeded, enabling early mobilization of emergency responders.

6.14 Tropical Storm Jerry, while not directly affecting Barbados, contributed to strong winds, gusts near gale force, rough seas, and elevated swells, all of which were effectively monitored and verified using the national observing network, including buoys and autonomous marine platforms.

6.15 Challenges identified included public perception and response to hazard messaging, particularly limited understanding of the implications of a “watch” versus a “warning,” despite timely issuance. Post-event feedback indicated gaps in public awareness and risk interpretation, underscoring the need for continued sensitization and refinement of impact thresholds.

6.16 Best practices highlighted included the effective use of IBFWS, strong integration of observational data with decision-making, and close coordination with disaster response agencies. Additionally, Barbados noted positive environmental outcomes from several northerly swell events, which contributed to significant beach sand recovery along the west coast, demonstrating the value of comprehensive monitoring in capturing both adverse and beneficial impacts of weather and ocean conditions.

6.17 **British Virgin Islands (BVI):** Mr. Andrew Jackson of the Virgin Islands (UK) reported that the Virgin Islands were significantly affected by Hurricane Erin between 16 and 17 August 2025, with rainfall being the dominant hazard. Widespread flooding and numerous landslides occurred across Tortola, Virgin Gorda, Jost Van Dyke, and other islands, with Virgin Gorda recording the highest rainfall totals of approximately 11.5 inches. Average rainfall across the territory ranged from eight to nine inches, leading to infrastructure damage, road disruptions, and localized flooding in known hotspot areas. Wind impacts were moderate but notable, with sustained winds around 42.5 mph and stronger gusts reported, particularly in exposed locations.

6.18 Best practices included close coordination between the Department of Disaster Management and the Antigua and Barbuda Meteorological Service, effective use of seasonal outlooks from CIMH, proactive inter-agency briefings, and expanded public outreach through social media, live broadcasts, and mobile applications.

6.19 Challenges included competition from unofficial weather sources, gaps in observational infrastructure, and the absence of a national meteorological office. Ongoing efforts focus on improving weather station networks, formalizing SOPs with forecasting partners, and building local capacity through training initiatives such as the Meteorological Summer Programme.

6.20 **Jamaica:** The meeting was informed by Mr. Evan Thompson that Jamaica experienced a series of significant weather hazards in 2025, culminating in the catastrophic impact of Hurricane Melissa, a Category 5 hurricane that made landfall in south-western Jamaica on 28 October.

6.21 Earlier in the year, intense rainfall associated with upper-level troughs and tropical waves caused severe flash flooding in Montego Bay and the Kingston Metropolitan Area, overwhelming drainage systems and highlighting growing climate-related rainfall extremes.

6.22 Hurricane Melissa represented the most severe event, with sustained winds near 280 km/h, storm surge of up to 13 feet, widespread inland flooding, landslides, fallen trees and downed power lines and prolonged power and telecommunications outages. The **impacts were extensive**, including **45 confirmed fatalities, tens of thousands of displaced households, damage to over 191,000 buildings**, disruption to **more than 600 schools**, significant **infrastructural damage**, **32% of the country without electricity** and **estimated national losses** approaching **30% of GDP**. Notably, prolonged post-hurricane impacts included elevated groundwater tables and delayed flooding weeks after landfall, further displacing communities.

6.23 **Key operational challenges** identified included managing public fatigue during the hurricane's unusually slow approach, loss of telecommunication between offices, maintaining communications generally amid widespread telecommunications failures, coordinating airport reopening without reliable on-site observations, and balancing national warning timelines with those of international partners.

6.24 A key operational challenge following the passage of the system was related to the alignment of warning discontinuation timelines between national authorities and external partners. Even though international guidance often encouraged early issuance and rapid discontinuation of warnings based on system movement, national experience in the Jamaica-case showed the importance of timing warnings to coincide with on-the-ground impacts as premature discontinuation may not adequately reflect continuing hazards.

6.25 It was stressed that it was important to ensure that national meteorological services retain sufficient space to issue and lift warnings based on local impact assessments, while carefully coordinating release times with international partners, was identified as an ongoing coordination challenge requiring clearer protocols, mutual understanding, and continued dialogue.

6.26 Despite these challenges, **several best practices were highlighted**. These included **early issuance of severe weather alerts**, sustained and trusted **engagement through daily national press briefings**, strong integration of **impact-based forecasting and decision-support services**, effective use of the **Common Alert Protocol (CAP)** and **multi-channel dissemination**, close **coordination with emergency management agencies**, and the **restoration and operational use of weather radar ahead** of the hurricane season.

6.27 The **consistent, calm, and authoritative presence of the Meteorological Service** Directorate, combined with human-centered communication, was credited with building public trust, countering misinformation, and supporting timely protective actions, underscoring the critical role of NMHSs in high-impact events.

6.28 **Montserrat:** Mr. Joseph Irish reported that even though Montserrat experienced no direct hurricane impacts during the 2025 hurricane season, a significant weather-related event occurred on 17 May 2025 due to an active upper-level trough enhancing low-level moisture. This resulted in intense rainfall over a short period, with approximately 180 mm (7.1 inches) recorded in under three hours, causing widespread flooding, landslides, fallen trees, damaged vehicles, and disruption to roads, drainage systems, and utility infrastructure across several communities, including St. Peter's, Little Bay, Brades, Caz Bay, and the Belham Valley area.

6.29 While there were no fatalities or injuries, two individuals were trapped in a vehicle and required rescue. The total estimated cost for response, recovery, and infrastructure reinstatement was approximately US \$10.8 million, reflecting damage to public buildings, transportation networks, and water and power systems.

6.30 Best practices included timely and accurate forecasts and warnings from the Antigua and Barbuda Meteorological Service, effective dissemination through radio and disaster management channels, proactive drain and gut clearing, and a rapid response by essential services that supported swift recovery and restoration of access. Post-event engineering assessments and utility inspections further strengthened recovery efforts.

6.31 Key lessons and challenges identified focused less on forecasting and more on infrastructure resilience. While no major issues arose with warnings or messaging, the event highlighted structural vulnerabilities, including the removal of a protective barrier near Delta Petroleum that had historically mitigated flooding in the Caz Bay area. Its absence contributed to flood impacts, underscoring the need for reinstated or alternative protective measures.

6.32 **Saint Lucia:** The meeting was informed by Ms. Vigil Saltibus that Saint Lucia's 2025 wet and hurricane season was characterized by multiple high-rainfall events but no direct impacts from major hurricanes. Notable hazards included early-season flooding in May linked to an enhanced tropical wave and upper-level trough, several heavy rainfall events in September and October associated with tropical waves and the periphery of Tropical Storm Jerry, and a rare waterspout that remained offshore without causing damage.

6.33 While localized flooding, minor landslides, and infrastructure disruptions were recorded, particularly in northern and western districts, impacts were mitigated by effective disaster response, including rapid debris clearance and road restoration. Climatologically, the 2025 season presented a paradox of episodic heavy rainfall within an overall dry wet season, with rainfall totals ranking among the driest on record when compared to long-term datasets.

6.34 Key challenges identified included public messaging fatigue, siloed inter-agency coordination, staffing constraints due to retirements and limited recruitment, aging and partially defunct equipment, and the absence of a fully modernized digital and web communication platform. Institutional knowledge loss and the lack of a fully implemented succession plan were also highlighted.

6.35 Best practices emerging from the season included the rollout of the Common Alerting Protocol (CAP), expanded use of WhatsApp and social media for last-mile dissemination, simple impact-focused flyers that were widely re-shared within communities, and strengthened coordination with social and financial sectors to enable anticipatory support for vulnerable populations. Engagement with WMO, CREWS 2.0, and national policy frameworks was also cited as positioning the Service for future resilience gains.

6.36 **St Kitts and Nevis:** Mr. Denel Dixon of St. Kitts and Nevis reported the country experienced a relatively uneventful 2025 hurricane season, marked instead by three localized weather events associated with troughs and tropical waves that produced heavy rainfall, flooding, severe thunderstorms, and lightning.

6.37 On 13 May 2025, a weak trough caused flooding primarily on the eastern side of St. Kitts, with known flood-prone areas such as College Street Gut overtopping and temporarily disrupting transportation. Additional impacts occurred between 7–8 May due to a tropical wave and upper-level trough ahead of Tropical Storm Jerry, which generated prolonged torrential rainfall, intense lightning, and thunderstorms severe enough to prompt school closures. A similar event affected Nevis between 15–16 October, again leading to flooding, lightning hazards, and precautionary school closures. While no major structural damage or casualties were reported, the events underscored the persistent vulnerability of low-lying and urban drainage areas.

6.38 Challenges during the season included delays in upgrading a flash flood advisory to a warning during the 13 May event, attributed in part to approval processes and the need for stronger reliance on real-time, ground-based observations. Lessons learned emphasized the importance of near-real-time ground-truthing to support faster decision-making and more responsive warning escalation.

6.39 Best practices implemented during the season included expanded stakeholder email alerts, joint infographic messaging from the Meteorological Service and the National Emergency Management Agency (NEMA), and direct engagement between meteorological leadership, NEMA, and senior government officials to support timely decisions such as school closures. The introduction of regular hurricane simulation exercises was also highlighted as a positive step, strengthening inter-agency coordination, clarifying roles, and improving readiness for future high-impact weather events.

6.40 **St Vincent and the Grenadines:** Mr. Gregory Cato reported that St Vincent and the Grenadines experienced a relatively quiet 2025 hurricane season, with no direct impacts from tropical storms or

hurricanes and no reported fatalities. The primary hazards arose from lesser-developed systems such as tropical waves and troughs, which prompted the issuance of rainfall and marine advisories due to periods of moderate to rough seas and localized rainfall.

6.41 A notable feature of the season was below-normal rainfall during several core wet-season months, particularly August and September, contributing to dry conditions and intermittent water supply advisories from the water authority. While one advisory was issued during the dry season, multiple water-related advisories occurred during the hurricane season, highlighting emerging water stress concerns.

6.42 Best practices included maintaining uninterrupted operational services despite staff shortages, proactive media engagement through radio and television, and the enhanced use of radar and satellite imagery in public advisories to improve message clarity and uptake.

6.43 Challenges centred on staffing constraints, forecast model limitations, and capacity gaps, which are being addressed through targeted recruitment, training initiatives such as a meteorological cadet programme, and expanded stakeholder engagement via the National Climate Outlook Forum to strengthen cross-sectoral decision-making and resilience.

6.44 **Trinidad and Tobago:** Mrs Carol Subrath-Ali of Trinidad and Tobago reported that it experienced a generally typical wet and hurricane season, punctuated by a rare and high-impact F1 tornado event on 7 October 2025. The tornado developed under conditions of a low-level trough, light winds, strong daytime heating, and a well-defined sea-breeze convergence, resulting in intense convection over northwestern Trinidad.

6.45 Impacts included structural damage such as roofs being torn off, power outages affecting approximately 150 people, localized flooding, and temporary displacement of residents. Beyond physical damage, a key impact identified was the significant psychological distress experienced by affected communities, underscoring the often-overlooked mental health dimension of severe weather events.

6.46 Challenges included the difficulty of forecasting such rare phenomena, limited lead time, and reliance on post-event social media and eyewitness accounts to confirm tornadic activity.

6.47 Best practices and lessons learned emphasized the value of radar analysis, the potential use of alternative atmospheric indices, and the need to strengthen nowcasting capabilities to better anticipate short-lived but severe local hazards.

6.48 **Turks and Caicos:** Dr. Holly Hamilton reported that the 2025 hurricane season in the Turks and Caicos Islands was characterized by multiple near-misses, with Hurricane Erin posing the most significant threat. Erin passed north of the islands in August, producing tropical-storm-force conditions primarily across the eastern islands, including Grand Turk, Salt Cay, and South Caicos.

6.49 Impacts included three to five inches of rainfall, hazardous seas, coastal flooding, sea spray overtopping seawalls, and extensive Sargassum deposition along coastlines. Other systems, including Invest 94L (later Hurricane Imelda) and Hurricane Melissa, resulted in limited impacts but required heightened preparedness due to forecast uncertainty.

6.50 Best practices included strong collaboration between the Meteorological Service and the Department of Disaster Management and Emergencies through joint advisories, diversified communication using social media, videos, and press briefings, and innovative automation tools to relay Bahamas-issued advisories during non-operational hours.

6.51 Challenges remained in limited staffing, public information overload from multiple sources, and the need for clearer institutional roles, enhanced CAP alert integration, and continued public education to strengthen early warning effectiveness.

SCIENTIFIC & INNOVATION PRESENTATIONS (Agenda Item 7)

A. CROSQ ON QUALITY MANAGEMENT SYSTEMS IMPLEMENTATION AND OPPORTUNITIES

7.1 *CARICOM Regional Organization for Standards and Quality* (CROSQ) made its first formal presentation to the Annual Meeting of Directors of Meteorological Services, marking a significant step in deepening collaboration between regional quality infrastructure institutions and Caribbean National Meteorological and Hydrological Services (NMHSs). The presentation highlighted the strategic role of quality management systems, metrology, accreditation, and standards in strengthening the accuracy, credibility, and resilience of meteorological services across the Caribbean. CROSQ emphasized the critical link between metrology (measurement science) and meteorology, noting that reliable, traceable, and internationally recognized measurements underpin effective forecasting, early warning systems, and climate services.

7.2 In a region highly exposed to tropical cyclones and climate-related shocks, CROSQ pointed out that quality infrastructure was positioned as a core enabler of disaster risk reduction, innovation, and public trust. The presentation also outlined key outcomes of CROSQ's led project **Metrology for Meteorology (M4M)** Project, implemented with the Caribbean Institute for Meteorology and Hydrology (CIMH), were presented, including capacity building, institutional partnerships, strengthened calibration and accreditation systems, and improved cooperation between National Metrology Institutes and NMHSs.

7.3 Lessons learned highlighted the need to expand access to accredited calibration services, scale up virtual training, and further integrate quality professionals into meteorological operations. A major development announced was **CROSQ's support to the Antigua and Barbuda Meteorological Service** in achieving ISO 9001 Quality Management System certification, thus establishing a regional benchmark for operational excellence. CROSQ outlined future priorities, including expanded training programmes, development of centers of excellence for calibration, donor mobilization, and continued support to NMHSs seeking certification and accreditation.

B. SAINT LUCIA METEOROLOGICAL SERVICE: MOVING FROM CAP WEBINAR, AWARENESS, & WORKSHOP TO OPERATIONALIZING COMMON ALERT PROTOCOL

7.4 The Saint Lucia Meteorological Service (SLMS) presented to the Directors' Meeting on its approach and process for implementing the Common Alerting Protocol (CAP) within the national early warning system. It was reported that, following participation in regional CAP webinars and a WMO-facilitated national CAP workshop conducted jointly by WMO and CMO in January 2025, SLMS transitioned from traditional text-based warnings to standardized, impact-based CAP messaging aligned with WMO guidelines and the WIS2 framework.

7.5 It was further demonstrated that institutional and operational arrangements were put in place, including the designation of national CAP focal points, the integration of CAP into standard operating procedures, and the deployment of CAP editors and RSS feeds to support automated, consistent, and multi-channel dissemination of alerts across digital platforms and social media.

7.6 The meeting was informed that initial CAP alerts were successfully issued during the 2025 hurricane season, demonstrating improved end-to-end forecasting-to-warning workflows and strengthened coordination with national disaster management agencies. Ongoing activities were noted to include continued staff training, stakeholder engagement to refine impact thresholds, expansion of last-mile dissemination channels, and registration in the WMO Register of Alerting Authorities to achieve full operational maturity.

C. STRENGTHENING BUSINESS CONTINUITY IN METEOROLOGICAL OPERATIONS — RECALIBRATE TO RESPOND

7.7 Mr. Haley Anderson, Project Development Officer at WMO Headquarters and member of the WMO **Task Team on Business Continuity Management (BCM)**, presented on the critical importance of

institutional resilience and continuity planning for National Meteorological and Hydrometeorological Services (NMHSs). Drawing on professional experience across quality management, disaster risk reduction, and recent global disruptions, the presentation highlighted that operational shocks, such as power outages, cyberattacks, and communication failures, can have long-lasting impacts that extend well beyond the initial incident.

7.8 Case studies from Chile, Portugal, and South Africa demonstrated how disruptions can rapidly cripple observational networks, forecasting systems, and communication channels, while also eroding public trust, triggering regulatory scrutiny, and exposing organizations to reputational, legal, and workforce risks long after technical systems are restored.

7.9 Mr. Anderson emphasized that Business Continuity Management is not solely a technical issue, but a leadership and governance function. A formal Business Continuity Management System (BCMS) enables NMHSs to maintain delivery of essential services within acceptable timeframes during crises, protect critical infrastructure and data, and recover more rapidly and credibly.

7.10 The presentation outlined WMO's 2024 BCM Guidelines and the development of structured training materials following EC-78, organized around eight practical steps, from leadership commitment and risk assessment to business impact analysis, recovery planning, exercising, and continuous improvement. Particular emphasis was placed on the first module, targeted at senior leadership, which supports the development of a BCM policy as a foundational step.

7.11 The key message was clear: NMHSs must shift from ad hoc, reactive responses to disruptions toward systematic, practiced, and institution-wide continuity planning, recognizing BCM as essential to public safety, national resilience, and institutional legitimacy.

D. USING LANGUAGE MODELS TO GENERATE TEXT IMPACT-BASED WEATHER FORECASTS: EXAMPLES FOR THE CARIBBEAN

7.12 Dr. Neil Gordon, former President of the WMO Commission for Aeronautical Meteorology and former Permanent Representative of New Zealand to WMO, presented on emerging opportunities for the use of Artificial Intelligence, particularly Large Language Models (LLMs) to enhance impact-based weather forecasting and early warning communication, with practical demonstrations relevant to the Caribbean.

7.13 Drawing on decades of experience across observation, forecasting, research, and senior management, Dr. Gordon highlighted that recent advances in AI are transforming the full warning value chain, especially the "last mile" of communication. AI-driven language models can now rapidly synthesize large volumes of forecast and ensemble data into clear, context-aware, impact-based text products, available in multiple languages and suitable for both public communication and decision support.

7.14 Key opportunities identified include:

- Improved handling of forecast uncertainty through ensemble summarization;
- Enhanced accessibility through multilingual outputs and conversational interfaces;
- Lower barriers to entry, as advanced AI tools can operate without large supercomputing infrastructure; and
- Support for forecasters through "human-in-the-loop" systems that augment, rather than replace, professional judgement.

7.15 Dr. Gordon demonstrated proof-of-concept applications for Caribbean countries, including area-wide impact-based forecasts for Jamaica and Trinidad and Tobago, incorporating local vulnerabilities, exposure, and socio-economic context. He emphasized that, while the technology is mature enough for experimentation and internal guidance, operational deployment by National Meteorological Services must be preceded by rigorous testing, governance safeguards, and quality assurance.

7.16 The presentation underscored that AI-enabled language tools represent a strategic opportunity for Caribbean NMHSs to strengthen impact-based forecasting, Early Warnings for All (EW4All) Pillars 2 and 3,

and last-mile communication, provided they are implemented responsibly, transparently, and under clear institutional authority.

E. KING'S COLLEGE LONDON (UK) & UWI (MONA) – INTERNATIONAL RELATIONS OF TROPICAL STORMS IN THE CARIBBEAN

7.17 A research team from King's College London and The University of the West Indies (UWI) Mona, presented an overview of an ongoing, three-year, policy-oriented research project entitled *The International Relations of Tropical Storms in the Caribbean*. The project is funded by the UK Research and Innovation (UKRI) / Economic and Social Research Council (ESRC) and is designed as a collaborative partnership with the World Meteorological Organization (WMO) and the Caribbean Meteorological Organization (CMO).

7.18 The research examines how climate change, extreme weather, and increasing vulnerability in the Caribbean intersect with evolving global political dynamics, including weakening international cooperation, rising nationalism, and pressure on multilateral institutions. The project adopts a co-production approach, combining social science methodologies with the technical and operational expertise of meteorological and disaster risk professionals. Its core empirical work uses Q-methodology, a structured survey technique that captures and maps expert perspectives on cooperation challenges.

7.19 The research focuses specifically on regional and international cooperation involving NMHSs, the CMO, and the WMO, including issues such as data sharing, resource constraints, governance arrangements, technical and institutional barriers, and last-mile communication challenges. Key outputs will include two policy reports: one aligned with the WMO's Early Warnings for All (EW4All) initiative, and a second focused directly on regional cooperation challenges relevant to Caribbean NMHSs and their relationship with international institutions. Additional outputs include academic articles and an edited volume, but the primary emphasis is on producing practical, accessible, and policy-relevant findings that directly support practitioners.

F. ST. KITTS AND NEVIS HURRICANE ATLAS AND FORECASTING SYSTEM

7.20 Mr. Denel Dixon of the St. Kitts and Nevis Meteorological Service presented on **St. Kitts and Nevis Hurricane Atlas and Forecasting System**, a key component of the country's **Climate Risk Intelligence Data Infrastructure** (CRID). The system was developed with support from the *Caribbean Community Climate Change Centre* (5Cs) under the country's GCF readiness programme and technical expertise was provided by HR Wallingford (UK). The Atlas is hosted on Amazon Web Services to ensure accessibility, reliability, and data security.

7.21 The Hurricane Atlas is designed to strengthen coastal risk assessment, land-use planning, and emergency preparedness, with a particular focus on wave, storm surge, and coastal flooding hazards. It integrates four primary data sources:

- Forecast data, automatically ingested from NOAA advisories during active tropical cyclone events;
- Historical data, covering ten of the most impactful hurricanes affecting St. Kitts and Nevis in recent history;
- Statistical simulations, representing 10,000 years of synthetic hurricanes generated to capture a wide range of plausible storm scenarios; and
- Derived hazard outputs, including maximum water levels, storm surge depths, wave setup, significant wave height, and peak wave period.

7.22 Through an interactive web-based interface, users can visualize hazard impacts for both St. Kitts and Nevis, run forecast-based scenarios during active storms, explore historical events, and assess future risk under multiple climate change scenarios. These scenarios incorporate projected sea-level rise and increased wind speeds for mid-century and end-of-century time horizons, supporting long-term development planning and climate adaptation.

7.23 Overall, the Hurricane Atlas represents a significant advance in climate and disaster risk intelligence for St. Kitts and Nevis, providing a practical, accessible tool to support evidence-based planning, preparedness, and risk-informed decision-making in a multi-hazard, climate-sensitive context.

G. WINDBORNE CLOSING GLOBAL DATA GAPS GLOBAL SOUNDING BALLOONS

7.24 Ms. Kylie Holland of *Windborne Systems* presented an innovative approach to addressing critical gaps in global upper-air observations, particularly over oceanic and data-sparse regions. The company's **long-endurance, controllable Global Sounding Balloons** provide repeated near-real-time atmospheric profiles over extended periods, significantly increasing observational coverage without the need for extensive new ground infrastructure.

7.25 A key innovation of the system is the integration of **balloon-mounted dropsondes**, allowing targeted observations within and around tropical cyclones by navigating balloons using different wind layers. This capability offers a lower-cost, lower-risk complement to crewed hurricane reconnaissance, particularly valuable for regions without dedicated hurricane hunter programmes.

7.26 The integration of balloon-mounted dropsondes further enhances targeted observations of severe weather systems, offering a complementary and cost-effective option for regions without dedicated airborne reconnaissance.

OTHER MATTERS

(Agenda Item 8)

8.1 No other matters discussed due to the progress of the meeting beyond the agreed working schedule.

ANNUAL MEETING OF DIRECTORS OF METEOROLOGICAL SERVICES
RODNEY BAY, SAINT LUCIA, 19 NOVEMBER 2025

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PROVISIONAL AGENDA

1. INTRODUCTION AND ADOPTION OF AGENDA
 2. STATUS OF ACTIONS FROM THE PREVIOUS MEETING
 3. TRAINING
 4. OPERATIONAL MATTERS
 - a) Early Warning for All Implementation & Artificial Intelligence
 - b) Cataloguing of Hazardous Events
 - c) WIGOS Implementation: OSCAR/Surface, Regional WIGOS Centre, WQMS, Global Basic Observation Network (GBON), and Systematic Observation Financing Facility (SOFF)
 - d) WIS 2.0 Transition
 - e) Strengthening National Capacity in WIGOS & WIS 2.0
 5. OUTCOME/HIGHLIGHTS FROM WMO TECHNICAL COMMISSIONS & THE 79TH SESSION OF THE EXECUTIVE COUNCIL AND WMO EXTRAORDINARY CONGRESS 2025 AND RELATED MEETINGS
 - a) Regional Basic Observation Network (RBON)
 - b) WMO Integrated Processing and Prediction System (WIPPS)
 - c) Climate monitoring and early warning systems
 - d) Global Greenhouse Gas Watch
 - e) WMO Statement On Weather Modification
 - f) Radio Frequency Coordination to Protect Bands vital for Weather and Climate
 6. IMPACTS OF THE WEATHER IN 2025 (LOSS & DAMAGE), CHALLENGES & BEST PRACTICES
 7. SCIENTIFIC / INNOVATION PRESENTATIONS
 8. OTHER MATTERS
-

ANNUAL MEETING OF DIRECTORS OF METEOROLOGICAL SERVICES (DMS 2025)
19 NOVEMBER 2025

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