



CARIBBEAN METEOROLOGICAL ORGANIZATION

ANNUAL MEETING OF DIRECTORS OF METEOROLOGICAL SERVICES
TORTOLA, BRITISH VIRGIN ISLANDS, 20 NOVEMBER 2024

Doc. 4

OPERATIONAL MATTERS (Submitted by the Coordinating Director)

INTRODUCTION

1. The Annual Meeting of Directors of Meteorological Services serves as the principal forum to collectively focus on operational meteorology priorities for National Meteorological and Hydrometeorological Services (NMHS) in the Caribbean Meteorological Organization (CMO) Member States and for assessing alignment of operational practices to the World Meteorological Organization (WMO) standards and recommendations.
2. Since DMS2023, CMO Member States NMHS continued to make progress in strengthening their operations, advancing their compliance with mandatory international WMO standards, and implementing key WMO programs and priorities through activities undertaken at the national level.
3. In this document, a number of matters related to and impacting operations at NMHSs are emphasized, reiterated, or addressed to either:
 - Raise awareness on the status of CMO Members compliance, or bring focus on existing gaps that need to be closed or deadlines that have to be met and require action by the NMHSs; or
 - Create awareness of ongoing or upcoming issues that will impact operational services in the near future.

A. EARLY WARNING FOR ALL IMPLEMENTATION

4. The Meeting will recall the discussion at DMS2023 (Port of Spain, November 2023) that called on Members NMHSs to leverage the **Early Warnings for All (EW4All)** initiative by developing and implementing their own initiatives and new activities related to EW4All. WMO has approved the following list of [High Priority Activities Contributing to the Early Warnings for All initiative](#):
 - 1) Implement the *WMO Information System (WIS) 2.0*, including the development of a *Common Alerting Protocol (CAP)* editor to be part of the “WIS 2.0 in a box” in the pre-operational phase of WIS 2.0.
 - 2) Implement the *Global Basic Observing Network (GBON)*, including through the support provided via *Systematic Observation Financing Facility (SOFF)*.
 - 3) Guide and support the development of the *Regional Basic Observing Network (RBON)*.
 - 4) Analyse gaps and enhance WIPPS products for priority hazards.
 - 5) Enhance engagement of academia and private sector in *WMO Integrated Processing and Prediction System (WIPPS)* development.
 - 6) Enhance the introduction of new emerging technologies (e.g., Artificial Intelligence (AI)) and science into WIPPS.
 - 7) Catalogue and analyse gaps in satellite products and applications for priority hazards.

- 8) Support Members to ensure access to satellite data and products and with train-the-trainers focused on access, processing, visualization, and interpretation of satellite data.

5. WMO has urged Members to support the implementation of the high-priority activities implementation by developing their own initiatives at regional and/or national levels. To assist NMHSs, WMO has highlighted focus areas in its [Road Map For The Early Warnings For All Initiative](#) that NMHSs must strengthen for effective EWS. CMO Members NMHSs have a key role to play in the implementation of the WMO EW4All road map activities at the national level, and Directors are encouraged to take action on the following WMO recommendation:

- 1) Use the EW4All Road Map priority activities to update, align, and accelerate their respective work programmes and action plans as necessary, and continue to provide feedback to WMO on progress updates on the implementation of early warning systems in their national context.
- 2) Advance EWS and support EW4All nationally by implementing early warning services for all country-relevant hazards contained in the priority hazards list;
- 3) Share with the WMO successful examples where their NMHSs have gained visibility and authority within their governments;
- 4) Promote early warning systems and increase public awareness about the importance of EWS and how to respond to them.
- 5) Document and share successful coordination mechanisms with disaster and emergency management agencies, including formal communication and joint training exercises;
- 6) Continuously enhance early warning capabilities and exchange knowledge and good practices in early warning systems by participating in regional and international forums.
- 7) Engage and call on all stakeholders from the public, private, and academic sectors and civil society to contribute to EW4All in a manner aligned with the WMO EW4All Road Map.

B. STRENGTHENING SERVICE CAPACITY, INCLUDING MARINE AND OCEAN SERVICES

Operational Readiness NWP Capability

6. The Meeting is reminded of the Caribbean NWP Capacity Development and Operational Readiness Workshop in Support of EW4All, which was held from 5-9 August 2024 in Port of Spain, Trinidad and Tobago, in collaboration between the CMO HQ and WMO. The goal of the workshop was to increase in-house NWP capability and competence, using the WRF-based Plug and Run Tool (PN-Tool) developed by the WMO Education and Training Office to facilitate real-time operational forecasting.

7. Directors are informed that the workshop was attended by twenty-three (23) participants from twelve (12) CMO Member States, Sint Maarten, Costa Rica, and the WMO's Regional Training Centers in Barbados (CIMH) and Costa Rica. During the workshop, participants successfully ran a 24-72-hour NWP simulation for their countries and territories at 1, 3, and 9-km spatial grid resolutions and at 1, 3, and 6-hour temporal resolutions.

8. All CMO Member States left the workshop with an NWP PN-tool configured to national circumstances that would have been easy to plug and run for real-time operations, case studies, and research at their NMHSs. The workshop responded to Members' demands for support to strengthen their capacity to deliver high-quality hydrometeorological and early warning services in support of the global Early Warnings for All initiative.

9. Directors are encouraged to provide resources to integrate the WRF-based PN Tool in their real-time operational forecasting to strengthen their NMHS operational capacity. Directors are also reminded that NMHSs service capacity can also be strengthened by increased use of high-

resolution products of the limited area NWP models provided through the [Severe Weather Forecasting Programme \(SWFP\) Extranet hosted by Meteo-France Martinique](#).

Multi-Hazard Impact-Based Forecasting and Warnings and Common Alert Protocol

10. Recalling the updated [Technical Regulations \(WMO-No. 49\), Volume I: Section 5](#), which now include the Common Alerting Protocol (CAP) standard as a recommended practice, WMO is now promoting the global implementation of the CAP and Impact-Based Forecast and Warning Services (IBFWS) as key approaches and milestones in the EW4All initiative.

11. The [Annex](#) to the WMO Road Map for Implementation of the EW4All Initiative indicates that many of the required actions to support Members' development and operation of early warning systems (EWSs) are non-hazard specific and/or respond to requirements of multi-hazards. Under the Road Map, WMO will support the production of multi-hazard impact- and risk-based forecasts and warnings (IBFWS) by providing Members with IBFWS training workshops and expansion of the IBFWS eCourse for priority hazards. Support for warning dissemination tools will also be continued through the implementation of the CAP to make sure that all Members have the capacity to disseminate warnings in CAP format in the long term. For this purpose, e-learning courses and the CAP editor tool will be integrated into WIS 2.0.

12. The Common Alerting Protocol (CAP) Caribbean Webinar series, organized in collaboration with the WMO, CMO HQ, the Caribbean Institute for Meteorology and Hydrology (CIMH), and the National Meteorological Service of Barbados, Belize, and Trinidad and Tobago, was held on 14 and 21 May 2024. The main objectives of this series were to promote the value of CAP, encourage the formatting of warnings into the CAP standard, and advance implementation in the Caribbean. During the workshop, participants were exposed to the CAP Alert Editor tool using the "Guest User" access to explore further with a live demonstration by the Chief Meteorologist (Head) of the National Meteorological Service of Belize.

13. Results from a survey conducted during the webinar series showed 70% of the forty (41) Caribbean participants reported that their NMHS did not use CAP for dissemination of warnings; however, there was a high interest in implementing CAP in 2024, as shown in Figure 1.0. It is essential that CMO Members NMHS forecasts, alerts, and warnings and communication modalities adhere to international standards.

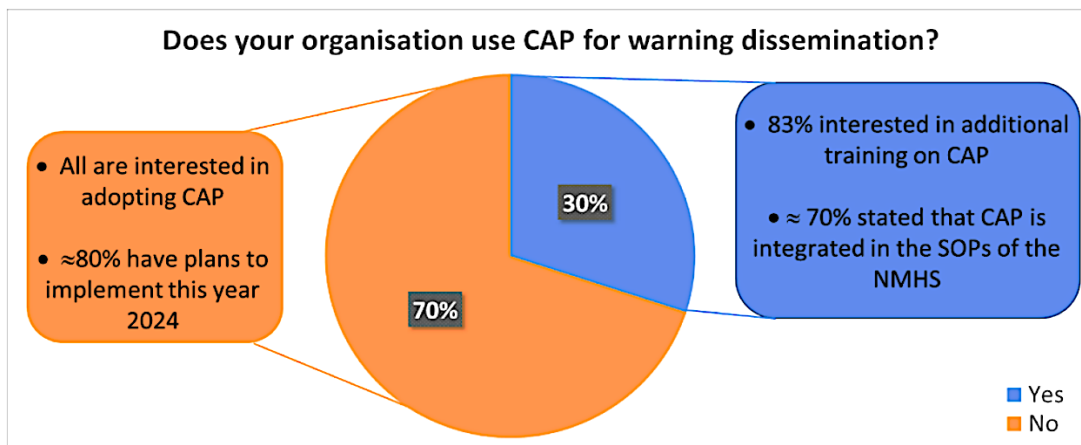


Figure 1. Result on use of CAP by NMHS in the Caribbean during CAP Webinar

14. Following the CAP webinar series in May 2024, in-country CAP implementation workshops are scheduled to be held during the first quarter of 2025 in Grenada, Saint Lucia, and Dominica. This initiative is funded by the CREWS Caribbean 2.0 Project and will be facilitated by the CMO Headquarters, a regional implementation partner.

15. The purpose of this workshop is to aid fast-tracking of CAP implementation at the national level, by providing participants with practical and hands-on training to format warnings into CAP standards, mainstreaming the usage of CAP as an operational practice, and testing the recently developed WMO CAP editor tool integrated with *WIS 2.0 in a Box* to operationalize CAP. The workshop will also include a brief introduction to impact-based forecasting.

Strengthen Marine and Ocean Services

16. WMO competency requires the following weather phenomena, parameters, and variables, including spatial extent, onset and cessation, duration, intensity, and temporal variations, where applicable, when issuing marine forecasts for high seas and coastal areas;

- 1) Wind, including directional variability, speed, and wind gusts;
- 2) Sea state;
- 3) Damaging large waves or swell systems;
- 4) Precipitation and associated horizontal visibility;
- 5) Fog or mist, and associated horizontal visibility;
- 6) Other types of obscurations to visibility, including dust, haze, volcanic ash, and associated horizontal visibility;
- 7) Synoptic situation as required;
- 8) Thunderstorms, heavy precipitation with poor horizontal visibility, downburst and microburst, squalls or gust front, hail, tornadic, and waterspout activity;
- 9) Tropical cyclones, hurricanes, and their movement.

17. Currently, only five (5) CMO Member States NMHSs provide dedicated marine weather forecasts on a daily basis, as shown in Annex I. The remainder have marine forecast information integrated into their public weather forecasts. At the same time, all CMO Member States NMHSs provide marine weather warning information.

18. The WMO is continuing its [5-year Marine Services Implementation Plan](#) to strengthen the capacity of Members to deliver marine and coastal weather forecasting services. The 2024 WMO Marine Services Course for Caribbean English-speaking Members of WMO Regional Associations III and IV—Phase-II, a follow-up course for participants from phase 1 in 2022, will have the face-to-face training in Barbados from 2–11 December 2024.

C. WIGOS IMPLEMENTATION: OSCAR/SURFACE, REGIONAL WIGOS CENTRE, GLOBAL BASIC OBSERVATION NETWORK (GBON) AND THE ASSOCIATED SYSTEMATIC OBSERVATION FINANCING FACILITY (SOFF)

Status of WIGOS Implementation

19. At the DMS2023 discussion on the implementation of the *WMO Integrated Global Observing System* (WIGOS) centered its operational plan. During that meeting, Directors were asked to note that there were outstanding WIGOS gaps to be closed that required their attention and action. Since then, most CMO Member States NMHSs have advanced WIGOS implementation and continue to increase their WIGOS compliance. However, there has been uneven implementation of WIGOS.

20. Notably, all sixteen (16) NMHSs now have functional National Focal Points (NFPs) in the required WIGOS areas, as illustrated in Table 1.0. However, some of the NFPs require additional training to understand the programs and their relationships, how to use the WIGOS tools effectively, and their responsibility as NFPs. Additionally, there has been an increase from two (2) to nine (9) NMHSs that have developed and implemented National WIGOS Station Identifiers (WSI) systems as shown in Table 2.0, which is critical for implementing and exchanging observation data from new GBON stations.

21. These efforts, supported by CMO Headquarters, yielded key outcomes and deliverables that are consistent with WMO RA IV regional priorities and the CMO Headquarters strategic goal to advance regional and national WIGOS implementation. Particularly, the CMO Members made considerable improvements in the number of NMHSs with functional WIGOS-related National Focal Points (NFP). The majority now have trained NFPs for WIGOS, WDQMS, and OSCAR/Surface.

22. Despite these gains, there is a significant lack of Members with national WIGOS Implementation Plans (WIP). Only Barbados and Belize have started developing their WIP. The National WIP is defined by WMO as one of the main priority areas of the WIGOS Operational Plan.

Table 1.0: CMO Member States Functional National Focal Points within the WIGOS Programme

| CMO Member State | Focal Point/Contact | | |
|-------------------------------|---------------------|-------|-------|
| | OSCAR/Surface | WIGOS | WDQMS |
| Anguilla | ✓ | ✓ | ✓ |
| Antigua and Barbuda | ✓ | ✓ | ✓ |
| Barbados | ✓ | ✓ | ✓ |
| Belize | ✓ | ✓ | ✓ |
| British Virgin Islands | ✓ | ✓ | ✓ |
| Cayman Islands | ✓ | ✓ | ✓ |
| Dominica | ✓ | ✓ | ✓ |
| Grenada | ✓ | ✓ | ✓ |
| Guyana | ✓ | ✓ | ✓ |
| Jamaica | ✓ | ✓ | ✓ |
| Montserrat | ✓ | ✓ | ✓ |
| Saint Lucia | ✓ | ✓ | ✓ |
| St Kitts and Nevis | ✓ | ✓ | ✓ |
| St Vincent and the Grenadines | ✓ | ✓ | ✓ |
| Trinidad and Tobago | ✓ | ✓ | ✓ |
| Turks and Caicos | ✓ | ✓ | ✓ |

Table 2.0 CMO Member States NMHSs WIGOS Implementation Gaps

| Member | National WIGOS Station Identifiers (WSI) | National WIGOS Implementation Plan in Place |
|------------------------|--|--|
| Anguilla | No | No |
| Antigua And Barbuda | No | No |
| Barbados | Yes | Currently in draft status as of 18 October, 2024 |
| Belize | Yes | 60% completed as of 18 Oct 2024 |
| British Virgin Islands | No | No |
| Cayman Islands | Yes | No |
| Dominica | No | No |
| Grenada | Yes | No |

| | | |
|----------------------------------|-----------------------------------|----|
| Guyana | In progress as of 25 Oct. 2024 | No |
| Jamaica | Yes | No |
| Montserrat | Yes | No |
| Saint Lucia | No | No |
| St Kitts and Nevis | No | No |
| St Vincent and the Grenadines | Yes | No |
| Trinidad and Tobago | Yes | No |
| Turks and Caicos Islands | Yes | No |

Regional WIGOS Center Monitoring and Activities

23. Directors are notified that the WMO updated [Technical Guidelines for Regional WIGOS Centres \(RWCs\) on the WIGOS Data Quality Monitoring System \(WDQMS\)](#) (WMO-No. 1224) are now available and provide guidance for RWCs to perform the operational activities related to WDQMS.

24. The meeting is reminded that the *RA IV Regional WIGOS Centre* (RWC) started operating in pilot mode on 21 December 2023 with two leading nodes (USA and Canada) and three contributing nodes (Costa Rica, Trinidad and Tobago, and CMO HQ—British Caribbean Territories (CMO HQ/BCT)). Since then, CMO HQ/BCT and Trinidad and Tobago, as contributing nodes, have been performing the mandatory functions of assisting CMO members with following up on data availability and quality issues identified via the WDQMS and Incident Management System (IMS) and supporting members with the management of metadata in OSCAR/Surface, respectively, as well as optional functions related to the operation of WIGOS tools.

25. This effort has improved the availability and quality of observational data of CMO Members WIGOS stations and their metadata within OSCAR/Surface. Using October 2024 as a snap shot in time, CMO Member States WIGOS stations observation availability performance ranges from 7% to 100% with 18 of the 26 WIGOS stations meeting the performance target of 80% or greater data availability over the month of October 2024. During the same period, eight (8) stations provided less than 80% of the number of observations expected as shown in Table 3.0.

26. At the time of writing this document, Anguilla, Belize, the British Virgin Islands, Jamaica, Saint Lucia, and the Turks and Caicos Islands have stations with the highest data availability issues (i.e., stations reporting fewer observations than expected based on metadata in OSCAR), which suggests capacity gaps. The capacity and data availability issues related to surface observations are not seen in the upper-air land observation performance, which ranges from 55% to 100%, with 4 of the 5 stations performing at 100%. However, equipment failures such as hydrogen generators and other operational matters have impacted the ability of NMHSs from time to time and can have an impact on data availability, which can affect GBON compliance.

Table 3.0 CMO Member States NMHSs Stations WDQMS Data Availability Performance

| Member Country | Station Name | Percent of Observations Available October 2024 |
|------------------------|-------------------------------|---|
| Anguilla | Anguilla | 70% |
| Antigua And Barbuda | VC Bird International Airport | 98.4% |
| Barbados | Grantley Adams | 99.7% |

| | | |
|-------------------------------|---|--|
| Belize | Belize/Phillip Goldston International Airport | 40.0% |
| | Ladyville | 90.0% |
| | Ranchito | 100.0% |
| | Belmopan (Not Registered in OSCAR) | 608 hours of observations reported via WIS 2.0 |
| | WSI: 0-84-100-9910002 (Not Registered in OSCAR, No Station Name) | 604 hours of observations reported via WIS 2.0 |
| | WSI: 0-84-100-9901003 (Not Registered in OSCAR, No Station name) | 608 hours of observations reported via WIS 2.0 |
| | 0-84-100-9920901(Not Registered in OSCAR, No Station name) | 639 hours of observations reported via WIS 2.0 |
| | WSI: 0-84-100-9900502(Not Registered in OSCAR, No Station name) | 624 hours of observations reported via WIS 2.0 |
| | WSI: 0-84-100-9920101(Not Registered in OSCAR, No Station name) | 663 hours of observations reported via WIS 2.0 |
| | WSI: 0-84-100-9920301(Not Registered in OSCAR, No Station name) | 486 hours of observations reported via WIS 2.0 |
| British Virgin Islands | Beef Island, Tortola | 7.0% |
| Cayman Islands | Owen Roberts Airport | 100.0% |
| | Cayman Brac | 100.0% |
| Dominica | Canefield Airport | 84.0% |
| | Melville Hall Airport | 93.0% |
| Grenada | Maurice Bishop International Airport | 99.5% |
| Guyana | Georgetown | 99.6% |
| | Timehri / Cheddi Jagan International Airport | 100.0% |
| | Ogle International Airport | 96.8% |
| Jamaica | Kingston/Norman Manley | 20.7% |
| | Montego Bay/Sangster | 32.5% |
| Montserrat | John A. Osborne Airport | 96.3% |
| Saint Lucia | Hewanorra International Airport | 34.1% |
| | George F.L. Charles Airport | 34.1% |
| St Kitts and Nevis | R.L. Bradshaw Int'l Airport | 96.6% |
| | V.W Amory International Airport | 88.0% |
| St Vincent and the Grenadines | Argyle International Airport | 83.0% |
| Trinidad and Tobago | Piarco International Airport | 99.2% |
| | Crown Point (ANR) International Airport | 97.7% |
| Turks and Caicos Islands | Providenciales | 57.6% |

Global Basic Observation Network (GBON)

27. The compliance status and reporting for GBON surface and upper-air stations over land are now available. A dedicated web tool (gbon-compliance.wmo.int) based on information from the WMO Integrated Global Observing System (WIGOS) Data Quality Monitoring System (WDQMS) was launched at INFCOM-3 and is based on the criteria found in Section 11.4 of the [Guide to the WMO Integrated Global Observing System](#) (WMO-No. 1165).

28. GBON Compliance includes two (2) parts: Member-level compliance and station-level compliance. GBON compliance trend among CMO Member States NMHSs remains positive. Currently, all CMO Members are achieving the Member-level compliance horizontal resolution

requirement based on reporting stations. Additionally, Belize, Cayman Islands, Dominica, St. Kitts and Nevis, and Trinidad and Tobago have all surpassed the GBON minimum horizontal resolution target of one GBON station, which was determined based on global GBON gap analysis. Station-level compliance in terms of quality also remains positive. However, station-level compliance in terms of reporting frequency and data availability remains with significant gaps in GBON compliance on a quarterly basis.

29. In reaction to the GBON regulations based on regional collaboration, there has been an increase in surface observation data reporting from CMO Member States NMHS at the national, regional, and international levels, with several CMO Member States NMHS stations closer to achieving full GBON station-level compliance since DMS2023. However, transitioning to full GBON station-level compliance among CMO Member States NMHSs remains challenging since there is a combination of manual and Automatic Weather Stations (AWS), from which observation data is taken for GBON reporting. This complicates achieving full GBON compliance for some Members as automation, integration of data collection, and reporting using WIS 2.0 nodes is not easily achieved.

30. The number of Members reporting observational data from their GBON-declared stations at the required hourly frequency **increased** from eight (8) members at the time of DMS2023 to thirteen (13) currently, as shown in Table 4.0. The five (5) additional Members that now report observational data hourly from their GBON stations are Anguilla, the British Virgin Islands, Dominica, Montserrat, and Saint Vincent and the Grenadines.

31. Nevertheless, despite this increase in hourly reporting, significant gaps remain in full GBON compliance, with only a small fraction of CMO Members meeting the GBON standard of reporting hourly observations for 24 hours. Only five (5) or 31% of the sixteen (16) CMO Members with GBON-declared stations are reporting observational data for all 24 hours, namely Antigua and Barbuda, Barbados, Grenada, Guyana, and Trinidad and Tobago (see Table 4.0).

32. It is worth noting that seven (7) CMO Member States, namely Anguilla, British Virgin Islands, Dominica, Montserrat, St. Kitts and Nevis, St. Vincent and the Grenadines, and Turks and Caicos, operate manned surface land stations exchanging hourly observations but with shortened operational hours, which prevents them from achieving full GBON compliance of 24-hour reporting frequency. Additionally, at the time of writing this document, three (3) CMO Members, namely Belize, Jamaica, and Saint Lucia, are not reporting hourly observation from their GBON stations, which contravenes GBON compliance; instead, observations are reported every three (3) hours.

33. In terms of upper air GBON stations, observations at Trinidad and Tobago upper air GBON stations return to GBON compliance with the mandatory 2 upper air observations per day. From June 5, 2024, to October 31, 2024, Trinidad and Tobago has provided 148 more upper air-generated observational data supporting global NWP, regional and local forecasts and warnings, as well as climate service delivery.

34. It is worth noting that the [Manual on the WMO Integrated Global Observing System \(WMO-No. 1160\)](#) 2024 editions (paragraph 3.2.2.10) now contains a provision for GBON surface marine meteorological stations/platforms within Members' Exclusive Economic Zones (EEZ), which was strongly advocated for inclusion of marine observations in GBON by the CMO.

Table 4.0: CMO Member States GBON Compliance Status

| Member | Number GBON Stations | Number GBON Stations Reporting Hourly Observation in 2023 | Number GBON Stations Reporting Hourly Observation in 2024 | Achieving Full GBON Compliance Reporting 24 Hourly Observation per day |
|-------------------------------|----------------------|---|---|--|
| Anguilla | 1 | 0 | 1 | No |
| Antigua And Barbuda | 1 | 1 | 1 | Yes |
| Barbados | 1 | 1 | 1 | Yes |
| Belize | 2 | 0 | 0 | No |
| British Virgin Islands | 1 | 0 | 1 | No |
| Cayman Islands | 2 | 1 | 2 | No |
| Dominica | 2 | 0 | 2 | No |
| Grenada | 1 | 1 | 1 | Yes |
| Guyana | 2 | 2 | 2 | Yes |
| Jamaica | 2 | 0 | 0 | No |
| Montserrat | 1 | 0 | 1 | No |
| Saint Lucia | 1 | 0 | 0 | No |
| St Kitts and Nevis | 2 | 2 | 2 | No |
| St Vincent and the Grenadines | 1 | 0 | 1 | No |
| Trinidad and Tobago | 2 | 2 | 2 | Yes |
| Turks and Caicos Islands | 1 | 1 | 1 | No |

Key for colour-coding

| | |
|--|--|
| Full GBON Compliance Reporting Frequency: 24 Hourly Observations Reporting Per Day | |
| Some GBON Compliance Reporting Frequency: Hourly Observations Reporting During Operational Hours | |
| GBON Non-Compliance Reporting Frequency: Less Than Hourly Observations Reporting During Operational Hours | |

35. Directors are encouraged to:

- Improve their GBON Station-level compliance by assigning automatic weather stations as GBON stations to extend hourly observation data reporting frequency to 24 hours daily using their WIS 2.0 node.
- Increase operational reporting of observational data at GBON Stations from every three (3) hours to hourly frequency, if this was not already done.
- Supplement hourly observation reporting at manual surface stations that have shortened operational hours with hourly AWS observational data reporting on a continuous basis using WIS 2.0.

36. The meeting is reminded that Article 9(b) of the ***WMO Convention and the Technical Regulations*** (WMO No. 49), Volume I, General Provisions, paragraph 6 indicates that if a Member finds that the temporal resolution required for GBON is not practically achievable for the observing network within parts of their territory, the Member shall inform the Secretary General of the reasons why it cannot achieve GBON compliance.

Note: A Member Invoking Article 9(b) concerning its commitment to GBON is required to clearly indicate to the WMO Secretariat:

- Which of its GBON stations will not be meeting the temporal resolution requirements.
- The reason why the requirements cannot be met
- The period during which it believes such a station would be exempt
- Whether it has any plan to improve the situation

37. An independent committee of experts designated by the President of INFCOM, in consultation with the INFCOM Management Group, will assess whether a Member claiming Article 9(b) should be regarded as GBON compliant using criteria set out in the [Guide to the WMO Integrated Global Observing Systems \(WMO-No. 1165, Chapter 1\)](#).

Systematic Observations Financing Facility (SOFF)

38. The initial scope of SOFF financing focused on surface and upper-air GBON land stations, however with marine surface observation stations now included in GBON, WMO encouraged Members to operate surface marine stations and has requested that SOFF consider expansion of its support to cover surface marine GBON stations/platforms in the Exclusive Economic Zones (EEZs) of Small Island Developing States (SIDS). This means the likelihood that SOFF support may be extended to include marine observations has increased.

39. Directors are encouraged to operate surface marine stations as GBON stations where affordable and start developing plans for implementing marine observations that would contribute to GBON, while collaborating with key stakeholders in the marine sector, taking into consideration deployment and maintenance of the marine observing equipment.

D. WIS 2.0 OPERATIONAL PHASE

40. The meeting will recall that the implementation of the second generation of the *WMO Information System* (WIS 2.0) entered the pre-operational phase in January 2024. Directors are reminded that as of 1 January 2025, WIS 2.0 would officially transition to be operational, with full transition expected by 2030, while the *Global Telecommunication System* (GTS) is scheduled to be decommissioned by 2033. The following are three significant documents related to WIS 2.0:

- 1) [Resolution 15 \(EC-78\)](#): Amendments on the [Manual on WMO Information System, Volume II—WMO Information Systems 2.0 \(WMO-No. 1160\)](#). The manual now informs that in the operational phase, NMHSs (National Centers) as WIS Centers shall be responsible for publishing data and discovery metadata using a WIS 2.0 node, and each Permanent Representative is responsible for ensuring that their centers remain compliant with WIS standards and practices.
- 2) Resolution 16 (EC-78): [Transition Guide from WIS 1.0 and Global Telecommunication System \(GTS\) to WIS 2.0, including Capacity Development](#). This document provides clear and comprehensive instructions for transitioning from WIS 1.0 and GTS to WIS 2.0. Migration to WIS 2.0 by an NMHS will be considered completed by the WMO when at least one WIS 2.0 node for the Member NMHS is operational and all the datasets transmitted on GTS are also shared on WIS 2.0. in compliance with the requirements in the Manual on WIS Volume II and Guide to WIS Volume II. During the WIS 2.0 transition phase (2025–2030),

meteorological data published via WIS 2.0 is expected to be automatically published to the GTS via the WIS 2.0 and WIS 2.0-to-GTS Gateways.

The Transition Guide for WIS 2.0 indicates that the data designators TTAAii as defined in Manual on GTS (WMO-No. 386) are not required in WIS 2.0 as their usage is limited to the exchange of data on the GTS. Therefore, the manual on GTS will no longer be updated from **31 December 2024**. Consequently, starting in **January 2025, any further evolution of the GTS, including the transmission of new data, will not be permitted.**

- 3) Resolution 18 (EC-78): Amendments to the Manual on Codes (WMO-No. 306), Volume 1.2, which focuses on changes in the mode of meteorological data exchange. WMO now recommends using Binary Universal Form for the Representation (BUFR) of meteorological data and discourages the use of Character Form for the Representation and Exchange (CREX) of data. Additionally, the CREX tables in the Manual on Codes (WMO-No. 306), Volume 1.2—International Codes, will no longer be updated.

WIS 2.0 Node Implementation Status

41. The CMO Caribbean implementation of the WIS 2.0 Node, which is supported by WMO through an agreement with CMO, remains operational with day-to-day monitoring and troubleshooting provided by the National Meteorological Service of Trinidad and Tobago and Belize, along with the CMO Headquarters Unit.

42. Last year at DMS2023, it was reported that eleven (11) of the sixteen (16) CMO Members NMHSs were exchanging observations in BUFR format using their implemented WIS2.0 node. As of 31 October 2024, **all sixteen (16) CMO Members NMHSs have successfully implemented WIS 2.0 nodes** and are exchanging observations internationally from at least one station using their WIS 2.0 node, as shown in Table 5.0. Thirteen (13) CMO Members implemented their WIS 2.0 node on the CMO reference WIS 2.0 node, while three CMO Members, namely Barbados, Belize, and Trinidad and Tobago, implemented their own WIS 2.0 nodes. Additionally, the Bahamas and Sint Maarten have also set up their WIS2 Nodes on the Caribbean reference WIS 2.0 Node.

43. All of CMO Members NMHS have set up their WIS 2.0 nodes to exchange observation data hourly during operational hours in keeping with the requirements of GBON. However, not all CMO Members NHMSs are achieving GBON compliance as indicated earlier in this document. The level of hourly data exchange using WIS 2.0 is above 80% for 12 CMO Members and intermittent for others, with below 30% hourly observation exchange via WIS 2.0 for Antigua and Barbuda, and Jamaica, while Saint Lucia's exchange of hourly observations ranges between 38% and 67%.

Table 5.0: CMO Member States WIS 2.0 Implementation and Data Exchange Compliance Status

| Member | CMO Caribbean Reference WIS 2.0 Node | Individual Country WIS 2.0 Node | No. of Hourly Observations Exchanged on Average (Oct 31, 2024) | No of Operational Hours Available (UTC) |
|------------------------|--------------------------------------|---------------------------------|--|---|
| Anguilla | ✓ | – | 13 | (13 hrs) 11:00 - 23:00 |
| Antigua and Barbuda | ✓ | – | 1 - 7 | (24 hrs) 12:00-11:00 |
| Barbados | – | ✓ | 24 | (24 hrs) 12:00-11:00 |
| Belize | – | ✓ | 24 | (24 hrs) 12:00-11:00 |
| British Virgin Islands | ✓ | – | 13 - 16 | (16hrs) 11:00 - 02:00 |
| Cayman Islands | ✓ | – | 17 | (17 hrs) 11:00 - 03:00 |

| | | | | |
|-----------------------------|---|---|---------|------------------------|
| Dominica | ✓ | – | 12 – 15 | (17 hrs) 10:00 - 02:00 |
| Grenada | ✓ | – | 24 | (24 hrs) 12:00-11:00 |
| Guyana | ✓ | – | 24 | (24 hrs) 12:00-11:00 |
| Jamaica | ✓ | – | 0-6 | (24 hrs) 12:00-11:00 |
| Montserrat | ✓ | – | 13 | (13 hrs) 10:00 - 22:00 |
| Saint Lucia | ✓ | – | 9 - 16 | (24 hrs) 12:00 - 11:00 |
| St Kitts and Nevis | ✓ | – | 16 | (16 hrs) 10:00 - 01:00 |
| St Vincent & the Grenadines | ✓ | – | 14 | (16 hrs) 10:00 - 01:00 |
| Trinidad and Tobago | – | ✓ | 24 | (24 hrs) 12:00-11:00 |
| Turks and Caicos Island | ✓ | – | 13 | (14 rs) 11:00 - 00:00 |

Action Required

- CMO Member States NMHSs to form a CMO Operational WIS 2 Node Execution Team (COWET) consisting of WIS 2.0 trained personnel from the National Meteorological Service of Belize and Trinidad and Tobago as leads, with at least five additional participants from Members with national WIS 2.0 Nodes on the CMO WIS 2.0 Node. The role of COWET will be to manage and troubleshoot issues on the CMO WIS 2.0 Node when they arise, with support from WMO experts.
- Directors must take actions to ensure designated focal points for the Caribbean WIS 2.0 node provide day-to-day monitoring and operational support to ensure sustainability of the CMO implemented reference WIS 2.0 node.
- NMHSs that have fully migrated their data exchange operations to WIS 2.0 shall communicate to the WMO Secretariat that their migration is complete and shall keep the WIS 1.0 and GTS operational and in parallel with the WIS 2.0 systems until receipt of communication from the WMO Secretariat.
- Directors to continue to advance migrating their NMHS (National Center) existing meteorological data exchange to WIS 2.0 from January 2025, including new stations that may be installed.
- All new station data to be exchanged by an NMHS (National Center) after December 2024 must be exchanged using WIS 2.0.

NMS Belize SURFACE Climate Database Management System and WIS 2.0

44. The meeting will recall the presentation at DMS2023 by Dwayne Scott of the NMS of Belize on the mature state of development of the NMSB Climate Database Management System (CDMS) called System for Unified Real-time Forecasting of Atmospheric and Climatic Events (SURFACE-CDMS), that is being developed using open-source technologies and WMO Climate Data Model (CDM) standards under the WMO OpenCDMS project.

45. SURFACE-CDMS is open-source, free, customizable to national requirements, compliant with WMO guidelines, and will advance national and international data exchange. It allows a NMHS to ingest, store, process, and output weather station data to the WIS 2.0 node in a seamless manner. SURFACE CDMS is bespoke and innovative work from the region that can be integrated with the WIS 2.0 Box for automatic exchange of data and satisfies the CDMS needs of CMO Members NMHS.

46. Belize SURFACE-CDMS is scheduled for a beta release by November 2025, with piloting and testing scheduled from November 2024 to April 2025. For the sustainability of the SURFACE-CDMS, it is important for CMO Members NMHSs to support the piloting and testing of the SURFACE CDMS.

Recommended Actions

47. Directors are **urged** to:

- i) Agree to the integration of the SURFACE-CDMS with their WIS 2.0 node and use the SURFACE-CDMS operationally as their NMHS climate data management system and operations.
- ii) Provide a focal point for the NMS of Belize to liaise with during participation in the piloting, testing, and use of the SURFACE CDMS.

State of Relevant Operational Aviation Meteorology Requirements

48. Implementing key priorities related to the provision of aeronautical meteorological services necessary to achieve compliance with the Standard and Recommended Procedures (SRPs) contained in ICAO Annex 3 remains delayed for most CMO Member States NMHS. Particularly, Members NMHSs implementation of the aviation weather information exchange in ICAO Meteorological Information Exchange Model format (IWXXM) and *Quality Management Systems* (QMS) in aeronautical meteorological service processes has not advanced since DMS2023.

ICAO Meteorological Information Exchange Model (IWXXM)

49. The Meeting is asked to recall the discussion on **ICAO Meteorological Information Exchange Model** (IWXXM), which became an ICAO Annex 3 standard in November 2020 for the operational exchange and sharing of aviation meteorological information for use in the aviation sector. Only the same three (3) CMO Member States, namely Barbados, Guyana, and Trinidad and Tobago, exchange aeronautical meteorological information using IWXXM.

50. The plan by ICAO is to remove the generation of Traditional Alphanumeric Code (TAC) messages as a standard from Annex 3 in 2029. While these planned changes do not preclude a Member from generating TAC messages, there will be no ICAO requirement for international distribution or distribution to other states of these TAC messages post 2029.

51. Currently, TAC remains as a standard in Annex 3. This provides some flexibility (at least for the next 3-4 years) for Members to continue to exchange aviation meteorological data (METAR, SPECI, TAF, etc.) using TAC. However, CMO Member States must consider the necessary system changes to migrate to IWXXM data for aviation meteorological services by 2029 using either TAC to IWXXM translation operational capability or the preferred direct generation of IWXXM messages with no TAC.

52. Notably, the updated [Guide to the WMO Information System \(WMO--No. 1061\)](#) Section, **"2.8.1.1 Publishing aviation weather data from WIS 2.0 into ICAO SWIM,"** states that a National Meteorological Service that is responsible for providing meteorological data to WIS 2.0 may be designated by the ICAO Contracting State to provide aeronautical meteorological information into SWIM (System Wide Information Management). IWXXM messaging is one of the cornerstone components of SWIM.

53. This section of the Guide also outlines how an NMHS may efficiently fulfill the requirements of providing aviation meteorology data to both WIS 2.0 and SWIM using an interoperability approach between WIS 2.0 and SWIM where meteorological data published via WIS 2.0 can be automatically propagated to SWIM by employing a WIS 2.0 to SWIM Gateway component as illustrated in the

schematics below. However, this only deals with how data from WIS 2.0 can be published into SWIM.

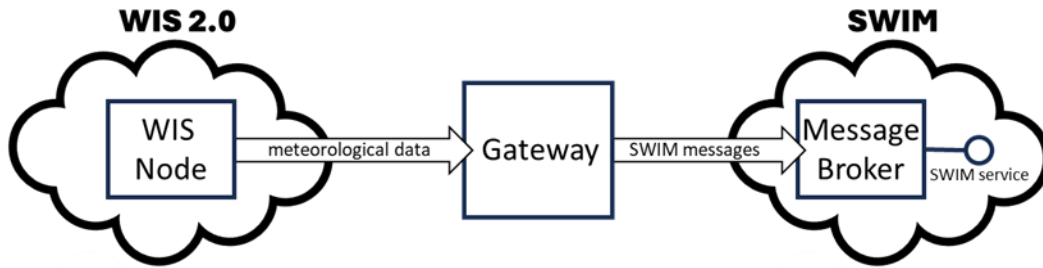


Figure 2. WIS2.0 to SWIM Interoperability Gateway Approach Schema

ICAO Basic Building Blocks (BBB) framework

54. The ICAO Basic Building Blocks (BBB) framework identifies the essential services to be provided for international civil aviation in accordance with ICAO Standards by a Member State. The essential services are: **Meteorology**, Aerodromes, Air Traffic Management, Search and Rescue, and Information Management. Under the BBB framework essential meteorological service, ICAO requires that Member States monitor and evaluate the level of implementation of the provision of meteorological service for International Air Navigation through a verification process to identify deficiencies. To demonstrate compliance with the obligations, the State must carry out documented surveillance, inspection, audits, and follow-up.

55. ICAO NACC/SAM has developed a new format for the evaluation of meteorological services provided by a State. The format includes protocol questions (PQs) as the primary tool related to the implementation of the baseline meteorological services. The PQs for meteorological services may include the following, among others:

- 1) Does the State ensure that the wind sensors for local routine reports are appropriately sited to give the best practicable indication of conditions along the runway/touchdown zone?
- 2) Does the State ensure that MET offices issue wind shear warnings for aerodromes where wind shear is considered a safety factor?
- 3) Does the State ensure that meteorological reports are issued in accordance with the related technical specifications outlined in Annex 3?
- 4) Does the State ensure that the meteorological personnel providing service for international air navigation comply with the requirements of the WMO in respect of qualifications, competencies, and education?
- 5) Does the State ensure that the aeronautical meteorological stations are inspected at sufficiently frequent intervals?

56. The Twenty-Second Meeting of ICAO's CAR/SAM Regional Planning and Implementation Group (GREPECAS/22) is to be held in Lima, Perú, from 20 to 22 November 2024. GREPECAS/22 will consider and evaluate a working paper on the analysis of the implementation of the Basic Building Blocks (BBB) of the Meteorological Service for International Air Navigation.

57. A standardized verification process is being developed for analysis of meteorological service BBB implementation. GREPECAS/22 will also examine implementation processes for the exchange of OPMET messages in IWXXM format and QMS implementation for meteorological services. Decision taken at GREPECAS/22 could impact operations at CMO Member States NMHS. CMO Members States NMHSs should pay attention to the outcomes of GREPECAS/22.

E. STATE OF THE CLIMATE REPORTS

58. The WMO annual State of the Climate Report provides a summary on the state of the climate indicators with sections on key climate indicators, extreme events, and impacts. The publication also provides the most recent findings on climate-related risks and impacts, including on food security and population displacement.

59. In August 2024, WMO launched the content preparation for the Annual State of the Climate Report 2024 and began collecting extreme and high-impact events data and a year-to-date climate summary consisting of text and figures from Members for inclusion in the report. A global summary statement will be released in November 2024 at the twenty-ninth session of the Conference of the Parties (COP29), with the final WMO State of the Global Climate report to be published in March/April 2025.

60. A check on the status of CMO Members' submissions of their year-to-date climate summary and extreme and high impact events for 2024 shows that as of 31 October 2024, eight (8) members had submitted their information.

61. Members who have already submitted a year-to-date climate summary are encouraged to continue to update their summaries monthly for final submission to WMO at the start of 2025. Members that have not yet submitted are urged to start developing their annual summary.

F. BUSINESS CONTINUITY MANAGEMENT

62. In the Caribbean, high-impact hydrometeorological events such as hurricanes and floods, other natural phenomena such as earthquakes and landslides, as well as potential disasters due to sabotage, power and utility disruptions, and cyber-attacks can have profound impacts on all aspects of the business operations of an NMHS.

63. CMO Members NMHSs therefore carry significant risk with respect to business continuity as the demands on operational meteorologists and national meteorological services staff, services, communication, ICT data, and monitoring infrastructure and assets in general can escalate significantly during severe weather events.

64. Uninterrupted operations are critical to the CMO Member States NMHSs ability to deliver services, including uninterrupted access to its human resources during severe high-impact and extreme weather events or other natural or man-made hazards. It is therefore highly important for NMHSs to have a business continuity plan.

65. The WMO EC 78 in June 2024 endorsed the [Business Continuity Management Guidelines 2024 \(BCM\)](#), recommended by SERCOM 3, which provides guidelines to assist NMHSs in maintaining operations during disasters or crises. The Guidelines describe the organizational structure, scope, and basic requirements needed for implementing and maintaining business continuity management capability within National Meteorological and Hydrological Services. It provides a step-by-step approach with simple guidance on how the BCM process should be implemented with examples that are relevant to the work of NMHSs. The Guidelines are supplemented by several annexes and links to business continuity plans shared by a few NMHSs.

66. Directors of NMHSs are encouraged to consider these hazardous scenarios and to embrace and use the sustainable practices contained in the BCM to develop plans to secure continuous operations and operational resilience to disruptive events. This is necessary to ensure critical services or products are delivered to save lives, livelihoods, and property and meet legal or other obligations, despite the risk posed by both potential natural and man-made hazards to the continuous operations of NMHSs.

ANNEX I: CMO Member States NMHSs Marine Weather Forecasts and Warning Status

| Member | Stand Alone Dedicated Marine Forecasts | Integrated Marine Forecast with Public Weather Forecasts | Marine Warnings/Alerts |
|---|---|---|--|
| Antigua and Barbuda Anguilla British Virgin Islands Montserrat St Kitts and Nevis | | Seas Waves Swells Winds | Colour-coded: Small Craft Alerts High Surf Advisory Wind Rough seas |
| Barbados | Colour Coded Daily Forecasts Area specific Forecasts Wind Waves Surf Swells Impacts | | Colour Coded Small Craft Advisory/warning High surf warning Marine Information Statement |
| Belize | Synopsis Marine Conditions Winds Seas Waves Weather: Thunderstorm Showers Max / Min Temperature Sea Surface Temperature Tides Sunrise/Sunset Moonrise/Moonset | | Small Craft Caution and Warning Rough seas Gusty winds |
| Cayman Islands | Seas/ Waves Wind Weather Sea Surface Temperature Tides Sunrise/Sun Set | | Small Craft Warning Small Craft Advisory |
| Dominica | | Seas/Waves Tides | Colour coded Small-craft Warning High Surf Advisory |
| Grenada | Colour Coded Daily Marine Bulletin Area specific (east/west) Synopsis Weather Sea State Visibility Wind Tide | | Colour Coded Small Craft Advisory/Warning |

| Member | Stand Alone Dedicated Marine Forecasts | Integrated Marine Forecast with Public Weather Forecasts | Marine Warnings/Alerts |
|-------------------------------|---|---|---|
| | Impacts Sunrise/Sunset Moonrise/Moonset Moon Phase | | |
| Guyana | | Seas Waves Swells Wind Tides | Colour Coded Marine Advisory Seas Waves/Swells Wind Thundershowers |
| Jamaica | Synopsis Area Specific (e.g., Inshore North Coast, Inshore South Coast) Weather Wind, speed, direction, gusts Waves Visibility | | Colour Coded Marine Condition Warning Small Craft Warning Strong Wind Warning Marine Flag warning |
| Saint Lucia | | Seas Waves Swells Tides | Small Craft Advisory Small Craft Warning |
| St Vincent and the Grenadines | | Seas Waves Swells Tides | Colour Coded Marine Warnings High Wind Warning High Surf Advisory Small Craft Warning |
| Trinidad and Tobago | | Seas Waves Swells Tides | Colour Coded High Wind Alert Hazardous Seas Alert Small Craft Warning |
| Turks and Caicos Islands | | Seas Waves Swells Tides | Colour Coded Small Craft Advisory High Surf Warning Dangerous Rip Current Advisory Beachgoer Warning |