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| WEATHER CLIMATE WATER | **World Meteorological Organization**  **COMMISSION FOR WEATHER, CLIMATE, WATER AND RELATED ENVIRONMENTAL SERVICES AND APPLICATIONS**  **Second Session** 17 to 21 October 2022, Geneva | **SERCOM-2/Doc. 5.6(7)** |
| Submitted by: Chair  21.X.2022  **APPROVED** |

**AGENDA ITEM 5: TECHNICAL REGULATIONS AND OTHER TECHNICAL MATTERS**

**AGENDA ITEM 5.6: Disaster risk reduction and public services**

# Technical Guide on Tropical Cyclones

**WMO Guide for National Meteorological and Hydrological Services in Support of National Multi-Hazard Early Warning Procedures, Coordination Mechanisms, Systems and Services**

**Guide No. 1 – Tropical Cyclone**



# GENERAL CONSIDERATIONS

**WMO Guide for National Meteorological and Hydrological Services in Support of National Multi-Hazard Early Warning Procedures, Coordination Mechanisms, Systems and Services**

**Guide No. 1 – Tropical Cyclones**

1. The [*WMO Guide for NMHS in Support of National Multi-Hazard Early Warning Systems, Procedures, Coordination Mechanisms, and Services*](https://wmoomm.sharepoint.com/:w:/s/wmocpdb/EcmFtn_ABoZNmABQ0F1jgd0BlfSWCTUamRggPVtJr2R7rg?e=zZDv89&CID=17237dd9-c962-e3d9-da64-a7383375540f) (hereafter the guide), was developed at the request of the World Meteorological Congress at its eighteenth session under [Resolution 16 (Cg‑18)](https://library.wmo.int/doc_num.php?explnum_id=9827/#page=84) - Guide(s) on the Support of National Meteorological and Hydrological Services (NMHSs) to their National Multi-hazard Early Warning procedures, Coordination Mechanisms, Systems and Service , which:

(a) Decided to task the Technical Commissions and other bodies with the development of guide(s) on procedures/mechanisms for effective support by NMHSs to their national disaster risk management, focusing on Multi-hazard Early Warning Systems (MHEWS) operations, legislation and policy making and leveraging existing guidance material and good practices related to the four elements of MHEWS;

(b) Requested the Executive Council to oversee the development of guide(s) on NMHSs support of their national MHEWS (possibly including a set of hazard-cluster guidelines);

(c) Requested the Technical Commissions and other bodies to start developing the guide(s) in collaboration with other relevant WMO bodies and Members; focusing on tropical cyclones;

(d) Requested Regional Associations to contribute to the development of the guide(s).

2. The [guide](https://wmoomm.sharepoint.com/:w:/s/wmocpdb/EcmFtn_ABoZNmABQ0F1jgd0BlfSWCTUamRggPVtJr2R7rg?e=zZDv89&CID=17237dd9-c962-e3d9-da64-a7383375540f) has been developed by the Expert Team on MHEWS Technical Guidance (ET-MTG) of SERCOM Standing Committee on Disaster Risk Reduction and Public Services (SC‑DRR) and reviewed by experts from members of Tropical Cyclone committees of Regional Associations I, IV and V and ESCAP/WMO Typhoon Committee and WMO/ESCAP Panel on Tropical Cyclones, members of the Advisory Group on Tropical Cyclones and members of the SERCOM Management Group.

3. The purpose of the [guide](https://wmoomm.sharepoint.com/:w:/s/wmocpdb/EcmFtn_ABoZNmABQ0F1jgd0BlfSWCTUamRggPVtJr2R7rg?e=zZDv89&CID=17237dd9-c962-e3d9-da64-a7383375540f) is to bridge the gap between early warnings and early actions and to enable outreach to the last mile to support early actions, and coincidently to support [Resolution 3 (EC-75)](https://meetings.wmo.int/EC-75/_layouts/15/WopiFrame.aspx?sourcedoc=/EC-75/English/2.%20PROVISIONAL%20REPORT%20(Approved%20documents)/EC-75-d04(2)-UN-GLOBAL-EARLY-WARNING-ADAPTATION-INITIATIVE-approved_en.docx&action=default) – UN Global Early Warning/Adaptation Initiative.

**Expected action**

Based on the above, the Commission is invited to adopt the draft Recommendation 5.6(7) (SERCOM-2).

# DRAFT RECOMMENDATION

## Draft Recommendation 5.6(7)/1 (SERCOM-2)

**WMO Guide for National Meteorological and Hydrological Services in Support of National Multi-Hazard Early Warning Systems, Procedures, Coordination Mechanisms, and Services**

**Guide No. 1 – Tropical Cyclones**

THE COMMISSION FOR WEATHER, CLIMATE, WATER AND RELATED ENVIRONMENTAL SERVICES AND APPLICATIONS,

**Recalling** [Resolution 16 (Cg-18)](https://library.wmo.int/doc_num.php?explnum_id=9827#page=84) – Guide(s) on the Support of National Meteorological and Hydrological Services to their National Multi-Hazard Early Warning Procedures, Coordination Mechanisms, Systems and Services,

**Having examined** the WMO [*Guide for NMHS in Support of National Multi-Hazard Early Warning Systems, Procedures, Coordination Mechanisms, and Services*](https://wmoomm.sharepoint.com/:w:/s/wmocpdb/EcmFtn_ABoZNmABQ0F1jgd0BlfSWCTUamRggPVtJr2R7rg?e=zZDv89&CID=17237dd9-c962-e3d9-da64-a7383375540f) (hereafter the guide),

**Appreciates** the development of the [guide](https://wmoomm.sharepoint.com/:w:/s/wmocpdb/EcmFtn_ABoZNmABQ0F1jgd0BlfSWCTUamRggPVtJr2R7rg?e=zZDv89&CID=17237dd9-c962-e3d9-da64-a7383375540f) by the Standing Committee on Disaster Risk Reduction and Public Services (SC-DRR) of SERCOM with assistance of the dedicated Expert Team on Multi-Hazard Early Warning Services Technical Guidance (ET-MTG) of SC-DRR;

**Appreciates further** the reviews to the [guide](https://wmoomm.sharepoint.com/:w:/s/wmocpdb/EcmFtn_ABoZNmABQ0F1jgd0BlfSWCTUamRggPVtJr2R7rg?e=zZDv89&CID=17237dd9-c962-e3d9-da64-a7383375540f) by experts from Members of Tropical Cyclone committees of Regional Associations I, IV and V and ESCAP/WMO Typhoon Committee and WMO/ESCAP Panel on Tropical Cyclones, members of the Advisory Group on Tropical Cyclones and members of the SERCOM Management Group;

**Recommends** to the Executive Council the adoption of Draft Resolution ##/1 (EC-76),[*WMO**Guide for NMHS in Support of National Multi-Hazard Early Warning Systems, Procedures, Coordination Mechanisms, and Services*](https://wmoomm.sharepoint.com/:w:/s/wmocpdb/EcmFtn_ABoZNmABQ0F1jgd0BlfSWCTUamRggPVtJr2R7rg?e=zZDv89&CID=17237dd9-c962-e3d9-da64-a7383375540f)*,* throughthe draft resolution provided in the [annex](#_Annex_to_draft) to the present Recommendation.

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[Annex: 1](#Annex_to_draft_Recommendation)

## Annex to draft Recommendation 5.6(7)/1 (SERCOM-2)

**Draft Resolution ##/1 (EC-76)**

**WMO Guide for National Meteorological and Hydrological Services in Support of National Multi-Hazard Early Warning Systems, Procedures, Coordination Mechanisms, and Services**

**Guide No. 1 – Tropical Cyclones**

THE EXECUTIVE COUNCIL,

**Recalling**

(1) [Resolution 16 (Cg-18)](https://library.wmo.int/doc_num.php?explnum_id=9827#page=84) - Guide(s) on the Support of National Meteorological and Hydrological Services to their National Multi-Hazard Early Warning Procedures, Coordination Mechanisms, Systems and Services,

(2) [Resolution 3 (EC-75)](https://meetings.wmo.int/EC-75/_layouts/15/WopiFrame.aspx?sourcedoc=/EC-75/English/2.%20PROVISIONAL%20REPORT%20(Approved%20documents)/EC-75-d04(2)-UN-GLOBAL-EARLY-WARNING-ADAPTATION-INITIATIVE-approved_en.docx&action=default) – UN Global Early Warning / Adaptation Initiative,

**Having examined** Recommendation 5.6(7)/1 (SERCOM-2),

**Having agreed** Recommendation 5.6(7)/1 (SERCOM-2),

**Adopts** the [*WMO Guide for NMHS in Support of National Multi-Hazard Early Warning Systems, Procedures, Coordination Mechanisms, and Services*](https://wmoomm.sharepoint.com/:w:/s/wmocpdb/EcmFtn_ABoZNmABQ0F1jgd0BlfSWCTUamRggPVtJr2R7rg?e=zZDv89&CID=17237dd9-c962-e3d9-da64-a7383375540f), as provided in the [annex](#_Annex_to_Draft_1) to the present resolution;

**Requests** the Secretary-General to publish and disseminate the [guide](https://wmoomm.sharepoint.com/:w:/s/wmocpdb/EcmFtn_ABoZNmABQ0F1jgd0BlfSWCTUamRggPVtJr2R7rg?e=zZDv89&CID=17237dd9-c962-e3d9-da64-a7383375540f);

**Requests** the Services Commission in coordination with the Infrastructure Commission Regional Associations, Research Board and regional intergovernmental entities on tropical cyclones and other relevant WMO bodies and partners to promote implementing the [guide](https://wmoomm.sharepoint.com/:w:/s/wmocpdb/EcmFtn_ABoZNmABQ0F1jgd0BlfSWCTUamRggPVtJr2R7rg?e=zZDv89&CID=17237dd9-c962-e3d9-da64-a7383375540f) and to support WMO Members prone to tropical cyclones to use the guide for developing or updating their national MHEWS procedures, coordination mechanisms and synergy, systems and services, and to report to the Executive Council progress and status on implementing the guide initially in 2024;

**Urges** Members to take desired actions to implement the recommendations provided in this [guide](https://wmoomm.sharepoint.com/:w:/s/wmocpdb/EcmFtn_ABoZNmABQ0F1jgd0BlfSWCTUamRggPVtJr2R7rg?e=zZDv89&CID=17237dd9-c962-e3d9-da64-a7383375540f) to establish their national MHEWS procedures, mechanisms and systems to enable information on warnings and response actions to reach everyone, and report to SERCOM via secretariat on their successes and challenges.

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[Annex: 1](#Annex_to_Resolution)

## Annex to draft Resolution ##/1 (EC-76)

**WMO Guide for NMHS in Support of National Multi-Hazard Early Warning Systems, Procedures, Coordination Mechanisms, and Services**

(The full texts are accessible [here](https://wmoomm.sharepoint.com/:w:/s/wmocpdb/EcmFtn_ABoZNmABQ0F1jgd0BlfSWCTUamRggPVtJr2R7rg?e=zZDv89&CID=17237dd9-c962-e3d9-da64-a7383375540f))

**Executive Summary**

The implementation of Multi-hazard Early warning systems (MHEWS) will improve our ability to prepare communities for hazardous weather and climate-related events and mitigate the impacts.

The eighteenth session of the World Meteorological Congress (Cg-18, 2019) approved [Resolution 16 (Cg-18)](https://library.wmo.int/doc_num.php?explnum_id=9827#page=84) tasking Technical Commissions in collaboration with Regional Associations to develop a guide for WMO Members to establish procedures/ mechanisms for more effective MHEWS.

The guide is aimed at:

 Enabling early warnings of responsible warning authority to be transformed into those of corresponding level of Government that can initiate early actions for all partners and public under its jurisdiction

 Thus enabling outreach to the last mile to support early actions.

The guide will serve to encourage WMO Members to establish and develop their national abiding procedures and mechanisms through legislation or administrative protocol specifying transforming National Meteorological and Hydrological Services (NMHSs) early warnings into Government level warnings; strategies/actions in response to the Government warnings; and defining who does what with accountabilities in case of failure to respond. These procedures and mechanisms should be supplemented with hazard monitoring and assessment systems to enable early warnings based on impacts and risks, including hazard observation, monitoring, and modelling.

Published in 2021, the [*WMO Guidelines on Multi-hazard Impact-based Forecast and Warning Services (IBFWS) Part II: Putting Multi-hazard IBFWS into Practice*](https://library.wmo.int/index.php?lvl=notice_display&id=21994) (WMO-No. 1150) has helped countries in applying the concepts of impact-based forecasting and warning services (IBFWS). However, there are still gaps between these concepts and actual implementation in both the developed and the developing worlds.

[Resolution 16 (Cg-18)](https://library.wmo.int/doc_num.php?explnum_id=9827#page=84) identified the need for a full guide to aid NMHSs to support the early alerting of governmental and non-governmental decision-makers, thus permitting preparatory steps to be taken well ahead of the occurrence of hazards through MHEWS.

This document is designed to provide practical guide for MHEWS operations to help NMHSs to provide effective and institutional support to their national disaster risk management mandates. In the present context, MHEWS operations cover procedures, coordination mechanisms, services, legislation, and policy making. This includes leveraging existing guidance material and good practices related to the four elements of MHEWS from within WMO but also from its partners with the following emphases:

 Risk knowledge – Institutional coordination in the areas of risk information and assessment for impact-based forecasting and risk-based warnings;

 Hazards awareness and warning – Detection, monitoring, analysis and forecasting of the hazards and assessment of possible consequences;

 Service delivery – Procedures and dissemination of advisory and warning information including the service delivery to communities and communication with partners; and

 Preparedness – Preparedness and response capabilities at all levels, including support for national response and recovery planning.

Chapter 1 introduces hazards, impacts, knowledge and challenges for MHEWS. Strategies for hazard awareness, warning, coordination, service delivery and emergency response are addressed in Chapter 2. Procedures followed in multi-hazard early warnings are depicted in Chapter 3. Good practices from around the world are *[Hong Kong, China]* reviewed in Chapter 4.

Annex 1 includes case studies submitted for this guideline. Further references and resources were *[Hong Kong, China]* summarized in the final section.

This is the first guide prepared by the WMO Expert Team on MHEWS Technical Guidance (ET‑MTG). It is hoped given the multi-hazard nature of TCs that this first guide will shed light onto other similar hazard clusters and be generalized to other early warnings.

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