

COORDINATION WITH OTHER ACTIVITIES OF THE WMO TROPICAL CYCLONE PROGRAMME

ACTION REQUIRED:

The Committee is invited:

- a) Review the activities carried out under the TCP since its Fifty-third session (Okinawa, Japan, February 2021, online) and the proposals for the future, which are indicated in Appendix B to this document or otherwise reported to the session; and,
- b) Consider what further measures, if any, may be taken to strengthen coordination between its own activities and those conducted under other parts of the TCP.

APPENDICES:

Appendix A – Draft Text for Inclusion in the Session Report
Appendix B – Coordination under WMO TCP

APPENDIX A
DRAFT TEXT FOR INCLUSION IN THE SESSION REPORT

Appendix A – Draft Text for Inclusion in the Session Report

1. The Committee was presented about activities under, and those requiring coordination through, TCP. It appreciated the comprehensive presentation, and thanked WMO support to the Committee.

2. The Committee was informed that the Extraordinary session of WMO Congress 2021 (Cg-Ext-2021) (October 2021, online) approved [12 resolutions](#) that are critical for long-term development of WMO. Among them, three will have critical support to better implementation and long-term development of TCP. They are:

- [Resolution 1/ \(Cg-Ext 2021\)](#) - WMO Unified Policy for the International Exchange of Earth System Data, which enables to cover Earth system data exchanged among Members.
- [Resolution 8/ \(Cg-Ext 2021\)](#) - Comprehensive review of the WMO regional concept and approaches, which enables regional structure and governance to most fit regional diversity and characteristics, and to meet evolving regional and national requirements.
- [Resolution 10/ \(Cg-Ext 2021\)](#) - Towards a structured WMO response to global crises, which requires to review principles and approaches related to Members' business continuity and contingency planning to maintain their essential operations.

3. The Committee was informed that Executive Council (EC-73, June 2021) approved a recommendation to introduce additional categories of subsidiary bodies of Technical Commissions to better address needs related to consultation and coordination (Advisory Group). As per recommendation of the Standing Committee on DRR and Public Services (SC-DRR), the president of the Technical Commission for Services (SERCOM) had approved the establishment of the Advisory Group on Tropical Cyclones (AG-TC). The Advisory Group will mainly be responsible for coordinated developments of globally applicable techniques and practices in tropical cyclone forecasting and warnings services.

4. In this connection, the Committee was informed that the kick-off meeting of the AG-TC was held online in early February 2022 with one of the agenda items focusing on development of impact-based tropical cyclone forecast products – to continue to implement the Decision 10/EC-68 (2016).

5. The Committee was informed of progress on implementation of Resolution 16 and resolution 14 of WMO Cg-18, supported by ET-MTG and ET-WCM respectively. The ET-MTG is to address the [Resolution 16 \(Cg-18\)](#) with the development of a guide for the effective support by NMHSs to their national disaster risk management and response. This guide is focusing on tropical cyclones as a first step. A draft guide will be submitted to SERCOM by October 2022 for approval.

6. The Committee was informed that under the overall framework on WMO IBF guideline WMO TCP is promoting tropical cyclone IBF information/products for regional tropical cyclone forecasting advisories and national tropical cyclone forecasting information and warnings to people.

7. The Committee noted with appreciation that many training activities on tropical cyclones were organized during the past year to support capacity development of the Members to meet competency and skills that are required for tropical cyclone forecasting

and services.

8. The Committee was informed that the regional activities on tropical cyclone regional bodies were well organized in the past year. Those meetings updated regional arrangements for tropical cyclone circumstances, and strengthened regional collaboration and coordination with concerted approaches toward tropical cyclones.

9 The Committee was informed that the 10th International Workshop on Tropical Cyclones (IWTC-X) is planned to take place in Shanghai, China, tentatively from 5 -9 December 2022. This is a quadrennial event jointly organized by WGTMR/WWRP and TCP.

10. The Committee was informed of the publication of the [Review of the 40 Years of WMO Tropical Cyclone Programme](#) (in [E-Library](#)) which will be downloadable after release, and [The Atlas of Mortality and Economic Losses from Weather, Climate and Water Extremes \(1970–2019\)](#). The Review briefly described essential businesses, major progresses, working mechanism, and some good lessons and practices in all aspects in the history of TCP, suggested way forward. This will be a good reference in understanding TCP. For information on loss and deaths by tropical cyclone for the past 40 years, the Atlas shall be able to serve as good and authoritative source of information.

11. The Committee was informed that the pilot project on TC probabilistic forecast products (TC-PFP) was going well. A workshop involving RSMCs and TCWCs was organized 15, 17-18 June 2021. The workshop was held online and attended by 80-100 participants from research communities as well as operational centres. The outcomes of the workshop will serve as input to the IWTC-X meeting in 2022, providing guidance on best practices for probabilistic TC forecasting.

12. The Committee was informed that WGTMR would organize the three projects (EXOTICCA, TLFDP and UPGRAFT) meeting in early March 2022 with expected projects outcomes and recommendations to move forward. The Committee Members are encouraged to share and exchange data, conventional and nonconventional, to improve tropical cyclone forecasting and warning services. WMO Secretariat will support to coordinate the sharing and exchange of the data.

13 The Committee was informed that all activities in relation to TCP under WMO Annual Operating Plan were very well implemented without delay. There was no impact by Covid-19 during implementing TCP activities. The Committee expressed sincere appreciation to WMO Secretariat and Members to have made all possible efforts to work closely to enable to carry out TCP activities with success.

Appendix B: Coordination under WMO TCP

**ACTIVITIES CARRIED OUT UNDER THE TROPICAL CYCLONE PROGRAM
SINCE ITS FORTY-THIRD SESSION**

1. PROGRAMME IMPLEMENTATION

1.1 The WMO Tropical Cyclone Programme carries out its activities in accordance with decisions/resolutions by Congress and Executive Council and Regional Associations. It is implemented in two components – general component and regional one, and covers mainly four areas – meteorology, hydrology, disaster risk reduction and capacity development by research and training.

1.2 After WMO reform and restructuring, new WMO constituent bodies and their subsidiary bodies have been established, including two Technical Commissions (INFCOM and SERCOM) and their subsidiary bodies like standing committees and task based expert teams, and a Research Board. Among the task teams, one for implementing each of the above Congress resolutions has been established.

1.3 A list of the events organized or co-sponsored under the Programme during the period from March 2021 may be found the dedicated [TCP website](#) here.

2. Global Activities

2.1 One major development from the INFCOM is to have organized data conference which gathered ideas and opinions about establishing new WMO data policies for data sharing and exchanges. The new WMO data policies, once established, will dramatically change the landscape of WMO data availability to Members, and have significant long-term impacts on and benefits to Members.

2.2 Extraordinary session of the World Meteorological Congress (Cg-Ext 2021) - (Online) was held from 11 to 22 October 2021. It approved [12 resolutions](#) that are critical for long-term development of WMO. Among those resolutions, the following are directly relevant to TCP:

- [Resolution 1/ \(Cg-Ext 2021\)](#) - WMO Unified Policy for the International Exchange of Earth System Data, which enables to cover Earth system data exchanged among Members.
- [Resolution 8/ \(Cg-Ext 2021\)](#) - Comprehensive review of the WMO regional concept and approaches, which enables regional structure and governance to most fit regional diversity and characteristics, and to meet evolving regional and national requirements.
- [Resolution 10/ \(Cg-Ext 2021\)](#) - Towards a structured WMO response to global crises, which requires to review principles and approaches related to Members' business continuity and contingency planning to maintain their essential operations.

2.3 Executive Council (EC-73, June 2021) approved a recommendation to introduce additional categories of subsidiary bodies of standing committees to better address needs related to consultation and coordination (Advisory Group). As per recommendation of the Standing Committee on DRR and public services (SC-DRR), the president of the Technical Commission for Services (SERCOM) has approved the establishment of the Advisory Group on Tropical Cyclones (AG-TC). The Advisory Group will mainly consist of the designated representatives from the regional operational centres (RSMCs/TCWCs) mandated or responsible for providing regional tropical cyclone forecast advisories in their respective Area of Responsibility.

Expert Team – MHEWS Technical Guide (ET-MTG)

2.4 Also under the SC-DRR, an Expert Team is currently engaged to address the [Resolution 16 \(Cg-18\)](#); the development of a guide for the effective support by the national meteorological services to their national disaster risk management. This guide is focusing on Tropical Cyclones as a first step. A draft guide will be submitted to SERCOM by October 2022 for approval.

WMO Coordination Mechanism Development (WCM – Cg-18, Resolution 14)

2.5 WCM – the process, information, expertise through which WMO aggregates Members information to provide value added advice to the UN and other Humanitarian Agencies. The Expert Team is now working on the development of an Implementation Plan to inform the sustainable implementation of the WCM. This plan will be presented to SERCOM for review and comment in Autumn 2022. Specific Task Teams have now established to look at training (for Members and UN / Humanitarian Agencies), utilisation of seasonal information, overwatch support for the UN and Humanitarian Agencies areas of concern. Through the WCM WMO are now supporting UN Principle Humanitarian Coordination Mechanism, the Inter Agency Standing Committee through the provision of monthly seasonal forecast outlooks, the delivery of further specific support to other areas of the UN either directly via Members or through further aggregation are under discussion.

Development of Impact-based Tropical Cyclone Forecast Products

2.6 The AG-TC had its first meeting (AG-TC-1) online on 3 February 2022. One of the items was about implementation of the Decision 10/EC-68 to develop impact-based tropical cyclone forecast (TC IBF) products under the initiative of RSMCs on tropical cyclones, in collaboration with Members with experience in impact-based tropical cyclone forecast and warning services. This development was coordinated during the 9th RSMCs/TCWCs Technical Coordinating meeting in Honolulu, Hawaii, USA from 9-12 December 2018. The AG-TC-1 was presented with list of TC IBF products which are currently available and in operational application in some RSMCs. The AG-TC-1 was invited to discuss and recommend further new products with impacts, and propose activities to move forward to supporting development of the impact-based TC forecasting products at national level. The AG-TC-1 encouraged other RSMCs/TCWCs that have not provided TC IBF products information to contribute to the current list of TC IBF products.

Review of the 40 years of TCP

2.7 The Review for the 40 Years of the Tropical Cyclone Programme is now published and due to release soon. This Review basically covers essential businesses and their development, governance and forecast cascading and coordinations arrangements under TCP.

The Atlas of Mortality and Economic Losses from Weather, Climate and Water Extremes (1970–2019)¹

2.8 An overview of impacts from weather, climate and water extremes globally from 1970 to 2019 based on disaster data from the Emergency Events Database (EM-DAT). Disaster statistics are conducted for the 50-year and decadal periods at the national, regional and global scales. A special section on the disproportionate impacts that tropical

¹ https://library.wmo.int/doc_num.php?explnum_id=10769

cyclones have on disaster statistics as well as on developing countries. Contributions from UNDRR and WHO discussing relevant sectoral loss and damage statistics, challenges and opportunities in recording and analysis of loss and damage data considering implementation of the Sendai Framework agreement and the 2030 global agenda.

3. UPDATES ON ACTIVITIES in WMO SINCE TC-53

Tropical cyclone seasonal forecasting

3.1 PICO and a network of RCCs in South Pacific are looking after the seasonal forecasting of tropical cyclones. However, the Panel on Tropical Cyclones at its 48th session further requested RSMC New Delhi to produce tropical cyclone seasonal forecasting for the Bay of Bengal and the Arabian Sea as soon as possible. RSMC La Reunion has made available tropical cyclone seasonal forecasting before the cyclone season with an updating during the season.

Supporting Disaster Risk Reduction and Humanitarian Activities

3.2 The activities below contribute to the reduction of disaster risks that arise from meteorological and hydrological hazards, including severe weather, floods and storm surges triggered by TCs. The bulk of these activities are funded by extrabudgetary projects, such as those under the Climate Risk and Early Warning Systems (CREWS) Initiative and implemented by WMO and its partners (such as ESCAP, RIMES, etc.).

- During the 2020 Humanitarian Networks and Partnerships Week (HNPW), WMO together with the European Commission's Joint Research Centre (EC-JRC) and the United Nations Office for Coordination of Humanitarian Affairs (UN OCHA) organized a Technical Meeting "Tropical Cyclone impact estimation for humanitarian preparedness and response: Joining the dots"².
- A follow-up session was planned for the 2021 HNPW, which has provided an update on the latest collaborative work between GDACS and Regional Specialized Meteorological Centres (RSMC) La Réunion. In particular the session showcased the developments in respect of replacing the current Joint Typhoon Warning Center (JTWC) information used by GDACS with that of the authoritative TC analysis from RSMC La Réunion.
- RSMC La Reunion has developed some new Impact-based forecasting tropical cyclone products. The new products were presented during the 24th session of the RA I Tropical Cyclone Committee (8-10 November 2021). The presentation is [here](#).
- WMO also joined with the International Federation of Red Cross and Red Crescent Societies (IFRC) and the International Telecommunications Union (ITU) to issue a joint Call to Action to improve availability and use of standardized emergency alerts. The heads of the three organizations endorsed the call to "collectively scale up our efforts to ensure that by 2025 all countries have the capability for effective, authoritative emergency alerting that leverages the Common Alerting Protocol (CAP), suitable for all media and all hazards." Special focus on the implementation of CAP was launched to fast-track CAP implementation in RA I. As of 5 October 2021, there were 9 more countries that had implemented CAP in the Region compared to November 2020. An extra 10 countries were expected to complete the implementation through assistance by experts from the Region, working in collaboration with WMO. Updates on progress on CAP implementation may be

² The meeting documents, including the final report, are available at:

<https://community.wmo.int/meetings/technical-meeting-tropical-cyclone-impact-estimation-for-humanitarian-preparedness-and-response>.

viewed on the [CAP Implementation Dashboard](#). Since 2006, WMO has recognized CAP as the key standard for all-hazards, all-media public warning and alerting from authoritative sources.

Seventh Session of the Global Platform for Disaster Risk Reduction (GP2022)

3.3 The seventh session of the Global Platform for Disaster Risk Reduction 'From Risk to Resilience: Towards Sustainable Development for All in a COVID-19 Transformed World' will take place from 23-28 May 2022 in Bali, Indonesia. WMO is also coordinating with members of the International Network for Multi-Hazard Early Warning Systems (IN-MHEWS) to organize the third Multi-Hazard Early Warning Conference (III-MHEWC) immediately preceding the GP2022 event.

WMO partners with a publication team for a Book Series for Children on Disaster

3.4 Some background information is available in the [Annex](#) of this document

- WMO is a Scientific Advisor³ for the COPE book series⁴, which aims at increasing the disaster resilience of children globally. Covering natural hazards such as tropical cyclones, storm surge, floods, landslide, tsunami, earthquakes etc, the books provide coping tools, preparedness and relatable stories in an imaginative and easy to understand way.
- The translation in other languages are allowed, free of charges. The process is to provide WMO with your translation in any language and the COPE Team will do the design and text placement for free. The translated version will be posted online as e-books, and it is allowed to print it for the usage in schools.
- The Committee is invited to liaise with WMO Secretariat which will facilitate the coordination with COPE to translate these Books for Children.

Impact-based forecasting and warning services - IBFWS

3.5 Following the decision of the IBFWS Symposium (Exeter, Devon, UK, 2-4 December 2021) to develop the 2nd edition of WMO guidelines on Multi-Hazard Impact-based Forecast and Warning Services (WMO No. 1150), the First Session of SERCOM (Second Part) (SERCOM II, 22 - 26 February 2021) decided to approve the publication of additional chapters as "WMO Guidelines on Multi-hazard Impact-based Forecast and Warning Services – Part 2 (WMO-No. 1150-Part II).

3.6 The WMO Guidelines on Multi-hazard Impact-based Forecast and Warning Services (WMO-No. 1150), Part II: Putting Multi-Hazard IBFWS into Practice was published and may be accessed [here](#).

3.7 In addition, the companion web page to WMO Guidelines No 1150: Part II: – Putting Multi-hazard IBFWS into Practice was developed and may be viewed [here](#).

IBF Training activities

3.8 The following IBF training activities were carried out:

³ Please see the Annex of this document for additional background information related to WMO and COPE

⁴<https://cope-disaster-champions.com/disaster-book-series/>

- Thailand CREWS-Canada Sub-Project Workshop on Impact-based Forecast and Warning Services (IBFWS)– 18-22 January 2021) was conducted. Details of the Workshop may be viewed [here](#).
- 26 July 2021 - 30 July 2021 - Video Conference: Philippines WMO CREWS-Canada Sub-Project Training Workshop on Impact-based Forecast and Warning Services (IBFWS)
- The following event is planned: 28 February 2022 - 10 March 2022 – Online: SWFP – South Asia and Southeast Asia - Training Workshop on Severe Weather and Impact Based Forecasting and Warning Services (ONLINE, 28 February - 10 March 2022))

Coastal Inundation

3.9 In 2019 and 2020, the WMO released two public awareness videos linked to coastal inundation services, about the: 1) [dangers of coastal inundation](#) and 2) [value of ocean buoys](#) for providing data for early warnings at the coast.

Research

3.10 To ensure close collaboration concerning research aspects of tropical cyclone activities within WMO's Tropical Cyclone Programme (TCP) and the World Weather Research Programme (WWRP), the Working Group on Tropical Meteorology Research (WGTRM) is tasked to keep developments in research aspects of TCP under continuous review and facilitate the coordination of research at regional levels by maintaining close liaison with tropical cyclone regional bodies.

3.11 The 4th joint project meeting: An online meeting is under schedule in March this year for the three science projects on typhoons, Experiment on Typhoon Intensity Change in Coastal Areas (EXOTICCA), Typhoon Landfall Forecast Demonstration Project (TLFDP), and Understanding and Prediction of Rainfall Associated with Tropical Cyclones (UPDRAFT). The virtual meeting is to promote the communication and collaboration between the three projects and will focus on the progress reports and identify some major outcomes from the three projects and the discussion of the future plan in 2022 and beyond. A set of recommendations will be developed for further plan and progress of the three projects. These recommendations require support and coordination from TCP regional bodies.

Tropical Cyclone-Probabilistic Forecast Products (TC-PFP) Pilot Project

3.12 To address one of the recommendations from the IWTC-IX, a task team has been compiled to address TC probabilistic forecast products (TC-PFP). The task team consists of members from the World Weather Research Programme's Tropical Meteorological Research WG, the Predictability, Dynamics and Ensembles Working Group as well as the Socio-Economical Research Application Working Group. This project was accepted/approved as a GDPFS pilot project by the INFCOM Standing Committee for Earth System Modelling Predictions in March 2021. The task team has two objectives: i) Derive best practices for tropical cyclone probabilistic forecast products (genesis, position and related hazards) through coordination with RSMCs and physical and social science researchers; ii) Create a foundation for data sharing and co-design that can be built upon for other TC attributes and related hazards.

3.13 A workshop involving RSMCs and TCWCs was organized 15, 17-18 June 2021. The workshop was held online and attended by 80-100 participants from research communities as well as operational centres. The outcomes of the workshop will serve as input to the IWTC-X meeting in 2022, providing guidance on best practices for probabilistic TC forecasting.

The 10th International Workshop on Tropical Cyclones (IWTC-X)

3.14 The IWTC-X will take place in December 2022. The WGTMR has started planning the meeting with the TCP. Built upon the experiences from previous IWTCs, we will explore mechanisms to better promote the IWTC recommendations and more effectively share the meeting reports.

Training and Regional activities

3.15 The third International Workshop on Satellite Analysis of Tropical Cyclones III (IWSATC-III) took place 7-10 December 2021. Its main purpose is to increase the accuracy and reliability of satellite analysis of tropical cyclones through the sharing of the latest knowledge and technologies between the operational forecasters and the researchers in this area. The specific objectives of IWSATC-3 were to: 1) Describe the latest operational procedures of TC satellite analysis from participating RSMCs/TCWCs; 2) Share recent and emerging developments in satellite sensors and associated analysis techniques for TC applications; 3) Enhance the understanding and application of TC satellite analysis techniques and recommend strategies for ongoing training and engagement as new technologies and applications emerge. All the material (presentations and videos) is available [here](#).

3.16 RA IV Workshop on Hurricane Forecasting and Warnings and Public Outreach is scheduled online 28 February – 4 March 2022.

3.17 RA I Training Course on Tropical Cyclone Forecasting and Warnings and IBFs was conducted online, 25-29 October 2021.

3.18 RA V Training Course on Tropical Cyclone Forecasting and Warnings and IBFs was organized online from 12 to 15 October 2021.

3.19 The attachment training organized by RSMC New Delhi was successfully conducted online from 6 to 18 October 2021, with two days dedicated to storm surge and wave forecasting, and was attended by 57 participants from PTC Members. The same attachment training in 2022 will be organized from 4 – 14 April, online.

2.20 The Sixth International Training Course on Tropical Cyclone Monitoring and Forecasting was organized from 25 November to 3 December 2021 and hosted online by the China Meteorological Administration (CMA)..

2.21 International Training Course on Tropical Cyclone Forecasts, 21 June – 2 July 2021, hosted online by RTC Nanjing (Typhoon Committee Training Centre), China. It was attended by 44 participants from different regions prone to tropical cyclones. SSO-TC was invited to deliver a lecture on WMO TCP and major challenges in tropical cyclone forecasts.

3.22 The attachment training by RSMC Tokyo was held online from 9-11 March 2021. And the same attachment training in 2022 took place online from 11-13 January.

3.23 The 53rd session of the ESCAP/WMO Typhoon Committee, Okinawa, Japan, 23 - 25 February 2021.

3.24 The 44th session of RA IV Hurricane Committee will be organized online 25-28 April 2022.

3.25 The 48th session of the WMO/ESCAP Panel on Tropical Cyclones was held in United Arab Emirates (Online), 20, 21, and 23 September, 2021

3.26 The 19th session of the RA V Tropical Cyclone Committee for the South Pacific and Southeast Indian Ocean was conducted online from 27 to 29 July 2021

3.27 The 24th session of the RA I Tropical Cyclone Committee for the Southwest Indian Ocean was conducted from 8 to 10 November 2021
