



# 55

## VIDEO CONFERENCE REPORT OF THE FIFTY-FIFTH SESSION OF TYPHOON COMMITTEE



HOSTED BY MACAO, CHINA  
07-09 March 2023



ESCAP/WMO  
Typhoon Committee

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**VIDEO CONFERENCE**  
**REPORT OF THE FIFTY-FIFTH SESSION**  
**OF TYPHOON COMMITTEE**

**Hosted by Macao, China**  
**07-09 March 2023**

**PART I – DECISIONS OF THE COMMITTEE**

1. The Committee decided to:
  - a. Approve Mr. LEONG Weng Kun, Director of Macao Meteorological and Geophysical Bureau (SMG), Macao, China, Permanent Representative (PR) of Macao, China with WMO, as Chairperson; Mr. Muhammad Helmi ABDULLAH, Director General of Malaysian Meteorological Department, Malaysia, PR of Malaysia with WMO, as Vice-Chairperson and Mr. Marcus Landon AYDLETT, Warning Coordination Meteorologist, National Weather Service, Weather Forecast Office (WFO) Guam, National Oceanic and Atmospheric Administration (NOAA), USA, as Chairperson of the Drafting Committee.
  - b. Consider the key tropical cyclone impacts on Members in 2022 and review the initiatives and activities to be pursued in support of the 19 TC Priorities to mitigate future impacts.
  - c. Adopt Section 2 of the Summary of Members' Reports 2022 as an "Executive Summary" to be distributed to Members' governments for information and reference.
  - d. Approve the Typhoon Committee Operational Manual (TOM) with the amendments provided in **Appendix XIX**.
  - e. Approve the recommendations submitted by the Working Group on Meteorology (WGM) as expressed in paragraph [59](#).
  - f. Approve the recommendations submitted by the Working Group on Hydrology (WGH) as expressed in paragraph [82](#).
  - g. Approve the recommendations submitted by the Working Group on Disaster Risk Reduction (WGDRR) as expressed in paragraph [89](#).
  - h. Approve the recommendations submitted by Training and Research Coordination Group (TRCG) as expressed in paragraph [101](#).
  - i. Approve the recommendations submitted by TCS as shown in **Appendix XIV**.
  - j. Approve the recommendations submitted by Advisory Working Group (AWG) as expressed in paragraph [109](#).
  - k. Appoint Dr. DUAN Yihong, from China, as the new Secretary of the Typhoon Committee for 2023-2026/early 2027.
  - l. Approve the submission of SSOP III Project to the UNESCAP Multi Donor Trust Fund for Tsunami, Disaster and Climate Preparedness.

- m. Approve the retirement of the names CONSON, KOMPASU, RAI, MEGI, MA-ON, NORU, NALGAE, HINNAMNOR and MALAKAS and request TCS to issue letters to the relevant Members (Socialist Republic of Viet Nam, Japan, the United States of America, Republic of Korea, Hong Kong, China, Democratic People’s Republic of Korea, Lao People’s Democratic Republic and the Philippines) to submit candidates for replacement names for approval at the next Session.
- n. Approve the 2023/2024 Budget as presented below (see **Appendix XXV** for detail):

By Group	Apr-Dec2023/ Jan-Mar2024
	Proposed
TCS	34,000.00
<b>ALL WGS (IWS with TRCG Forum)</b>	<b>68,000.00</b>
TRCG	27,000.00
WGM	38,000.00
WGH	25,000.00
WGDRR	15,500.00
<b>Total Proposed Budget in 2023/2024</b>	<b>207,500.00</b>

- o. Approve the recommendations of the Asia Pacific-Typhoon Collaborative Research Center (AP-TCRC) as expressed in paragraph [140](#).
- p. Accept the venue for the host of the 18<sup>th</sup> IWS in conjunction with the 4<sup>th</sup> TRCG Forum at Economic and Social Commission for Asia and the Pacific (ESCAP) facility in Bangkok, Thailand from 27 November to 01 December 2023. The final arrangements will be confirmed in due course by TCS and ESCAP.
- q. Accept the kind offer of Malaysia to host the 56<sup>th</sup> Session of TC in 2024, tentatively in the first week of March 2024. The final date and place will be confirmed in due course by Malaysia and later communicated to TCS.
- r. Accept the kind offer of China to host the 19<sup>th</sup> IWS in 2024 and the kind offer of the Philippines to host the 57<sup>th</sup> Session in 2025. The final date, place and arrangements will be confirmed by China and the Philippines to TCS and communicated later to Members.

## PART II – PROCEEDINGS OF THE COMMITTEE

### I. ORGANIZATION OF THE VIDEO CONFERENCE (VC) (agenda 1)

2. Originally planned to be conducted face to face in Macao, China, the 55<sup>th</sup> Session of the ESCAP/WMO Typhoon Committee (TC55) was proposed to be held virtually by the AWG in consultation with Macao, China due to the travel restrictions and quarantine measures associated with the ongoing COVID-19 pandemic. In accordance with Rule 1A of the Committee, after the approval by the TC54 Chairperson, the Committee decided to conduct the TC55 by video conference instead.
3. A video conference (VC) hosted by Macao, China was then scheduled from 07-09 March 2023.
4. The VC was attended by 141 participants from 13 out of 14 Members of the Typhoon Committee, namely: China; Democratic Republic of Korea (DPRK), Hong Kong, China; Japan; Lao People's Democratic Republic (Lao PDR); Macao, China; Malaysia; the Philippines; Republic of Korea; Singapore; Thailand; United States of America (USA); and the Socialist Republic of Viet Nam. Representatives of United Nations Economic and Social Commission for Asia and the Pacific (ESCAP), World Meteorological Organization (WMO) and Typhoon Committee Secretariat (TCS) also attended the VC.
5. The VC was also attended by observers from the Asian Disaster Reduction Center (ADRC); International Federation of Red Cross and Red Crescent Societies (IFRC). The list of participants can be consulted in **Appendix I**.

### Opening of the Session

6. The opening ceremony of the Session began at 09:30 am on Tuesday, 07 March 2023 (Hong Kong Time). Ms. Denise LAU from the TCS conducted the roll call, house rules and opening ceremony.
7. The following speeches were delivered at the opening ceremony and are provided in **Appendix II**:
  - a) **Mr. Viengxai MANIVONG**, Deputy Director-General of Department of Meteorology and Hydrology (DMH), Lao PDR, on behalf of Madam Outhone PHETLUANSY, the Chairperson of the 54th Session of the Typhoon Committee;
  - b) **Mr. Ben CHURCHILL**, Director of WMO Regional Office for Asia and the South-West Pacific (RAP), on behalf of Secretary-General of WMO;
  - c) **Mr. Sanjay SRIVASTAVA**, Chief, Information and Communications Technology, Disaster Risk Reduction (IDD), ESCAP;
  - d) **Mr. YU Jixin**, Secretary of Typhoon Committee;
  - e) **Mr. LEONG Weng Kun**, Director of Macao Meteorological and Geophysical Bureau (SMG), Macao, China, declared the VC Session opened.
8. The Dr. Roman L. KINTANAR AWARD for typhoon related disaster mitigation was presented for the year of 2022. The DR. KINTANAR AWARD 2022 was awarded to Macao Meteorological and Geophysical Bureau (SMG) of Macao, China, in recognition of their outstanding contribution to the enhancement of monitoring and early warning capabilities, and strengthening of regional cooperation.

9. The Committee took note that the Dr. Kintanar Award Plaque Ceremony will be held when the Session is able to meet face-to-face.

## **II. REPORT ON CREDENTIAL COMMITTEE (agenda item 2)**

10. Mr. YU Jixin, Secretary of TC, presented the Credential Letters submitted by TC Members and presented the Summary Report of the Credential Committee, which can be consulted at **Appendix III**.

## **III. ELECTION OF OFFICERS (agenda item 3)**

11. Mr. LEONG Weng Kun, Director of Macao Meteorological and Geophysical Bureau (SMG), Macao, China, Permanent Representative (PR) of Macao, China with WMO, was elected Chairperson and Mr. Muhammad Helmi ABDULLAH, Director General of Malaysian Meteorological Department, Malaysia, PR of Malaysia with WMO was elected Vice-Chairperson of the Committee.
12. Mr. Marcus Landon AYDLETT, Warning Coordination Meteorologist, National Weather Service, Weather Forecast Office (WFO) Guam, National Oceanic and Atmospheric Administration (NOAA), was elected Chairperson of the Drafting Committee.

## **IV. ADOPTION OF THE AGENDA FOR THE VC (agenda item 4)**

13. The Committee adopted the agenda for the VC. (**Appendix IV**)

## **V. TECHNICAL PRESENTATIONS (agenda item 5)**

### **5.1 Summary of the 2022 Typhoon Season**

14. The Committee noted with appreciation the review of the 2022 typhoon season provided by the RSMC Tokyo as provided in **Appendix V**, whose summary is presented in paragraphs 15 – 26 below:
15. Over the western North Pacific (WNP) and the South China Sea (SCS), 25 named tropical cyclones (TCs) formed in 2022 – almost the same as the 30-year average of 25.1 (1991 – 2020). Ten of these reached typhoons (TY) intensity, which was below the 30-year average of 13.3. A total of 12 formed during the peak period from August to September (above the average of 10.7), while only 6 formed from January to July (less than the average of 7.8). This was due to suppressed convection over the area where TCs frequently form, associated with the persistent La Niña event. The negative phase of the Indian Ocean Dipole (IOD) may also have contributed to suppressed convection, particularly from June to July.
16. The 2022 typhoon season started with Malakas (2201), which formed over the sea near the islands of Chuuk State in the Federated States of Micronesia (FSM) at 06 UTC on 6 April. Malakas became the first TC to reach TY intensity in the WNP. It reached peak intensity with maximum sustained winds of 90 kt and a central pressure of 945 hPa over the sea east of the Philippines at 18 UTC on 13 April.

17. The mean genesis point of named TCs was 19.3°N and 135.8°E, representing a northward deviation from the 30-year average (16.3°N and 135.9°E). The mean genesis point of named TCs in summer (June to August) was 21.8°N and 132.1°E, with a north-westward deviation from the 30-year summer average (18.5°N and 134.2°E), and that of named TCs in autumn (September to November) was 19.4°N and 139.1°E, representing a north-eastward deviation from the 30-year autumn average (16.2°N and 137.0°E). The clear northward shift of the mean genesis point throughout the year is partly due to the persistent La Niña event and to the intrusion of high potential vorticity from higher latitudes over the area from the central Pacific to the sea south of Japan.
18. The mean duration of TCs with tropical storm (TS) intensity or higher was 3.7 days, which was shorter than the 30-year average of 5.2 days. The mean duration of TCs with TS intensity or higher in summer was 3.8 days, which was shorter than the average of 5.0 days, and that of TCs with TS intensity or higher in autumn was 3.8 days, which was shorter than the average of 5.4 days. The shorter-than-average duration in autumn is consistent with the results of statistical studies on the La Niña event.
19. Two named TCs formed in April. The first, Malakas (2201), formed as a tropical depression (TD) over the sea around the FSM (here, TC locations are expressed as the area of TD formation unless otherwise noted) and further developed to typhoon (TY) intensity. Megi (2202) formed over the sea east of the Philippines. Although it did not intensify significantly, it caused flooding, landslides and other destructive effects in the Philippines.
20. Two named TCs formed in June. The first, Chaba (2203), formed over the SCS and hit the coast of southern China with TY intensity before transitioning into an extratropical cyclone over central China and bringing rain to wide areas of China, Macao China and Hong Kong China. Aere (2204), which formed over the sea east of the Philippines and made landfall on Japan's Nagasaki Prefecture with TS intensity, caused heavy rain, flooding and landslides over the Seto Inland Sea toward the Pacific Ocean even after transitioning into an extratropical cyclone.
21. Two named TCs formed in July. The first, Songda (2205) formed over the sea west of the Mariana Islands and dissipated over the Yellow Sea. Trases (2206) formed over the sea south of Okinawa Island and weakened to TD intensity near the western coast of the Korean Peninsula.
22. Five named TCs formed in August. The first, Mulan (2207), formed over the sea south of Hainan Island and moved southeastward before taking a counterclockwise path and hitting the coast of Viet Nam with TS intensity and bringing heavy rain, strong wind and storm surges to partial areas of China, Macao China, Lao PDR, Thailand and Viet Nam. Meari (2208) formed over the sea west of Minamitorishima Island and made landfall on Japan's Izu Peninsula after passing around Omaezaki in Shizuoka Prefecture with TS intensity. Maon (2209) formed over the sea east of the Philippines and reached severe tropical storm (STS) intensity before crossing the northern part of Luzon Island, and later hit southern China with STS intensity. Many Typhoon Committee Members in the WNP region were affected by this TC and its after-effects. Both Tokage (2210) and Hinnamnor (2211) formed over the sea around Minamitorishima Island. Tokage reached TY intensity over the sea east of Japan, and after accelerating east-northeastward crossed longitude 180°E. Hinnamnor reached peak intensity with maximum sustained winds of 105 kt (a tied record for 2022), bringing torrential rain and wind to a wide area of the WNP region.



23. Seven named TCs formed in September. The first, Muifa (2212), formed over the sea east of the Ogasawara Islands and developed to TY intensity over the sea south of Okinawa Island. After a slight weakening, it redeveloped and hit the coastline of central China. Merbok (2213) formed over the sea southeast of Minamitorishima Island, and after reaching TY intensity, it transitioned into an extratropical cyclone and crossed longitude 180°E over the Bering Sea. Nanmadol (2214), one of the strongest TCs of the season, formed over the sea south of Japan, reached TY intensity and made landfall on Japan's Kyushu region, resulting in extensive rain in Japan and Korea. Talas (2215) formed over the Ogasawara Islands and moved over the sea from the south to the east of Honshu Island. Noru (2216) formed over the sea east of the Philippines and crossed Luzon Island with TY intensity, hit Viet Nam and dissipated over Thailand, bringing heavy rain and flooding in the Philippines, Lao PDR, Thailand and Viet Nam. Kulap (2217) formed over the sea around the Mariana Islands and reached STS intensity, finally crossing longitude 180°E over the Bering Sea. Roke (2218) formed over the sea south of Japan and moved to the sea east of Japan after developing to TY intensity.
24. Five named TCs formed in October. The first, Sonca (2219), formed over the South China Sea and hit Viet Nam, causing severe damage to the country and widespread rain in Thailand. Nesat (2220) actually formed over the sea east of the Philippines before Sonca but was named later, and reached TY intensity after moving over the South China Sea. Haitang (2221) formed over the sea northeast of Minamitorishima Island and developed to TS intensity. Nalgae (2222) formed over the sea east of the Philippines and crossed Luzon Island with STS intensity. Banyan (2223) formed near the Caroline Islands and dissipated over the sea east of Mindanao Island after passing over the Republic of Palau.
25. The only named TC for November was Yamaneko (2224), which formed over the sea northeast of Wake Island and weakened to TD intensity over the sea north of the island.
26. The last-named TC, Pakhar (2225), formed in December over the sea east of the Philippines and transitioned into an extratropical cyclone over the sea south of Japan.

## **VI. REPORT ON TC'S KEY ACTIVITIES AND OVERVIEW SUMMARY OF MEMBERS' REPORTS (agenda item 6)**

### **6.1 Report on TC's Key Activities and Main Events in the Region**

27. The Committee took note of the report of the Typhoon Committee Chairperson on the TC's Key Activities and Main Events in the Region, 2022. (**Appendix VI**)
28. The Committee expressed appreciation to the contributions of Ms. Outhone PHETLUANGSY and Mr. LEONG Weng Kun, as the Chairperson and Vice Chairperson of the Committee.

### **6.2 Overview Summary of Members' Reports**

29. The Committee took note of the Summary of Members' Reports 2022 highlighting the key tropical cyclone impacts on Members in 2022 and the major activities undertaken by Members under the TC Priorities and components during the year. (**Appendix VII**)

30. The Committee expressed its sincere appreciation to AWG Chair for preparing the Summary of Members' Reports and the observations made with respect to the progress of Members' activities in support of the 19 Priorities identified in the TC Strategic Plan 2022-2026.

### **Recommendations of AWG**

31. Consider the key tropical cyclone impacts on Members in 2022 and review the initiatives and activities to be pursued in support of the 19 TC Priorities to mitigate future impacts.
32. Adopt Section 2 of the Summary of Members' Reports 2022 as an "Executive Summary" to be distributed to Members' governments for information and reference.

## **VII. REVIEW OF ACTIVITIES OF RSMC TOKYO AND AMENDMENTS OF TOM (agenda item 7)**

### **7.1 Review of the activities of the Regional Specialized Meteorological Center (RSMC) Tokyo 2022 (Appendix VIII)**

33. The Committee noted with appreciation the review of RSMC advisories, products and operational activities and changes made in 2022. It noted the forecast verification results for 25 TCs that reached TS intensity or higher formed in 2022: the forecast track errors of the year of 72 km (87 km in 2021), 124 km (157 km), 172 km (225 km), 195 km (261 km) and 267 km (264 km) for 24-, 48-, 72-, 96- and 120-hour forecasts, respectively, the annual mean Root Mean Squared Errors (RMSEs) for central pressure forecasts of 13.7 hPa (11.9 hPa), 19.4 hPa (15.9 hPa), 21.3 hPa (18.0 hPa), 19.4 hPa (19.0 hPa) and 15.5 hPa (17.9 hPa) for 24-, 48-, 72-, 96- and 120-hour forecasts, respectively, and those for maximum wind speed forecasts for 24-, 48-, 72-, 96- and 120-hour forecasts of 6.3 m/s (5.0 m/s), 8.7 m/s (6.5 m/s), 8.7 m/s (6.9 m/s), 7.7 m/s (7.6 m/s) and 6.0 m/s (8.2 m/s) respectively.
34. The Committee noted with appreciation the changes in RSMC advisories, products and operational/coordination activities made in 2022, especially the upgrades of tropical cyclone heat potential products and the Japan Meteorological Agency's (JMA's) global ensemble prediction system.
35. The Committee noted with appreciation the operation of RSMC Tokyo's Numerical Typhoon Prediction (NTP) website, and noted changes made in 2022 as well as those planned for the near future.
36. The Committee noted with appreciation RSMC Tokyo's maintenance of a dedicated platform for enhanced communication between operational forecasters and RSMC-Tokyo, as well as the sharing of advance-notice updates. In the 2022 typhoon season, more than 10 inquiries relating to tropical cyclones have been submitted, with related discussion helping to clarify TC status and forecasts.
37. The Committee noted with appreciation the contribution of RSMC Tokyo (which also serves as an International Civil Aviation Organization (ICAO) Tropical Cyclone Advisory Centre (TCAC Tokyo)) to compliance with ICAO Standards and Recommended Practices (SARPs), addressing the provision of TCA information in text, graphical and the ICAO Meteorological Information Exchange Model (IWXXM) 3.0 formats via multi-platform channels such as the TCAC Tokyo website.

38. The Committee was pleased to note the progress of the regional Storm Surge Watch Scheme (SSWS), which includes an upgrade of JMA's storm surge watch scheme model and an update of its products in August 2022. The Committee also noted with appreciation the ongoing contribution of RSMC Tokyo to the regional SSWS, especially the provision of various products including storm surge forecast distribution maps and time-series charts for selected stations, as well as week-range probabilistic wave forecasts for significant wave heights and peak wave periods. The Committee again encouraged Members to make their sea level observation data available in order to support verification activity.
39. The Committee noted with appreciation the efforts and progress made by RSMC Tokyo about development of tropical cyclone genesis guidance using early Dvorak Analysis and global ensemble. The Committee also welcomes RSMC Tokyo's efforts in seeking further approaches to increase the benefits of ensemble forecast utilization, including improvement of current operational products.
40. The Committee was pleased to note the progress of the regional radar network development project, under which experimental exchange of radar composite data among Japan, Thailand and Malaysia started in 2016. The project has been expanded, and three more Members (Lao PDR, the Philippines and Viet Nam) joined in 2018. The Committee noted with appreciation the progress made on regional radar data exchanges, especially the creation of a sample regional composite map based on Members' radar data, and the Guide to Quantitative Precipitation Estimation (QPE) Program finalized by Thailand, Malaysia and Japan in July 2022.
41. The Committee was pleased to note the activities of the project for enhancing the utilization of Himawari-8/9 products, under which technical support for developing Rapidly Developing Cumulus Area (RDCA) identification using Himawari-8/9 data is provided. The Committee noted with appreciation the ongoing discussion, support and efforts contributed by project Members (Malaysia, Singapore, Thailand and Vietnam), including their presence at an online technical meeting in 2022. The Committee also noted that HCAI (High-resolution Cloud Analysis Information) data and AMV-based Sea-surface Wind data are provided to NMHSs every 10 minutes.
42. The Committee noted with appreciation RSMC Tokyo's publication of its Technical Review No. 24 and the Annual Report on the Activities of the RSMC Tokyo Typhoon Center 2021 in April and October 2022, respectively.
43. The Committee was informed that RSMC Tokyo had started tropical cyclone satellite re-analysis in 2012 for the period from 1981 onward to enable evaluation and improvement regarding the quality of the Current Intensity (CI) number in satellite TC analysis. It also acknowledged that the Center has almost completed the reanalysis along with basic quality checking (QC) for the period from 1987 to 2016, and will share the whole dataset for the period from 1987 to 2016 with Members in 2023.
44. The Committee noted with appreciation the operation of Himawari-8/9 geostationary meteorological satellites and further welcomed the intention of RSMC Tokyo to continue providing Himawari products as well as technical support for using them. The Committee was informed that the switchover from Himawari-8 to -9 took place on 13 December 2022.
45. The Committee noted with appreciation RSMC Tokyo's virtual hosting of the 22nd Attachment Training session from 11 to 13 January 2023 with 51 attendees from eight

Members (China, Hong Kong China, Macao China, Malaysia, the Philippines, the Republic of Korea, Thailand and the USA). The 2023 session included presentations on state-of-the-art TC motion by a distinguished invited lecturer and exercises on satellite image analysis. The course helped attendees to learn about basic understanding of TC monitoring and forecasting techniques and their application to operational services.

46. The Committee noted for RSMC-Tokyo's regular monitoring of observation data exchanges in 2022 as per the Typhoon Committee Operational Manual - Meteorological Component (TOM), with results to be provided by March 2023. The Committee expressed appreciation to all Members providing special observation data to Committee Members in 2022, and further encouraged all Members to conduct additional observation as requested by TOM.
47. The Committee noted with appreciation RSMC Tokyo's contribution to WMO Programmes and related activities, and its promotion of cooperation with other RSMCs for the Tropical Cyclone Programme. These included participation in the Advisory Group on Tropical Cyclones (AG-TC) under the Standing Committee on Disaster Risk Reduction and Public Services (SC-DRR), provision of real-time forecast guidance to Typhoon Committee Members, and contribution to capacity building within the framework of the Severe Weather Forecasting Programme – Southeast Asia (SWFP-SeA) and the Expert Team of Marine Services (ET-MS) under WMO Regional Association II. The Committee also noted with thanks the Center's coordination with adjacent RSMCs for ensuring consistent information delivery across basins.

## **7.2 Typhoon Committee Operational Manual (TOM)**

48. The Committee noted that the Typhoon Committee Operational Manual (TOM) Rapporteur requests WMO to publish and upload the 2023 edition of TOM on the Tropical Cyclone Programme (TCP) Website as submitted by the Rapporteur, with the amendments given in **Appendix XIX**.
49. The Committee also noted that the tropical cyclone forecast competency in the region is kept the same when added to the Compendium of WMO Competency Frameworks (WMO-No. 1209).
50. The Committee expressed its appreciation to the Rapporteur for the update of TOM.

## **VIII. REPORTS OF TC WORKING GROUPS AND TRCG (agenda item 8)**

51. Parallel sessions of the Working Groups (WGs) on Meteorology, Hydrology and Disaster Risk Reduction were convened during the WG's individual online meetings and during the online 17<sup>th</sup> IWS to review progress of work during the past year, identify priorities for cooperation and make recommendations to the Committee.
52. The outcomes of the parallel sessions of the three WGs were reported to the plenary session as given in the following sections.

## 8.1. Meteorological Component

53. The Committee took note of the Members' activities and major progress and issues in Meteorological Component in 2022 as reported by Members at the 17th IWS.
54. The Committee reviewed the activities of Members in implementing the TC Strategic Plan and its annual operating plan in relation to Meteorological Component during the past year. These details are presented in **Appendix X**.
55. The Committee took note of the outcomes of the WGM Parallel Session at the 17th IWS on 29-30 November 2022. With the assistance of TCP/WMO and TCS, and the strong support from all Members, WGM successfully completed the tasks in 2022 with significant outcomes as follows:
  - a. WGM fulfilled all the action plans (4 POPs, 9 AOPs and 2 PPs) in 2022, which were endorsed at the 54<sup>th</sup> TC Session.
  - b. Since the outbreak of COVID-19 in early 2020, the impacts of the COVID-19 pandemic have been deep and wide. Some activities in WGM such as research fellowships, technical transfer and meetings have been either cancelled or postponed due to global travel restrictions and border closures, as well as due to strict social distancing measures in many countries/places.
  - c. After the 54<sup>th</sup> TC Session in 2022, WGM carried out the following activities that involved the cooperation among Members as well as other TC WGs and international organizations:
    - i. Coordinated with the Malaysian Meteorological Department (MET Malaysia) to organize the fifth WGM Annual Meeting in a hybrid mode (video and face-to-face) on 13 October 2022.
    - ii. Coordinated with China Meteorological Administration (CMA) for the training Course "Seventh International Distance Training Course on Tropical Cyclone Monitoring and Forecasting" from 24 October to 4 November 2022.
    - iii. Coordinated with TRCG to host the 2022 research fellowship by the Hong Kong Observatory (HKO) on a topic entitled "Study on the characteristics and model forecast performance of rapid intensification (RI) of near-landfall tropical cyclones" via a remote approach.

## Conclusions of WGM

56. Based on the information provided by Members and the respective coordinators of the operating plans, and discussions during the Parallel Meeting, the following conclusions were reached:
  - a. Members have made important progress in the implementation of the TC Strategic Plan during 2022.
  - b. Members made significant progress during 2022 in tropical cyclone monitoring and communication systems, data assimilation and numerical weather prediction systems, tropical cyclone forecast-aiding systems, and scientific understanding of tropical cyclone activities.
  - c. With the help of Tropical Cyclone Programme (TCP) of WMO and Typhoon Committee Secretariat (TCS), and the absolute sincere cooperation of all Members and the effective efforts of the WGM focal points, WGM has successfully completed the tasks in 2022.
  - d. Based on the discussion on the operating plans for 2022 during the 17<sup>th</sup> IWS, it was concluded to adopt the operating plans as follows:

- i. The POP items 1-4 will be continued in 2023.
  - ii. The AOP items 1-9 will be continued in 2023.
  - iii. The PP item 1 will be closed.
  - iv. The PP item 2 will be moved to AOP10 in 2023.
  - v. A new PP item 1 “Assessment Report on Regional Influence of Anomalous Tropical Cyclone Activity in the WNP” organized by CMA will be introduced in 2023.
  - vi. A new PP item 2 “Tropical Cyclone Monitoring using Drifting Buoys” organized by KMA will be conducted in 2023.
57. The total budget proposed by WGM, which will be concurred at the AWG meeting, for undertaking the operating plans (AOPs, POPs and PPs) in 2023 is US\$38,000.
58. The proposed WGM 2023 operating plans (AOPs, POPs and PPs) including the actions, the success indicators, coordinators and budget is listed in Annex II in **Appendix X**.

### **Recommendations of WGM**

59. After deep discussion and communication, participants agreed to submit the following recommendations to the Committee at TC 55<sup>th</sup> Annual Session:
- a) To request KMA to further develop the techniques of typhoon summer prediction and provide the information to TC Members.
  - b) To request CMA to encourage TC Members to use the Collaborative Discussion (CoDi) platform especially for tropical cyclones in the basin of SCS.
  - c) To request CMA to enlarge the usage of CoDi platform for the International Training Course on Tropical Cyclone and examination of TC track and intensity.
  - d) To request STI to publish the TCRR Journal on a quarterly basis in 2023, and to improve the editorial procedure and Journal’s influence.
  - e) To request STI to issue the summary report on verification of TC forecast products in 2022 typhoon season in the WNP, and to investigate the track predictability for other basins.
  - f) To request STI to strengthen international cooperation and promote the exchange of TC data and verification techniques.
  - g) To request JMA to provide the current operational TC genesis guidance products using ensemble forecasts.
  - h) To request JMA to seek further approaches to increase the benefit of ensemble forecast utilization, including improvement of the current operational products.
  - i) To request CMA to improve the forecast ability and reduce the long-term forecast error of the CMA-TRAMS model, and to optimize the visualization for typhoon forecast products.
  - j) To request JMA to further refine quality control techniques applied to the participants’ radar networks to improve their quality of radar composites, and to implement and refine Malaysian Meteorological Department (MET Malaysia) and Thailand Meteorological Department (TMD)’s QPE calibration using rain-gauge.
  - k) To request JMA to support applicants to join the experimental regional radar data exchange in the future, and to share the progress with the RA II/V WIGOS radar project in Southeast Asia.
  - l) To request JMA to hold follow-up technical meeting(s) upon receipt of progress reports on the project Development of Regional Radar Network (AOP3) from participants.

- m) To request MET Malaysia and HKO to conduct training attachment for two participants from two TC Members on Radar Integrated Nowcasting System (RaINS) in 2023.
- n) To request JMA to add storm surge time series prediction upon request from Members, and to publish verification results of storm surge predictions.
- o) To request JMA to encourage Members to provide complete hourly sea level data of at least one year to provide accurate astronomical tides at the stations.
- p) To request JMA to encourage Members to provide sea level observations during storm surge events for verification of storm surge predictions.
- q) To request CMA to conduct more scientific experiments with focus on boundary layer structure and air-sea interaction, and to share experiment datasets under support of the Asia-Pacific Typhoon Collaborative Research Center (AP-TCRC).
- r) To request CMA to conduct research based on experiment datasets to improve forecast skills including identification technique for intensity and gale radius, and data assimilation and physical scheme.
- s) To request JMA to improve the Rapidly Developing Cumulus Area (RDCA) algorithm through the joint development by JMA and Met Malaysia.
- t) To request JMA to provide support for development of RDCA by Meteorological Service Singapore (MSS), TMD and Viet Nam Meteorological and Hydrological Administration (VNMHA).
- u) To request JMA to hold follow-up meeting(s) upon receipt of progress reports on the project Enhancing Utilization of Himawari 8/9 Products (AOP7) from participants.
- v) To request CMA to hold a specific seminar on Parallel Analysis of Satellite Data in Operational Tropical Cyclone Monitoring (AOP8) in 2023.
- w) To request CMA to share the work of AOP8 and discuss with experts during ITWC-10 on 5-9 December 2022.
- x) To request CMA to analyze TCs in the SCS using parallel satellite data.
- y) To request JMA to support a new AOP of WGH through providing 1-month and 3-month ensemble NWP model data, necessary for the project and available, to ICHARM.
- z) To request JMA to continue sharing knowledge and experience on awareness raising through lectures for online workshops and meetings of IFI project.
- aa) To request JMA to promote awareness with hydrological authorities to both local governments and public, including the appropriate use of products.
- bb) To request KMA to introduce GK2A high level products related to typhoon forecast and share the technique using GK2A data.
- cc) To request KMA to hold follow-up technical meeting(s) upon the receipt of progress reports to identify a way forward.
- dd) To endorse the proposed action plans in 2023 (including 4 POPs, 10 AOPs and 2 PPs) as listed in Annex II of **Appendix X** – Summary Report for the WGM Parallel Meeting at the 17<sup>th</sup> IWS, which summarizes the above recommendations with additional action items.
- ee) To endorse the WGM budget request included in the budget proposal to be submitted by AWG for TC's approval.
- ff) To re-appoint Dr. TANG Jie as Chair of WGM, Dr. Vicente B. MALANO and Mr. Muhammed Helmi ABDULLAH as Vice-Chairs of WGM.
- gg) To re-appoint Mr. HOSOMI Takuya as the Rapporteur of TOM.
- hh) To encourage project coordinators of all working groups to submit the outcome (research paper) to the TCRR journal.

## 8.2. Hydrological Component

60. The Committee reviewed the activities of the Members related to the implementation of the decision of TC 54<sup>th</sup> Session and its Annual Operating Plan (AOP) for the hydrological component during the past year. Details can be found in the **Appendix XI**.
61. The Session noted the flood-related disasters that happened in 2022 and the hydrological activities conducted by Members. It also noted the special measures taken by Members for flood disaster risk reduction and the progress achieved in Members under the situation of COVID-19.
62. The Session noted with pleasure that, the video conference (VC) for the 11<sup>th</sup> working meeting of Working Group on Hydrology (WGH) was organized by the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) in cooperation with Infrastructure Development Institute (IDI) and International Centre for Water Hazard and Risk Management (ICHARM) of Japan on 18-19 October 2022. The VC was attended by more than 40 participants from 11 of 14 Members of the Typhoon Committee, namely: China; Hong Kong, China; Japan; Lao People’s Democratic Republic (Lao PDR); Malaysia; the Philippines; Republic of Korea; Singapore; Thailand; USA and Viet Nam. Among them 15 participants from Japan, Lao PDR, Malaysia, Philippines and Thailand took part in the face-to-face meeting at the MLIT headquarters. Typhoon Committee Secretariat (TCS) and Thai Meteorological Department (TMD) of Thailand also participated in the VC. The Session expressed its appreciation to the Japan government through MLIT with cooperation of ICHARM and IDI of Japan for generously hosting the meeting.
63. The Session noted that WGH encouraged all Members to consider undertaking the hosting of the WGH annual working meeting. The Session also was informed with appreciation that MLIT of Japan is planning to jointly host the 12<sup>th</sup> WGH working meeting with Royal Irrigation Department (RID) of Thailand with funding support in Bangkok, Thailand.
64. Following the decisions made at TC 54<sup>th</sup> Session, WGH tried its best to conduct the activities for implementing its 7 AOPs in 2022 including domestic research, paper works and virtual meetings:
  - a. AOP1: Knowledge Sharing on Storm Surge Inundation Mapping
  - b. AOP2: Application of Hydrological Data Quality Control System in TC Members
  - c. AOP3: Enhancement of Flood Forecasting Reliability with Radar Rainfall Data and Stochastic Technique
  - d. AOP4: OSUFFIM Phase-II—Extension of OSUFFIM Application in TC Members
  - e. AOP5: Impact Assessment of Climate Change on Water Resource Variability in TC Members
  - f. AOP6: Flood Risk Watch Project for Life-saving
  - g. AOP7: Platform on Water Resilience and Disaster under IFI
65. The Session was informed that the project of “Knowledge Sharing on Storm Surge Inundation Mapping” (AOP1) led by Guam of USA had not yet started the piloting study in Members. WFO Guam is currently soliciting interested Members and then a copy of the program POSSIM will be provided to the interested Members as well as the training on use and update of bathymetry data will be conducted in 2023 and beyond. The Session also noted with pleasure that, up to November 2022, China, Republic of Korea and Thailand expressed their interest in taking part in this project.



66. The Session noted that the project on Application of Hydrological Data Quality Control System in TC Members (AOP2) and the project on Enhancement of Flood Forecasting Reliability with Radar Rainfall Data and Stochastic Technique (AOP3), led by Han River Flood Control Office (HRFCO) of the Republic of Korea in cooperation with Korea Institute of Civil Engineering and Building Technology (KICT) conducted the following activities: (1) organized a joint virtual seminar on 18 November 2022 to introduce the development status on the system, demonstrate the system operation, and listen to Members' needs for future system improvement. The workshop was attended by 12 participants from Republic of Korea, Lao PDR, Philippines Thailand as well as TCS; (2) finalized the establishment of the hydrological data quality control system (PC-version). and the stochastic flood forecasting system; (3) drafted the user manuals for two systems which will be printed after the TC 55th Session in 2023. The Session was informed that two projects will be closed at TC 55th Session and expressed its gratitude to HRFCO and KICT of Republic of Korea as well as all participating Members for their contribution and cooperation during the past 5 years to make the two AOPs successful.
67. The Session noted that the pilot study of Liuxihe Model for the phase-II of the project on Development and Application of Operational System for Urban Flood Forecasting and Inundation Mapping (OSUFFIM-II) for TC Members (AOP4) was continually conducted in China, Malaysia and Philippines with the satisfactory results in 2022. The Session also informed that the following activities will be conducted in 2023: (1) improving parameter optimization for the pilot studies in Malaysia, Philippines, and China; (2) conducting trial operation of real-time flood forecasting of the pilot studies in Malaysia, Philippines, Vietnam, and China; (3) organizing a project workshop, online or face-to-face (TBD); and (4) final conclusion.
68. The Session was informed with pleasure that China-side achieved the following on the project Impact Assessment of Climate Change on Water Resource Variability in TC Members (AOP5) in 2022: (1) the RCCC-WBM model was improved by adding flow duration curve module and software was registered; (2) 25 catchments with different hydro-meteorological characteristics were selected. The improved model was applied to these catchments. The simulation for low flow was well improved by considering flow duration curve; and (3) the Technical Report of "RCCC model and its application for Impact Assessment of Climate Change on Water Resource Variability" was published as TC publication (TC/TD-No. 0023). The scheduled activities for 2023 includes: (1) to organize face to face training workshops in selected TC Members focusing on data acquisition and evaluation, and model calibration and application; (2) to extend RCCC-WBM model application in interested TC Members for assessing climate change impact, and exchange experiences and lessons of model application; and (3) to provide guidance on case studies of typical catchments in interested TC members by using the RCCC-WBM model and understanding practical situation of catchments for supporting climate change adaptation and water resources management.
69. The Session was informed that the scheduled activities for the project on Flood Risk Watch Project for Life-saving (AOP6) in 2022 were implemented in Malaysia, including: (1) MLIT recruited water level gauge (WLG) manufacturers to participate in the 3L WLG test installation plan, and four companies decided to participate in the test installation; (2) Malaysia and Japan have resumed concrete activities to start 3L WLG installation and test observations in the first half of 2022; (3) WLG manufacturers participating in the test construction have developed 3L WLGs that meet Malaysian specifications; (4) all WLG manufacturers brought their 3L WLGs to Malaysia and installed them in the test site, and

- (5) all companies started test observations in late July 2022. The Session also informed that, in 2023, MLIT of Japan will continue to make adjustments of observation accuracy, status of data transfer to the server, and evaluation of observation accuracy according to the specific requirements. The implementation will be completed in April 2023, and MLIT of Japan will share the results of the test observations of 3L WLG in Malaysia with other TC Member.
70. The Session was informed that, in 2022, ICHARM of Japan conducted the following activities for the project of Platform on Water Resilience and Disasters under IFI (International Flood Initiative) (AOP7), including: (1) the hands-on training was conducted for Davao City in the Philippines by remotely gathering 31 participants from different disciplines and sectors of local society; and (2) Online Synthesis System for Sustainability and Resilience (OSS-SR) has been updated to upload local knowledge and status. The Session noted with appreciation that the project will be officially closed at TC 55th Session, and expressed its appreciation to ICHARM for its contribution to this cooperation project.
71. The Session was informed with pleasure that 5 new projects were proposed from Members to be officially launched at TC 55th Annual Session as WGH new AOPs in 2023 and beyond. These included:
- a. Improvement of Hydrological Data Quality Control System by Using AI technology
  - b. Improvement of Flood Forecasting modeling by Using AI technology
  - c. Flood resilience enhancement through Platform on Water Resilience and Disasters
  - d. Training Course on Hydrological Monitoring and Flood Management for Developing Countries
  - e. Synergized Standard Operating Procedures for Coastal Multi-Hazard Early Warning System (SSOP)-Phase III
72. The Session was informed that the project on Improvement of Hydrological Data Quality Control System by Using AI technology during the 5-year period from 2023 to 2027, proposed by HRFCO in cooperation with KICT, will be launched officially at TC 55th Session as WGH new AOP2. The following activities/implementation plan for the project in 2023 are described as: (1) to conduct application and practical testing in 4 pilot target TC Members (Malaysia, Lao P.D.R, Philippines, Thailand); (2) to conduct requirement analysis and gathering the opinions and comments from TC Members; and (3) to update and modify the hydrological quality control system and select the new technique for system upgrading.
73. The Session was informed that the project on Improvement of Flood Forecasting modeling by Using AI technology during the 5-year period from 2023 to 2027, proposed by HRFCO in cooperation with KICT, will be launched officially at TC 55th Session as WGH new AOP3. The following activities/implementation plan for the project in 2023 are described as: (1) to conduct the application and practical testing in TC Members; (2) to conduct requirement analysis and gathering the opinions and comments from TC Members; and (3) to establish the modification plan of the Extreme Flood Forecasting System (EFFS) and select the upgrade item for operating system.
74. The Session was informed that the project on Flood resilience enhancement through Platform on Water Resilience and Disasters during the 5-year period from 2023 to 2027, proposed by ICHARM, will be launched officially at TC 55th Session as WGH new AOP7. The following activities/implementation plan for the project in 2023 are described as: (1) to develop and improve OSS-SR which will integrate knowledge, technology, know-how, and experience of different disciplines related to flood disasters; (2) to conduct capacity

development to foster local Facilitators utilizing OSS-SR as an E-learning tool; (3) to cooperate with Facilitators for disseminating scientific knowledge and technology to local stakeholders relevant to water-related disaster management; and (4) to cooperate to implement the activities above with other working groups of the Typhoon Committee.

75. The Session was reformed that the Training Course on Hydrological Monitoring and Flood Management for Developing Countries, organized by the Ministry of Water Resources, China is a long-term annual training programme for developing countries covering most TC and PTC Members. Combining this annual training course with TC WGH activities as one of the AOPs can benefit TC Members from the training programme through facilitation, expertise and funding resources in future. As requested from Members, China agreed to officially launch the Training Course on Hydrological Monitoring and Flood Management for Developing Countries at TC 55th Session as WGH AOP8 at TC 55th Session. This AOP will be executed in the period of 3 years from 2023 to 2025. An annual two-week training course will be held virtually, hybrid, or face-to-face, with funding support from China, depending on the situation of the COVID-19.
76. The Session noted that WGH recognized the phase-III of Synergized Standard Operating Procedures for Coastal Multi-Hazard Early Warning System (SSOP-III) as a meaningful proposal to TC Members, and agreed to set SSOP-III as WGH AOP9 during the 3-year period from 2023 to 2025. The Session was informed with pleasure that USA would like to play the role as the driver of SSOP-III, and WGH AOPs' leaders expressed their willingness to combine their activities (such as training, missions) and research results with SSOP-III activities.
77. The Session was informed that the project of Knowledge Sharing on the Southeast Asia Flash Flood Guidance System (SeAFFGS), which was proposed at TC 54th Session, is not yet ready to officially launch at TC 55th Annual Session as one WGH AOP in 2023 and beyond. The Session also recognized that flash flooding is a common severe challenge for TC Members. Sharing knowledge of flash flood guidance among Members is important in promoting capacity-building of flash flood related disaster prediction and early warning. MHA of Vietnam has initiated a project on the Southeast Asia Flash Flood Guidance System (SeAFFGS) which will benefit all TC Members. The Session requested MHA of Vietnam to continue considering the possibility of officially launching this project as WGH AOP when it is ready to do so.
78. The Session was informed that considering the change in security policy in the Republic of Korea since 2017, the strategy of maintaining and operating the WGH web-page should be changed and advised to be integrated with TC web-page for an effective maintenance and easy accessibility. The Session expressed its appreciation to HRFCO with cooperation of KICT for their maintaining and operating the WGH web-page in the past years.
79. The Session was informed that Dr. Mamoru MIYAMOTO from Japan was selected to continue serving as WGH Chairperson; Dr. CHO Hyo Seob from Republic of Korea, Dr. HOU Aizhong from China, and Mr. Kenneth KLEESCHULTE from USA to continue serving as Vice-chairpersons for next two years. The Session expressed its gratitude for their hard work and contribution in the past two-year term.
80. The Session noted with pleasure that as the situation of COVID-19 epidemic improves, WGH plans to enhance the cooperation with RAII Coordination Panel on Hydrology and Water Resources (CPH, former RAII Working Group on Hydrological Services) under the

coordination of TC WGH vice chairperson Dr. Hyo-Seob CHO as the Chair of the WMO RAI CPH. The Session also noted with gratitude that Dr. Hwirin Kim, Head of Hydrological and Water Resources Services Division (HWR) of WMO, had a very positive response in encouraging synergy between TC WGH and RAI CPH.

## Conclusions of WGH

81. On the basis of the discussion and outcomes at the 11th WGH working meeting and the parallel session of TC 17th IWS, participants recognized the importance in the following aspects for further direction of WGH:
  - a. The 11th WGH working meeting was held in a hybrid format. Participants from 5 Members joined the face-to-face meeting in Tokyo, Japan. To a certain extent, it made the meeting more effective and efficient, especially to the sessions of technical discussion. Face-to-face meetings should be encouraged as far as possible in the future if COVID-19 conditions allow.
  - b. Due to climate change and urbanization, extreme hydro-meteorological events occur more frequently than in past decades. Flash floods and landslides caused by local heavy rainstorms have become a major disaster risk, and its forecasting and warning presents a challenge in the Asia and Pacific region. Every year, flash floods and landslides result in significant economic damage and loss of life in TC Members. WMO Secretariat and National Meteorological and Hydrological services (NMHSs) have paid close attention and made great efforts on promoting the capacity of flash flood disaster forecasting and early warning. The WMO has agreed to establish Vietnam National Meteorological and Hydrological Administration (VNMHA) as a Regional Center for developing and implementing the Southeast Asian Flash Flood Guidance System (SeAFFGS), and the project on SeAFFGS was launched officially in Ha Noi, Viet Nam on 28 June 2022. To share the knowledge of flash flood guidance among Members, MHA of Vietnam was encouraged to officially launch this project as WGH AOP when it is ready to do so.
  - c. SSOP phase-I focused on analyzing status and summarizing the knowledge of operating procedures for coastal multi-hazard early warning systems. SSOP phase-II focused on training and sharing the synergized knowledge on standard operating procedures (SOP) achieved from phase-I. SSOP-III is proposed to practice the knowledge of SSOP in operating procedures for coastal multi-hazard early warning, and will focus on the last mile at the local level. The proposed practice of SSOP will enable Members to know and practice the SOP for coastal multi-hazard early warning, therefore promoting the capacity of coastal multi-hazard disaster risk reduction. As a very important link to coastal multi-hazard early warning and disaster risk reduction, the hydrological component should be closely involved in the proposed SSOP phase-III.
  - d. It is recognized that training is an effective and important measure for TC Members to improve the capacity of their professional staff. In past years, WGH conducted a series of activities related to training courses and workshops including on-the-job training and achieved favorable results. In 2021, Nanjing Research Institute of Hydrology and Water Conservation Automation (NIHWA), the Ministry of Water Resources, China set a long-term programme of an annual training course on hydrological monitoring and flood management for developing countries, covering some Members of TC and PTC. WGH discussed the merits of this programme to TC Members on sharing the resources including facilities, expertise and funding

- resources. On this connection, combining this long-term annual training programme with TC WGH activities as one of its AOPs should greatly benefit both TC and China.
- e. Due to the impact of COVID-19 in the past 3 years, the virtual conference became a normal format for WGs' annual meeting and TC integrated workshop (IWS). Due to the time difference and limited agenda, it is very hard for AOP leaders to have enough time for deep technical explanation and discussion at WGs' meetings and TC IWS. To resolve this problem, all AOP leading Members are encouraged to conduct extra workshops or training courses for their AOPs (virtual, hybrid, or face-to-face) with the purpose of deep technical training and discussion for AOP's implementation so as to keep its momentum and sustainability.
  - f. It is a consensus that the working meeting of WGH is very important to review and push forward hydrological activities, and is very necessary to prepare IWS and annual session. WGH appreciated the generous contribution from the Republic of Korea and Japan in the past years for hosting WGH working meetings. WGH also encouraged more Members to host its working meeting.
  - g. As the situation of COVID-19 epidemic improves, WGH agreed to continue enhancing the cooperation with RA II, PTC and other regions, under the Cooperation Mechanism between TC and PTC, through involving more participants from outside of Typhoon Committee region in WGH working meeting. WGH is willing to make a synergy between TC WGH and RAI CPH (former WGHW) under WMO umbrella.

## **Recommendations of WGH**

82. Based on the deep discussion and communication, participants agreed to submit the following recommendations to the Committee at TC 55th Annual Session:
  - a) to re-appoint Dr. Mamoru MIYAMOTO from Japan as Chairperson, and to re-appoint Dr. CHO Hyo Seob from Republic of Korea, Dr. HOU Aizhong from China, and Mr. Kenneth KLEESCHULTE from USA to continue serving as Vice-Chairpersons for WGH in next two years.
  - b) to request US\$25,000 from TCTF for supporting overall WGH activities for 2023 calendar year.
  - c) to thank Japan for hosting the hybrid conference for the 11th WGH Working Meeting on 18-19 October 2022.
  - d) to request Japan and Thailand to jointly-host the 12th WGH working meeting in Bangkok, Thailand in 2023.
  - e) to approve the project of "Improvement of Hydrological Data Quality Control System by Using AI technology" from the Republic of Korea as WGH AOP2 in the period from 2023 to 2027.
  - f) to approve the proposal of "Improvement of Flood Forecasting modeling by Using AI technology" from the Republic of Korea as WGH AOP3 in the period from 2023 to 2027.
  - g) to approve the proposal of "Flood resilience enhancement through Platform on Water Resilience and Disasters" from Japan as WGH AOP7 in the period from 2023 to 2027.
  - h) to approve the proposal of "Training Course on Hydrological Monitoring and Flood Management for Developing Countries" from China as WGH AOP8 in the period from 2023 to 2025.
  - i) to approve the proposal of "Synergized Standard Operating Procedures for Coastal Multi-Hazard Early Warning System (SSOP)-Phase III" as WGH AOP9 in the period from 2023 to 2025, and the USA plays the role of driver of this AOP.

- j) to thank HRFCO with cooperation of KICT, Republic of Korea for maintaining and operating the WGH web-page in the past year.
- k) to continue focusing on improving the ability to forecast hydrological phenomena and provide measures for the effectiveness of the improvements.

### **8.3. Disaster Risk Reduction Component**

- 83. During the 17th Integrated Working Group DRR parallel virtual meeting on 29 November 2022, the WG reviewed its activities and its Annual Operating Plans (AOPs) for 2022. Please refer to **Appendix XII** for details.
- 84. Dr. Jongseol LEE Chair of WGDRR welcomed all the members online and delivered the opening remarks. He emphasized the importance of WGDRR review of the AOP 2022 and the Plan of working for 2023. It was a great chance for cooperation of WGDRR as well as the contribution to the future of the world.
- 85. Dr Chihun LEE, NDMI, moderated the meeting and welcomed all the members and representatives. Participants were invited to introduce themselves during the meeting and a group photo was taken.
- 86. 22 members and representatives from ESCAP, WMO, Republic of Korea, ADRC, Japan, Lao PDR, Malaysia, Philippines, Thailand, USA, Vietnam, China, Hong Kong, China and TCS.
- 87. The Working Group passed the following AOPs 2022:
  - a. AOP1. Capacity Building / Knowledge Sharing (NDMI)
    - i. NDMI and NOAA held the Knowledge Sharing program in Guam on 26 July 2022. A total of 20 experts, including those from the Office of Civil Defense and the American Red Cross, attended the program.
    - ii. 7 experts from NDMI delivered presentations on disaster management, drought, satellite monitoring, landslides, and disaster investigation.
  - b. AOP2. Setting up Early Warning and Alert System (NDMI)
    - i. NDMI launched the project for strengthening capabilities of disaster risk reduction with the Philippines from 2013 to 2015.
    - ii. An Early Warning and Alert System was installed in Toledo and Dumanjug City, in the province of Cebu, Philippines in October 2022.
    - iii. NDMI conducted the field survey to choose sites for constructing systems from 12-18 June 2022 in Toledo & Dumanjug
    - iv. Feasibility studies were conducted and included site visits, land surveys and meetings with local offices
  - c. AOP3. WGDRR Annual Meeting (NDMI)
    - i. Due to the COVID situation, WGDRR annual meeting had been using the online mode since 2020. If the situation in 2023 permits, it will return to a face-to-face meeting in Korea. If not, it will remain in the online format.
  - d. AOP4. Benefit Evaluation of Typhoon DRR (STI)
    - i. Dr. PEIYUN from Shanghai Typhoon Institute (STI), China Meteorological Administration (CMA) presented the progress of the benefit Evaluation of Typhoon DRR.

- ii. This Project was led by STI and aims to establish a set of evaluation indices and to provide an evaluation report that assists in the decision-making basis for the optimization of typhoon disaster behavior. It included the research of the validity of STIDM, the development of a real time simulation system of typhoon rainstorm waterlogging over Shanghai, an update the operational pre-assessment system of risk caused by TCs and an update to the database of damage caused by TCs over the WNP
  - iii. A real - time flood simulation system in Shanghai is developed and tested by historical cases.
  - iv. Taking Shanghai as an example, a town-scale operational pre-assessment system of TC hazards for a megacity was tested during Muifa 2022.
- e. AOP5. Sharing Information related to DRR
- i. WGDRR will continue to exchange information and experience related to DRR through the forum on the TC website. Members are welcome to upload DRR information such as data and video clips to the TC website.
- f. AOP6. Making Education Videos related to DRR (HKO)
- i. A video titled “Does a closer distance of a tropical cyclone from Hong Kong always mean a greater threat?” was translated into English with voiceover and subtitles as the coming education video related to DRR. The Hong Kong Observatory (HKO) shared the video during the meeting and no further comment was received from the members. The video was uploaded to the Typhoon Committee website and WMO’s YouTube Channel for members to use on public education on DRR.
- g. AOP7. Seminar for TC Crowd-sourcing High Density Non-conventional Weather Data (HKO)
- i. An online seminar for TC crowd-sourcing high density non-conventional weather data for TC members was held on 5 July 2022. During the seminar, two talks on the “Pilot Crowd-Sourcing Scheme” and “Establishment of Microclimate Station Network in Hong Kong ” were delivered by HKO. AOP 7 was regarded as accomplished after this online seminar.

## Conclusions of WGDRR

88. Based on information provided by the Members, the reports presented by project coordinator/leader, and findings of the parallel session on WGDRR, the following conclusions were reached:
- a. With the continuous travel restrictions and risk of infection of COVID-19, most of the face-to-face meetings, including the 17th WGDRR annual meeting and the seminar for TC crowd-sourcing high density non-conventional weather data hosted by HKO, were conducted online. Projects such as Capacity Building/knowledge Sharing Program, setting up of Early Warning and Alert System in Philippines, benefit evaluation of Typhoon DRR (STI), making an educational video related to DRR, and DRR information sharing were successfully implemented.
  - b. The 17th WGDRR annual meeting was hosted by NDMI Korea on 21 October 2022 to discuss the issues related to WGDRR activities. WG reviewed the AOPs implementation with the budget expenditure in 2022 and proposed the plans for 2023. In addition to the TC DRR members, ADRC, WMO and ESCAP were also invited to the meeting to provide comments for WG.

- c. WGDRR decided to continue conducting the disaster management capacity-building projects among TC Members through the exchange and sharing of information . Examples included participation in DRR world conferences, organizing the expert team to selected member states, using an effective platform to exchange DRR information, and holding the WGDRR annual meeting.
- d. The project of Capacity Building/Knowledge Sharing in DRR resumed in 2022. NDMI and NOAA held the Knowledge Sharing program in Guam, on 26 July 2022. A total of 20 experts attended the program, including the Guam Office of Civil Defense and the American Red Cross. 7 experts from NDMI provided presentations on disaster management around topics of drought, satellite monitoring, landslides, and disaster investigation.
- e. WGDRR decided to continue the projects related to public education on DRR for promotion in the coming future which can raise public awareness on typhoon related disasters.
- f. At the 17th WGDRR annual meeting, HKO expressed that they could continue contributing educational videos related to DRR for TC DRR public education use. HKO will continue to lead this project.
- g. An online seminar for TC crowd-sourcing high density non-conventional weather data for TC members was held on 5 July 2022. During the seminar, two talks on the “Pilot Crowd-Sourcing Scheme” and “Establishment of Microclimate Station Network in Hong Kong” were delivered by HKO. AOP7 was regarded as accomplished after this online seminar.
- h. For implementation of the proposed projects in 2023, WGDRR proposed the request of USD 15,500 to be allocated by the TCTF for the following items:
  - i. To allocate USD 12,500 budget of TCTF in 2023 for capacity building/knowledge sharing in DRR
  - ii. To allocate USD 3,000 budget of TCTF in 2023 for making education video related to DRR

## **Recommendations of WGDRR**

89. Based on the conclusions, the WGDRR made the following recommendations:
- a) To request NDMI to organize the team to the selected member for the project of capacity building and knowledge sharing in DRR
  - b) To request NDMI to continue supporting the development and improvement of the early warning and alert systems related to typhoon disasters in the participating members
  - c) To request NDMI to continue supporting and hosting the WGDRR Annual Meeting in 2023 in ROK.
  - d) To request STI, China to continue conducting the research of the project of benefit evaluation of typhoon disaster prevention and preparedness.
  - e) To encourage the Members to share information related to DRR on the established forum of TC Website.
  - f) To request HKO to continue providing WGDRR with videos related to typhoon disaster or severe weather, and to translate it into English version (voiceover and subtitle) for members to use on DRR public education.
  - g) To request the cooperation of the Synergized Standard Operating Procedures for Coastal Multi-Hazard Early Warning System Phase 3 concept (SSOP-III) with WGDRR.
  - h) To request the Typhoon Committee to approve the proposed projects and related budget in 2023.



#### **8.4. Training and Research Coordination Group (TRCG)**

90. The Committee took note of the progress made in training and research activities as presented in the TRCG Report 2022 (**Appendix XIII**)
91. The Committee appreciated China for successfully organizing the Seventh International Distance Training Course on Tropical Cyclone Monitoring and Forecasting from 24 October to 4 November 2022. A total of 172 participants from 48 countries and regions joined the training workshop, including 21 trainees from TC Members.
92. The Committee recognized that the RSMC Tokyo Training Attachments were successively held on 11-13 January 2023 with a total of 51 participants in the Attachment. The Committee thanked Japan and WMO TCP for continuous support in this capacity-building initiative.
93. The Committee thanked Hong Kong, China for hosting the research fellowship project in 2022/2023.
94. The Committee recognized the efforts of TRCG to develop a training programme and to identify and recommend experts for the Typhoon Forecasting Techniques Workshop hosted by Malaysia in October 2022 under a WGM PP.
95. The Committee was informed about the proposed plan to further postpone the 4th TRCG Forum and TRCG Planning Meeting to Q4 of 2023 in conjunction with the 18th IWS.
96. The Committee noted that the Roving Seminar would be conducted in Q2 of 2023 in Hanoi, Vietnam.
97. The Committee recognized TRCG's collaboration with the Asia-Pacific Typhoon Collaborative Research Center (AP-TCRC) to develop a draft attachment programme and research topic for the time-bound Pilot Project.
98. The Committee appreciated TRCG for organizing a half-day Special Session at the 17th IWS on 30 November 2022 with presentations from invited experts from WGs on the latest development of tropical cyclone analysis and forecasting techniques, applications of remote sensing data and AI/ML methods.
99. The Committee appreciated TRCG's inputs in support of training and research activities in connection with TC's cross-cutting projects.
100. The Committee noted that Mr. WONG Wai-Kin of Hong Kong, China will step down from the Chairperson of TRCG, and the nominations of Dr Anh Tien DO of Vietnam as the new Chairperson and Mr. CHOY Chun-wing of Hong Kong, China as the new Vice Chairperson.

#### **Recommendations of TRCG:**

101. Based on the conclusions reached by the deliberation of Members, the TRCG made the following recommendations:
  - a) To request Members to confirm their respective focal points as members of TRCG and update the list of resource persons as appropriate.

- b) To endorse the priority training and research areas as proposed in TRCG Annual Report 2022.
- c) To endorse the TRCG Work Plan for 2023-2024 and AOP 2023 (with Q1 of 2024) including the hosting of the Roving Seminar, the 4th TRCG Forum and TRCG Planning Meeting under the support of TCTF, and other budget requests which are incorporated into the budget proposal to be submitted by AWG.
- d) To appoint Dr Anh Tien, DO (Vietnam) as the new Chairperson of TRCG, replacing Mr. WONG Wai-kin.
- e) To appoint Mr CHOY Chun-wing (Hong Kong, China) as the new (co-)Vice Chairperson of TRCG.
- f) To re-appoint Dr CHA Eun Jeong (Republic of Korea) as the (co-)Vice Chairperson of TRCG.

## **IX. REPORTS OF THE TCS AND AWG (agenda item 9)**

### **9.1 Activities of TCS**

- 102. The Committee took note of the report of the Typhoon Committee Secretariat (TCS) and further recommendations submitted by TCS. (**Appendix XIV**)
- 103. The Committee noted with appreciation the TCS's 2022 activities in order to enhance coordination and support to Members and coordinate WG activities.
- 104. The Committee noted with high appreciation to the Macao Government for the strong support to TCS in the past years and its cooperation to renew and implement the Agreement between the Government of the Macao Special Administrative Region of the People's Republic of China and the ESCAP/WMO Typhoon Committee regarding Administrative, Financial and Related Arrangements for the Typhoon Committee Secretariat.
- 105. The Committee expressed appreciation to Members for their donation to the Typhoon Committee Trust Fund and in-kind contributions and encouraged Members to continue to support activities of the Committee.

### **9.2 Activities of AWG**

- 106. The Committee was informed of the activities and major issues discussed at the AWG Meetings in 2022 and prior to the 55<sup>th</sup> Session of the Typhoon Committee (**Appendix XV**).
- 107. The Committee was informed of the proposed budget for 2023/2024, including the items in support of non-recurring items for special funding consideration.
- 108. The Committee noted with appreciation the review on the future meeting approaches of major activities of TC conducted by AWG and was informed of AWG's recommendations based on this review (**Appendix XVI**).

### **Recommendations of AWG**

- 109. The AWG made the following recommendations:

- a) Recognize and thank Lao PDR for their leadership and great effort in hosting the 54th Session of the Typhoon Committee virtually in February 2022.
- b) Recognize and thank TCS for their exceptional effort in preparing and hosting the 17th Integrated Workshop virtually in November 2022.
- c) Thank TCS for arranging the “voting by correspondence” for the appointment of the next TC Secretary (2023-2026/early 2027) and appreciate ESCAP’s kind assistance in the backup arrangement of the voting.
- d) Take note of the further postponement of the 4th TRCG Forum due to the COVID-19 pandemic.
- e) Re-appoint Dr. T. C. LEE (Hong Kong, China) and Mr. Tom EVANS (USA) as Chair and co-Vice Chair of the AWG respectively for the second 2-year term.
- f) Endorse AWG’s recommendations on the future meeting approaches of TC activities as provided in **Appendix XVI**, including the proposal of shortening the duration of the Integrated Workshop (IWS).
- g) Take note of the progress and recommendations made in the planning and implementation of TC activities, including review of the expenditure of WGs and the preparation of the budget for 2023/2024.

#### **X. APPOINTMENT OF THE NEXT TC SECRETARY (2023-2026/EARLY 2027) (agenda item 10)**

110. The Committee took note of the Report by TCS on the nomination and selection of the Secretary for the period 2023-2026/early 2027 (**Appendix XVII**). The final result of voting by correspondence, elected Dr. DUAN Yihong, from China. The Committee appointed Dr. DUAN Yihong, from China as the new TC Secretary in succession to Mr. YU Jixin.
111. The Committee expressed its highest appreciation to Mr. YU Jixin for his excellent work and great contribution in the past 8 years during which he served with the Committee as Secretary by earnestly enhancing the capacity-building of Secretariat, effectively executing the decisions of the Committee, wisely coordinating the activities of WGs, and promoting the visibility of the Committee in the region.
112. The Committee noted the request of Dr. DUAN Yihong for Mr. YU Jixin to continue to serve as TC Secretary until Dr. DUAN assumes duty as new TC Secretary around April/May 2023.

#### **XI. PROPOSAL FOR THE SSOP III PROJECT (agenda item 11)**

113. The Committee noted the presentation on the proposal for the SSOP III to the UNESCAP Multi-Donor Trust Fund for Tsunami, Disaster and Climate Preparedness (**Appendix XVIII**).
114. The Committee endorsed the submission for an SSOP III project to the UNESCAP Multi-Donor Trust Fund for Tsunami, Disaster and Climate Preparedness.

## **XII. PUBLICATIONS (agenda item 12)**

### **12.1 Publications by TCS**

115. The Committee took note of the publications of the Typhoon Committee in 2022. **(Appendix XIX)**
116. The Committee noted with appreciation all Members' contributions to the publications of Typhoon Committee which have promoted the visibility and transparency of TC. Also, the Committee further urged Members to take measures and actions for continuing support to the TC publication and making contributions to the TCRR Journal especially.

### **12.2 Publications by WMO**

117. The Committee took note of the publications from WMO. The publications can be consulted on the WMO website.

### **12.3 Publications by ESCAP**

118. The Committee took note of the publications from ESCAP.

## **XIII. PROGRAMME FOR 2023 AND BEYOND (agenda item 13)**

### **13.1. Retired and new tropical cyclone names (Appendix XX)**

119. The Committee noted the request from the Philippines to replace CONSON, KOMPASU, RAI, MEGI, MA-ON, NORU and NALGAE.
120. The Committee noted the request from the Republic of Korea to replace HINNAMNOR.
121. The Committee noted the email from the United Kingdom Met Office for issues with MALAKAS.
122. The Committee took note the retirement of the names of tropical cyclones CONSON, KOMPASU, RAI, MEGI, MA-ON, NORU, NALGAE, HINNAMNOR and MALAKAS and requested TCS to issue letters to the relevant Members (Socialist Republic of Viet Nam, Japan, the United States of America, Republic of Korea, Hong Kong, China, Democratic People's Republic of Korea, Lao People's Democratic Republic and the Philippines) to provide replacement names in accordance with the Committee's procedure.

## **XIV. COORDINATION WITH OTHER ACTIVITIES OF THE WMO TROPICAL CYCLONE PROGRAMME (agenda item 14)**

123. The Committee was presented about activities under **Appendix XXI**, and those requiring coordination through TCP. It appreciated the comprehensive presentation, and thanked the WMO for its support to the Committee.
124. The Committee was informed of EC-75 (June 2022) Resolutions/Decisions relevant to tropical cyclones:

- a. Decision 3.1(3)/1 (EC-75) - Proposed Approaches to the Business Continuity and Contingency Planning to ensure uninterrupted provision of services during hazardous conditions.
  - b. Resolution 4(2)/1 (EC-75)- UN Global Early Warning / Adaptation Initiative to address the request by UN Secretary-General Dr António Guterres for WMO to lead and to prepare for a plan of action to enable the early warning systems to cover everyone within 5 years.
125. The Committee was further informed that EC-76 (17 February - 3 March 2023) approved resolutions/decision/recommendation relevant to tropical cyclones, among others:
- a. Resolution 3.1(10)/1 (EC-76) - 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. This Guide will promote and support WMO Members prone to tropical cyclones to develop/establish their effective national disaster risk management and response coordination mechanisms, protocols and procedures. It will be published soon as per EC-76 resolution.
  - b. Resolution 3.1(2) (EC-76) - Tropical Cyclone Forecasting Competency Framework – that decides to add the five regional Tropical Cyclone Forecaster Competencies (one for each of the Tropical Cyclone Programme regional bodies) to the Compendium of WMO Competency Frameworks (WMO-No. 1209).
  - c. Resolution 3.1(13)/1 (EC-76) - WMO Coordination Mechanism Implementation Plan – that is facilitating the access to meteorological, hydrological, climate information and data for UN & humanitarian organizations.
  - d. Decision 4(2)/1 (EC-76) - UN Early Warnings for All Initiative Follow-Up - that decided to establish an Expert Team on Early Warning Services (ET-EWS) under the SERCOM Standing Committee on Disaster Risk Reduction and Public Services (SC-DRR). The ET-EWS will be responsible for implementing the UN Early Warnings for All Initiative under Resolution 4(2)/1 (EC-75) mentioned above.
  - e. Recommendation 9(1)/1 (EC-76) to 19th WMO Congress (22 May – 2 June 2023) - Review of previous resolutions of Congress - that recommended maintaining the WMO Tropical Cyclone Programme (Res 23/Cg-XVI).
126. The Committee was informed that the 10th International Workshop on Tropical Cyclones (IWTC-10) was held in Bali, Indonesia, from 5 to 9 December 2022. The workshop was hosted by the Agency for Meteorology, Climatology, and Geophysics of the Republic of Indonesia (BMKG-BADAN METEOROLOGI, KLIMATOLOGI, DAN GEOFISIKA), in face-to-face modality, and supplemented with simultaneous online mode for its plenary sessions. This is a quadrennial gathering jointly organized by WWRP and TCP. Overall, the workshop was attended by more than 120 in-person participants and over 300 registered online. The main objectives of IWTC are: 1) to report on current knowledge, forecasting and research trends on tropical cyclones from an integrated global perspective; 2) to foster communication within and between operational and research communities; and 3) to identify needs and opportunities in tropical cyclone operational and research and recommendations for actions that will improve the global knowledge of, and response to, tropical cyclones. All the reports, presentations, and recordings are available on the IWTC-10 [website](#). In total, 22 recommendations were made from the workshop. Additionally, 11 Members of the Committee were physically represented in the IWTC-10.
127. The Committee was informed that the Advisory Group on Tropical Cyclone (AG-TC) under the SC-DRR of SERCOM organized two meetings with AG-TC-2 that was conducted online on 07 and 09 June 2022, and AG-TC-3 that was conducted on hybrid mode on 10 December

2022 in Bali, Indonesia, back-to-back with the IWTC-10. The AG-TC is looking after the global/general component of the TCP. The AG-TC meetings addressed several important issues with recommendations as follows:

- a. WMO GDPFS centers' compliance review.
  - b. WMO Coordination Mechanism (WCM) and the Weather4UN project.
  - c. Tropical Cyclone - Probabilistic Forecast Products (TC-PFP) Project.
  - d. Review of the GDPFS Manual related to appendices on TC matters.
  - e. International Workshop on Tropical Cyclones – 10th session (IWTC-10) – recommendations.
  - f. Tropical Cyclone Forecaster Competency.
  - g. Development of Tropical Cyclone Impact-based Forecasting products – Implementation Decision 10 (EC-68).
  - h. WMO Guide for National Meteorological and Hydrological Services in Support of National MHEWS Procedures, Coordination Mechanisms, Systems and Services – Tropical Cyclones.
128. The Committee noted with appreciation that many tropical cyclone training activities were organized in 2022 to support capacity development of the Members to meet competency and skills requirements for tropical cyclone forecasting and services as set in regional tropical cyclone competencies.
129. 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 harmonized approaches toward tropical cyclones.
130. The Committee was informed that all activities in relation to TCP under the WMO Annual Operating Plan were well implemented without delay in 2022. There were no impacts by Covid-19 during the implementation of TCP activities. The Committee expressed sincere appreciation to the WMO Secretariat and Members for making all possible efforts to work closely to enable them to carry out TCP activities with success.
131. The Committee Members were notified of the following matter: In context of NESDIS/SAB potentially discontinuing Dvorak fixes globally, there is an inquiry as to which agencies are providing subjective Dvorak fixes in various regions. In the Typhoon Committee region, which agencies are providing those Dvorak analyses? Are they publicly available, through GTS/WIS? Or through webpages?

## **XV. SUPPORT REQUIRED FOR THE COMMITTEE'S PROGRAMME (agenda item 15)**

### **15.1. Typhoon Committee Trust Fund (TCTF)**

132. The Committee reviewed the provisional statement of account of TCTF for the period of 1 January to 31 December 2022 as in Appendix B and the final statement for 1 January to 31 December 2021 as in Appendix C, submitted by the representative of the WMO Secretariat (**Appendix XXII**). The statement for 2021 had been audited by WMO external auditors. The auditing report for 2021 statement had been communicated to TCS. The Committee expressed appreciation to WMO Secretariat for its good management of the TCTF.

133. The Committee encouraged its Members to continue and possibly enhance Members' contribution to the Fund, although on a voluntary basis, for the purpose of sustainability and supporting activities of the Committee.
134. The Committee was informed by TCS, the summary of income and expenditure from 1 January to 31 December 2020 and 2021 and the provisional summary of income and expenditure for 2022 related to the execution of the Work Plan 2020, 2021 and 2022. In addition, a provisional summary of income and expenditures from 1 January to 31 March 2023 and summary of TCTF budget 2020/2021, 2021/2022 and 2022/2023 with additional three months from January to March 2021 to 2023 was provided as reference. **(Appendix XXIII)**

### **15.2. In-kind Contributions**

135. The Committee expressed appreciation for the in-kind contributions from some Members, namely China; Hong Kong, China; Japan; Malaysia; the Philippines; Republic of Korea; Thailand and USA. The Committee also invited the other Members to report their in-kind contributions, quantifying the corresponding unit of Man-months that have consumed in actions related to TCTF projects. **(Appendix XXIV)**.
136. The Committee also expressed the importance of having in-kind contributions with correspondence values.

### **15.3. Approval of Typhoon Committee Trust Fund (TCTF) 2023/2024 Budget**

137. The Committee noted that the allocation from normal and special budget by WG's has been approved by the Chair of Typhoon Committee and Secretary of the Typhoon Committee.
138. The Committee discussed and approved the budget proposal for 2023/2024. **(Appendix XXV)**

## **XVI. REPORT ON THE PROGRESS OF ASIA-PACIFIC TYPHOON COLLABORATIVE RESEARCH CENTER (AP-TCRC) (agenda 16)**

139. The Committee noted the report on the progress of AP-TCRC in 2022. **(Appendix XXVI)**.
140. The Committee approved the recommendations of the AP-TCRC to:
- a) recommend 3 experts from TC, namely Dr. Vicente MALANO (the Philippines), Dr. Mamoru MIYAMOTO (Japan) and Dr. Eun Jeong CHA (Republic of Korea), as International Scientific Steering Committee (ISSC) Members for AP-TCRC;
  - b) approve the Pilot Project with TRCG; and
  - c) appreciate the kind support from Shanghai Typhoon Collaborative Research Fund (STCRF).

## **XVII. DATE AND PLACE OF THE 18<sup>th</sup> IWS (agenda 17)**

141. The Committee took note that the 18<sup>th</sup> IWS will be held in conjunction with the 4<sup>th</sup> TRCG Forum in ESCAP conference facilities from 27 November to 1 December 2023. The final arrangements will be confirmed in due course by TCS and ESCAP.

### **XVIII. DATE AND PLACE OF THE 56<sup>th</sup> SESSION (agenda 18)**

142. The Committee was informed of the kind offer of Malaysia to host the 56<sup>th</sup> Session in Malaysia. The tentative dates would be the first week of March in 2024 and the final arrangements will be confirmed and later communicated to TCS.

### **XIX. HOSTING OF THE 19<sup>th</sup> IWS AND 57<sup>th</sup> TC SESSION (agenda 19)**

143. The Committee took note, and by following the updated sequential list of Annual Sessions and IWS, that China will host the 19<sup>th</sup> IWS in 2024. The final date and place will be confirmed in due course by China and later communicated to TCS

144. The Committee was informed that the Philippines is willing to host the 57<sup>th</sup> Session of Typhoon Committee in 2025. The final date and place will be confirmed in due course by the Philippines and later communicated to TCS.

### **XX. OTHER BUSINESS (agenda 20)**

145. The Committee noted that the Roving Seminar in 2023 will be held in Hanoi, Vietnam by the end of June. The TRCG will communicate to TCS for the preparation.

### **XXI. CLOSURE OF THE VC SESSION (agenda 21)**

146. The delegates from the Members of the Typhoon Committee expressed their thanks and appreciation to Macao, China and TCS's support for the successful hosting and organizing the VC of the 55<sup>th</sup> Session of the Typhoon Committee in this unprecedented time.

147. The Chairperson of TC55 delivered the closing remark for the TC55 VC.

148. The VC Session was closed by the Chairperson at 11:54 am, 09 March 2023 (Hong Kong Time).