



# 49<sup>th</sup> ESCAP/WMO TYPHOON COMMITTEE Session Report

Yokohama • Japan 21-24 February 2017



ESCAP/WMO  
Typhoon Committee



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**Forty-Ninth Session of Typhoon Committee**

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**REPORT OF THE FORTY-NINTH SESSION  
OF TYPHOON COMMITTEE**

**Yokohama, Japan  
21- 24 February 2017**

**PART I – DECISIONS OF THE COMMITTEE**

1. The Committee decided to:
  - a. Approve the recommendations submitted by Credential Committee as provided in the **Appendix III**.
  - b. Approve the Typhoon Committee Operational Manual (TOM) with the amendments provided in the **Appendix XIII**.
  - c. Approve the recommendations submitted by Working Group on Meteorology (WGM) as expressed in **paragraph 51**.
  - d. Approve the recommendations submitted by Working Group on Hydrology (WGH) as expressed in **paragraph 70**.
  - e. Approve the recommendations submitted by Working Group on Disaster Risk Reduction (WGDRR) as expressed in **paragraph 91**.
  - f. Approve the recommendations submitted by Training and Research Coordination Group (TRCG) as expressed in **paragraph 99**.
  - g. Approve the recommendations submitted by Typhoon Committee Secretariat (TCS) as presented in **paragraph 103**.
  - h. Request AWG to follow up on the need for an Executive Summary as expressed **paragraph 29**.
  - i. Approve the Terms and Conditions of the EXOTICCA as provided in **Appendix VIII**.
  - j. Request TCS to invite Members to join based on the Terms and Conditions of EXOTICCA, expressing the benefits on joining the project.
  - k. Set up Steering Committee (SC) for SSOP-II, which will be composed of AWG Chair, TC Secretary and PTC Secretary.
  - l. Request SSOP-II SC to engage a Project Manager through consultation with TC and PTC Members.
  - m. Request TCS to communicate with ESCAP on RIMES involvement in the SSOP-II.
  - n. Approve Mr. Raymond TANABE from USA as the Chairperson of AWG; Mr. Chiashi MUROI from Japan and Dr. T. C. LEE, from Hong Kong, China to serve as Vice-Chairpersons of AWG.
  - o. Approve the Long Term Mechanism for TC Secretary Appointment as **Appendix XXI**.
  - p. Accept the kind offer from Macao, China to host TCS for another four-year period from 2019 to 2022.
  - q. Approve the Strategic Plan 2017-2021 as shown in **Appendix XXIII**.
  - r. Request WGs review the priorities in the Strategic Plan 2017-2021 and submit updates

every year, as appropriate for approval at Sessions.

- s. Request the WGs to align future activities, including AOPs, with the Strategic Plan.
- t. Approve the activities for the celebration of the 50<sup>th</sup> Anniversary of Typhoon Committee as shown in **Appendix XXIV**.
- u. Approve the proposal to establish a TECO Task Team and a TC50 Session Task Team.
- v. Request TCS to send letters informing Members about TECO and TC50 Session Task Teams and to invite Members to nominate representatives to join the TC50 Session Task Team.
- w. Approve the dates for the TECO from 26 to 27 February 2018 and for TC50 Session from 28 February to 03 March 2018, which will be held in Ha Noi, Viet Nam.
- x. Approve KOGUMA, CEMPAKA, SAUDEL and SURIGAE as replacement names for KOPPU, MELOR, SOUDELOR and MUJIGAE, respectively, in the list of the names of tropical cyclones.
- y. Approve retirement of the names of tropical cyclone HAIMA, SARIKA, NOCK-TEN, MERANTI and request TCS to issue letters to relevant Members (China, Cambodia, Lao, PDR and Malaysia) to provide replacement names in accordance with the Committee's procedure.
- z. Approve the 2017/2018 Budget as presented below (see **Appendix XXVIII** for detail):

<b>By Group</b>	2017/2018
	<b>Proposed</b>
TCS	33,000.00
<b>ALL WGS (IWS ONLY)</b>	<b>50,000.00</b>
TRCG	7,500.00
WGM	21,000.00
WGH	14,000.00
WGDRR	21,500.00
<b>TOTAL</b>	<b>147,000.00</b>
<b>Plus</b>	
Special Request Budget for WGs and TC50 events	96,000.00
<b>Total</b>	<b>96,000.00</b>
<b>Total Proposed Budget plus Special Request Budget in 2017 and TC50 events in 2018</b>	<b>243,000.00</b>

- aa. Approve the change of TC financial period from 01 January-31 December to 01 April-31 March each year to facilitate the expenditure early in the calendar year required in support of the organization of the annual Session.
- bb. Accept the kind offer of Republic of Korea to host the 12th IWS, possibly in conjunction with the TRCG Meeting. The proposed dates are 30 October-03 November 2017 in Jeju, Republic of Korea.
- cc. Request TCS to work with WG Chairs on the theme for the 12th IWS and to consider including a session for EXOTICCA. Request TCS to circulate the proposed arrangements to Members.
- dd. Accept the kind offer of Thailand to host the 13<sup>th</sup> IWS in 2018, pending final formal government approval. The final date and place will be confirmed in due course by Thailand and later communicated to TCS.

## PART II – PROCEEDINGS OF THE COMMITTEE

### I. ORGANIZATION OF THE SESSION

2. The Forty-Ninth Session of the ESCAP/WMO Typhoon Committee (TC) was held at the Pacifico Yokohama, Yokohama, Japan, from 21 to 24 February 2017.

The Session was attended by **98** participants from 13 of 14 Members of the Typhoon Committee, namely: Cambodia; China; Hong Kong, China; Japan; Lao People's Democratic Republic (PDR); Macao, China; Malaysia; 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 Session.

The Session was attended by observers from Asian Disaster Reduction Center (ADRC), Joint Typhoon Warning Center (JTWC), International Federation of Red Cross and Red Crescent Societies (IFRC), Tohoku University of Japan, University of the Ryukyus, Japan and Yokohama National University, Japan. The list of participants is given in **Appendix I**.

#### Opening of the Session (agenda item 1)

3. The opening ceremony of the Session began at 9:30 am on Tuesday, 21 February 2017. Dr. Toshihiko HASHIDA, Director General of Japan Meteorological Agency (JMA), conducted the opening ceremony.
4. The following speeches were delivered at the opening ceremony and are provided in **Appendix II**:
  - a) **Mr. Yukinori NEMOTO**, Parliamentary Vice-Minister of Land, Infrastructure, Transport and Tourism, declared the 49th Session open and provided welcoming remarks.
  - b) **Dr. Petteri TAALAS**, Secretary-General, World Meteorological Organization.
  - c) **Mr. Sanjay SRIVASTAVA**, Chief, Disaster Risk Reduction, United Nations Economic and Social Commission for Asia and the Pacific.
  - d) **Mr. Raymond TANABE**, Chair of Typhoon Committee.
  - e) **Mr. YU Jixin**, Secretary of the Typhoon Committee.
  - f) **Mr. Kunihiko YAMAUCHI**, Director General, Global Environment Department, Japan International Cooperation Agency (JICA).
5. Dr. Roman L. KINTANAR Award for typhoon related disaster mitigation was presented to:
  - (i) **Meteorological Satellite Center of JMA**, in recognition of their commitment and outstanding achievements in observation, telecommunication and collection of radio report for meteorological, hydrological and terrestrial phenomena and related radiation from space using meteorological satellites, and their collaboration with Typhoon Committee Members on meteorological satellite data provision; and
  - (ii) **Han River Flood Control Office (HRFCO)**, in recognition of their steady commitment and outstanding achievements towards the water-related disaster mitigation, and activities of TC Working Group on Hydrology, particularly in Extreme Flood Management Research and Development focusing on enhancement of the capacity building of flood forecasting and warning in Typhoon Committee Region.

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

6. Dr. LEI Xiaotu, Chair of WGM, Mr. Yoshio TOKUNAGA, Chair of WGH and Dr. Jaehyun SHIM, Chair of WGDRR, as appointed members of the Credential Committee, reviewed the Credential Letters submitted by Members. Dr. Jaehyun SHIM, who was appointed as Chair of the Credential Committee at the 48<sup>th</sup> Session, presented the Summary Report of the Credential Committee which can be consulted at **Appendix III**.

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

7. Dr. Toshihiko HASHIDA, Director General JMA, was elected Chairperson and Prof. TRAN Hong Thai, Deputy Director General National Hydro-Meteorological Service of Viet Nam was elected Vice-Chairperson of the Committee.
8. Mr. Tom EVANS, Deputy Director, Central Pacific Hurricane Center of NOAA, National Weather Service (NWS), was elected Chairperson of the Drafting Committee.
9. Dr. LEI Xiaotu was appointed as Chair of the Credential Committee.

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

10. The Committee adopted the agenda as shown in **Appendix IV**.

## **V. TECHNICAL PRESENTATIONS AND CROSS-CUTTING PROJECTS (agenda item 5)**

### **5.1 Summary of the 2016 typhoon season**

11. The Committee took note with appreciation of the review of the 2016 typhoon season provided by the RSMC Tokyo as provided in **Appendix V**.

### **5.2 Verification of tropical cyclone operational forecast in 2016 typhoon season**

12. The Committee took note with appreciation of the report on Verification of tropical cyclone operational forecast in 2016 typhoon season provided by the Shanghai Typhoon Institute (STI) in **Appendix VI** and presented by Mr. CHEN Guomin on behalf of Dr. LEI Xiaotu, Chairperson of WGM. Hong Kong, China had provided comments and further information to update the verification.

### **5.3 Recent activities and new technologies of typhoon forecast and warnings**

13. The technical lectures were presented as shown in **Appendix VII**. The Committee expressed its appreciation to all the lecturers and requested the TCS to post all the lecture papers/PowerPoint presentations on the TC website. The following technical lectures were presented:
  - a. Regional component of IN-MHEWS (International Network for Multi-hazard Early Warning System) - *Mr. Sanjay SRIVASTAVA, ESCAP.*
  - b. Recent policy progress for evacuation. - *Ms. Setsuko SAYA, Director, International Cooperation Division, Disaster Management Bureau, Cabinet Office.*
  - c. Reflecting the targets and indicators of the Sendai Framework for Disaster Risk Reduction to the new strategic plan of the Typhoon Committee - *Dr. Yuichi ONO, Professor, International Research Institute of Disaster Science, Tohoku University.*

- d. Brief Introduction to China Emergency Early Warning Release Platform – Mr. *CHENG Zhengquan, Guangdong Meteorological service, CMA.*
- e. Introduction to Multi-hazard Risk-based Early Warning System in Japan- Mr. *Yasuo SEKITA, Director-General of Forecast Department, JMA.*
- f. Utilization of radar composite for severe weather watches, warnings, and advisories - Mr. *Boonlert ARCHEVARAHUPROK, Expert on Research & Development for Meteorology, Thai Meteorological Department (TMD.)*
- g. The latest Model Simulation and Observational Studies in Japan - Dr. Munehiko YAMAGUCHI, Senior Researcher, MRI/JMA, Tropical Cyclone Research in Japan Model Simulation Studies - Dr. Hironori FUDEYASU, Associate Professor, Yokohama National University and Overview of Observational Studies of Tropical Cyclones in Japan - Dr. Hiroyuki YAMADA, Associate Professor, University of the Ryukyus.
- h. Operational Hurricane Modeling at NOAA National Center for Environmental Prediction/Environmental Modeling Center (NCEP/EMC) - Dr. *Avichal MEHRA, NOAA, USA.*
- i. Activities of Numerical Weather Prediction for Typhoon forecast at Japan Meteorological Agency - Mr. *Masayuki NAKAGAWA, Numerical Prediction Division, JMA.*
- j. The recent progresses in tropical cyclone forecasting service at the National Hydro-Meteorological Service of Socialist Republic of Viet Nam - Mr. *VO Van Hoa, Director Red River Delta Regional Hydro-Meteorological Center, NHMS.*
- k. 2016 CMA Typhoon Forecast Performance and Challenges - Mr. *QIAN Chuanhai, National Meteorological Center, China Meteorological Administration (CMA)*
- l. Development of objective forecast guidance on rapid intensification of tropical cyclones over the western North Pacific - Dr. *T.C. LEE, Hong Kong Observatory.*
- m. Introduction of Himawari-8/9 for Typhoon Monitoring - Mr. *Kazumi KAMIDE, Meteorological Satellite Center, JMA.*
- n. Climate Mechanism for Stronger Typhoon in a Warmer World. - Dr. *Nam-Young KANG, National Typhoon Center/Korea Meteorological Administration (KMA).*
- o. Flash Flood Risk Information for Local Resilience - Dr. *Toshio KOIKE, Director, International Water Hazard and Risk Management, Public Works Research Institutes, Japan.*

#### **5.4 Cross cutting Projects**

##### **5.4.1 Report on the Progress of Experiment on Typhoon Intensity Change in Coastal Area (EXOTICCA) and its Annual Implementation Plan**

14. The Committee took note with appreciation of the progress report EXOTICCA provided by the WGM Chair, Dr. LEI Xiaotu as provided in **Appendix VIII**.
15. The Committee discussed the update and approved the Terms and Condition of EXOTICCA.
16. The Committee expressed that all the Members should be invited to join the project and request the Organizing Committee (OC) to find a way to accommodate other Members on the project.
17. The Committee made a suggestion to hold an EXOTICCA Workshop to encourage Members to participate.
18. The Committee request TCS to invite Members to join this project based on the Terms and Conditions of EXOTICCA expressing the benefits on joining the project.



#### **5.4.2 SSOP-II Implementation Plan**

19. The Committee reviewed the final version of the ESCAP-funding application for the proposal of the Project on SSOP-II: Implementation of Synergized Standard Operating Procedures (SSOP) for Coastal Multi-hazard Early Warning System, and noted the progresses made in 2016. The details can be found in the **Appendix IX**.
20. The Committee noted with pleasure that TCS made its efforts on the Proposal, and also expressed its appreciation to ESCAP for its support and cooperation on the application.
21. The Committee also requested Advisory Working Group (AWG), the Working Groups and Regional Specialized Meteorological Center (RSMC)-Tokyo, in cooperation with TCS, to proceed with the project of SSOP-II should funds become available.
22. The Committee discussed the need to have a Steering Committee and a Project Manager for the SSOP-II
23. The Committee requests AWG Chair to be part of the Steering Committee (SC) and to consult the Members

#### **5.4.3 ESCAP innovative financing for the Typhoon Committee and Panel on Tropical Cyclones**

24. The Committee took note with appreciation the presentation on ESCAP innovative financing for the Typhoon Committee and Panel on Tropical Cyclones.

### **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**

25. The Committee took note of the report of the Typhoon Committee Chairperson on the TC's Key Activities and Main Events in the Region, 2016 (**Appendix X**).
26. The Committee expressed appreciation to the contributions of Mr. Raymond TANABE and Dr. Toshihiko HASHIDA as the chairperson and Vice Chairperson of the Committee.
27. The Committee dealt with related issues under the relevant agenda items.

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

28. The Committee took note of the Summary of Members' Reports 2016 (**Appendix XI**) that highlighted the key tropical cyclone impacts on Members in 2016 and the major activities undertaken by Members under the various KRAs and components during the year.
29. The Committee took note of the proposed Summary statement of Members' Report, and request AWG to assess further the need for including an overall Executive Summary for the Session Report and Members' Report to be sent to Members' governments in the future.
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 trends in Key Result Area (KRA) activities under the different components.

## **VII. REVIEW OF THE 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 2016 (Appendix XII)**

31. The Committee was pleased that RSMC Tokyo began providing multi-scenario storm surge predictions as well as ensemble wave forecasts based on the JMA's Typhoon Ensemble Prediction System (TEPS) to the Committee Members, in June and August 2016 respectively. Verification of the storm surge prediction using tidal data available was also conducted. The Committee expressed its gratitude to RSMC Tokyo for provision of storm surge forecasts to the TC Members and sharing information on storm surges through the annual TC attachment training.
32. The Committee with appreciation noted that RSMC Tokyo began providing TC genesis prediction, i.e. Tropical Cyclone Activity Prediction maps using ensembles of ECMWF and UKMO in June 2016.
33. The Committee was informed that RSMC Tokyo started tropical cyclone satellite re-analysis in 2012 for the period from 1981 to confirm and improve the quality of the Current Intensity (CI) number in the satellite TC analysis. Re-analysis for the period from 1987 to 1995 has been completed. In addition, TC satellite analysis datasets for the period from 2004 to 2013 were investigated and the re-analysis was partially completed. RSMC Tokyo plans to complete re-analysis 1987 to 2013 by the end of 2018.
34. The Committee was informed that RSMC Tokyo is continuing experimental provision of TC advisory in CAP format at the JMA website ([http://www.jma.go.jp/jma/jma-eng/jma-center/rsmc-hp-pub-eg/RSMC\\_HP.htm](http://www.jma.go.jp/jma/jma-eng/jma-center/rsmc-hp-pub-eg/RSMC_HP.htm)) since 12 November 2012.
35. The Committee was pleased that an experimental test of radar data sharing among RSMC Tokyo, Thai Meteorological Department (TMD) and Malaysia Meteorological Department (MMD) were stated in 2016. It also noted with appreciation that a technical meeting was held at the JMA headquarters in November-December 2016 to discuss technical issues to improve data quality of nationwide radar composite maps developed by TMD, to provide technical assistance in application of the JMA's QPE technique to the TMD's radar data, and to identify the way forward.
36. The Committee was informed that RSMC Tokyo, in cooperation with RSMC Honolulu, developed and circulated a draft Tropical Cyclone Forecaster Competency, responding to the discussion at the 66th WMO Executive Council. It noted with appreciation that, in 2017, the RSMC's plan to organize a task team meeting to finalize the competency and discuss how to utilize it for future training activities in the Committee region.
37. The Committee noted with appreciation that RSMC Tokyo completed the comparison study on TC satellite analysis between CMA, HKO, JMA, and JTWC, and developed the final report, including a set of recommendations toward more harmonized TC intensity analysis, in the western North Pacific.
38. The Committee was informed that in March 2016, RSMC Tokyo upgraded graphical Tropical cyclone advisories (TCAs) by using a new Himawari-8 product for identifying Cb areas around TCs.
39. The Committee with pleasure noted that Himawari-9 geostationary meteorological satellite was successfully launched on 2 November 2016. It noted with appreciation that, a series of expert missions were conducted to Cambodia, Malaysia, Singapore, Thailand, Viet Nam, and the Philippines to enhance weather monitoring and forecasting capacity using Himawari-

8/9 products. It further welcomed the intention of RSMC Tokyo to continue providing technical supports for Members to utilize Himawari products.

40. The Committee noted with appreciation that RSMC Tokyo published the RSMC Tokyo Technical Review No.18 and the Annual Report on Activities of the RSMC Tokyo in March and December 2016 respectively.
41. The Committee was pleased that RSMC Tokyo conducted the 16th Attachment Training from 15 to 26 August 2016, inviting three forecasters from Lao P.D.R., the Philippines, and Viet Nam. In accordance with the decision of the third joint session of the Panel on Tropical Cyclone (PTC) and the Typhoon Committee, RSMC Tokyo, ESCAP, WMO, and PTC secretariats invited three forecasters from PTC Members, i.e., Oman, Pakistan and Sri Lanka with the Japan Trust Fund. The Committee with pleasure noted that RSMC Tokyo extended the training course by 2 days to provide lectures on TC warning developments with the financial supports of the WMO Secretariat.

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

42. The Committee noted that the Typhoon Committee Operational Manual (TOM) rapporteur requests WMO to publish and upload the 2016 edition of TOM on the Tropical Cyclone Programme (TCP) Website as submitted by the Rapporteur, with the amendments given in **Appendix XIII**.
43. The Committee expressed its appreciation to the rapporteur for update of TOM.

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

44. Parallel sessions of the Working Groups on Meteorology, Hydrology and Disaster Risk Reduction were convened during the 11th IWS to review progress of work during the past year, identify priorities for cooperation and make recommendations to the Committee.
45. The outcomes of the parallel sessions of the three Working Groups were reported to the plenary session as given in the following sections.

### **8.1. Meteorological Component**

46. The Committee took note of the Members' activities and major progress and issues in Meteorological Component in 2016 as reported by Members at the 11th IWS.
47. 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, details of which are presented in **Appendix XIV**.
48. The Committee took note of the outcomes of the WGM Parallel Session at the 11th IWS on 25-26 October 2016. With the help of WMO/TCP and TCS, and the sincere cooperation of all Members, WGM has successfully completed the tasks in 2016 with significant outcomes as follows:
  - a. WGM has fulfilled all the plans (including 5 POPs, 8 AOPs and 2 PPs) which were endorsed at the 48th Session.
  - b. RSMC Tokyo provided a variety of tropical cyclone products including ensemble tropical cyclone track guidance of ECMWF, NCEP and JMA, and ensemble tropical cyclone genesis guidance. Two- and five-day prediction maps were included in the NTP web site from June 2016.

- c. RSMC Tokyo drafted the final report for harmonization of tropical cyclone intensity analysis and circulated to CMA, HKO, JTWC for their feedback. A list of recommendations was provided and TC Members were encouraged to follow with their own efforts and/or through collaborative efforts under TC.
  - d. Literature review (including non-English papers) and discussion for the 3rd Assessment Report on the impact of climate change on tropical cyclones in TC region were carried out by the Members in 2016. A survey and an expert symposium will be held in 2017.
  - e. WGM has provided help for WMO demonstration project (WMO-TLFDP and UPDRAFT) and TC cross-cutting project (EXOTICCA). Field campaigns were carried out by STI/CMA and HKO for selected tropical cyclones, and with coordination from HRD, STI/CMA finished the experimental study on the preliminary evaluation of the first rocket-deployed dropsonde observation in STY Mujigae (2015).
49. The Committee further noted the following WGM activities in 2016:
- a. A joint workshop for EXOTICCA and WMO-TLFDP was held in Shanghai on 21 October 2016 on the target data using in-structure analysis and typhoon numerical model. Data policy for field observation was also discussed.
  - b. A technology transfer of Typhoon Analysis and Prediction System (TAPS) was conducted by NTC/KMA for PAGASA, Philippines between 13-14 October 2016. The technology transfer included three lectures and practice classes which showed the typhoon forecast process and structure of TAPS.
  - c. A research fellowship scheme was offered by STI on tropical cyclone genesis forecast technique. The objectives of the research were to develop techniques for tropical cyclone genesis forecast and implement them in STI's objective typhoon forecast system, and provide the forecast products to Members through WMO-TLFDP's web site. The fellowship was offered to DPR Korea in November 2016.
  - d. A technical meeting on radar composite map project was held in Japan between JMA and TMD experts from 29 November to 2 December 2016 to discuss issues on the project such as quality management, algorithm for developing QPE product and further utilization and sharing of radar data.
  - e. Experts from USA and Thailand were invited by STI in October 2016 to improve the influence of the TC Journal Tropical Cyclone Research and Review (TCRR) by providing guidance on editorial procedures, seeking and encouraging submission of articles from Members as well as international institutions, and accelerating publicity and promotional activities about the Journal. The first editorial board meeting was held in Shanghai on 21 October 2016.
  - f. The WMO international training course and TC training course on tropical cyclone was held in the WMO Regional Training Center (RTC) and TC training center in Nanjing between 21 November and 2 December 2016. The workshop was to assist Members in their efforts to improve operational tropical cyclone forecast and warning through providing training and knowledge updates to its forecasters.

#### **Conclusions of WGM:**

50. On the basis of the information provided by Members and the respective coordinator of the action plans and based on the discussion during the 11th IWS, the following conclusions were reached:
- a. WGM action plans in 2016 were successfully completed.

- b. Members made important progress in the implementation of the TC Strategic Plan during the year 2016.
- c. Members made significant progress during 2016 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.
- d. Seasonal outlook information for number of typhoon genesis and track pattern issued by the KMA continued to be useful to TC Members.
- e. The web-based typhoon forum maintained by STI/CMA would be migrated to TCS web site to attract more TC Members, forecasters, scientists as well as the public.
- f. Up to September 2016, 14 issues of the TC Journal Tropical Cyclone Research and Review (TCRR) have been published (since 2012) with more than 79,000 downloads from the website. Two visiting editors from USA and Thailand were invited to STI in October 2016 to provide guidance of improving the editorial procedures, reviewing articles and inviting articles, and the first editorial board meeting was held in Shanghai on 21 October 2016.
- g. The NTC/KMA conducted another technology transfer of TAPS to PAGASA in the Philippines between 13-14 October 2016. During the visit, introduction and demonstration of TAPS as well as installation of the system on forecaster's computers were carried out.
- h. Performance of tropical cyclone track and intensity forecasts from operational forecast agencies and deterministic NWP models in 2015 was evaluated by STI. Real-time verifications on track and intensity forecasts were provided routinely through WMO-TLFDP website. STI/CMA hosted the TLFDP-III project meeting in Shanghai between 20-21 October 2016 with coordination of WMO, and a two-month research fellowship was offered to two experts from DPR Korea between October and November 2016.
- i. RSMC Tokyo relaunched the Numerical Typhoon Prediction (NTP) website in May 2015 and provided a variety of tropical cyclone products including ensemble tropical track guidance of ECMWF, NCEP and JMA. Multi-center grand-ensemble (MCGE) for tropical cyclone prediction was examined and two- and five-day prediction maps were included in the NTP web site from June 2016.
- j. The New Generation of TRAMS (NG-TRAMS), which included a 3-D reference atmosphere scheme and the coupling of dynamic and physical processes, was developed by CMA in 2016.
- k. The website of RFSC-Ha Noi of SWFDP for Southeast Asia continued to improve and provide global and regional (ensemble) NWP forecast products as well as guidance products. The domain of the regional models will be extended to cover Philippines and Myanmar.
- l. A technical meeting on the development of regional radar network was held in Japan between JMA and TMD experts to discuss issues on quality management, algorithm for developing QPE product and further utilization as well as sharing of radar data.
- m. Literature review (including non-English papers) and discussion for the 3rd Assessment Report on the impact of climate change on tropical cyclones in TC region were carried out by the Members in 2016. A survey and an expert symposium will be held in 2017.

- n. The storm surge prediction system developed by JMA continued and more stations were added. Maximum storm surge forecast for up to 6 scenarios (official forecast plus 5 scenarios from Typhoon EPS model) were provided in 2016.
- o. For EXOTICCA, STI carried out the field campaign on 3 target typhoons – Meranti (1614), Megi (1617) and Sarika (1621) in East China coastal area together with Zhejiang and Fujian Meteorology Service, while HKO carried out the field campaign on tropical depression on 26 July, typhoon NIDA on 1 August, low pressure area on 16 August, and the TS Dianmu on 18 August. With coordination from HRD, STI/CMA finished the experimental study on the preliminary evaluation of the first rocket-deployed dropsonde observation in STY Mujigae (2015).
- p. RSMC Tokyo drafted and updated the zero draft of the tropical cyclone forecasting competency based on the input and feedback from WGM Members. Members were also invited to nominate a focal point, preferably a tropical cyclone forecaster, for this project.
- q. RSMC Tokyo drafted the final report for harmonization of tropical cyclone intensity analysis and circulated to CMA, HKO, JTWC for their feedback. A list of recommendations was provided and TC Members were encouraged to follow with their own efforts and/or through collaborative efforts under TC.
- r. The quality of observation data and spatial distribution from the South China Sea (SCS), were assessed and re-processed. A new method was developed to estimate the intensity of tropical cyclones over central SCS and make landfall in the southern part of China and the performance was compared to using the Dvorak technique and satellite data.
- s. Based on the discussion during the 11th IWS on the action plans for 2017, and according to the new structure of the action plans, it was concluded that:
  - i. The POP items 1-5 will continue in 2017.
  - ii. The AOP items 1-8 will continue in 2017.
  - iii. The PP item 1 will be closed in 2017.
  - iv. The PP item 2 will continue in 2017 as item 1.
  - v. A new PP item 2, Collaborative Discussion (CoDi) platform on tropical cyclone (TC) analysis and forecast organized by CMA and HKO, will be established in 2017.
  - vi. The total budget proposed by WGM, which was also concurred at the AWG meeting after the 11th IWS, for undertaking the actions plans (AOPs, POPs and PPs) in 2017 was US\$21000. The financial support of US\$5000 for EXOTICCA OC meeting (workshop) and US\$5000 for TCRR expert team meeting will be allocated through the “Special funding request”.

### **Recommendations of WGM**

- 51. On the basis of the outcomes of the WGM Parallel Session at the 11th IWS and subsequent discussion, the WGM made the following recommendations:
  - a. To request RSMC Tokyo and the WMO Regional Training Center (RTC) of Nanjing to continue the collaboration with TRCG and WGM to conduct the annual training for operational forecaster from TC Members.
  - b. To request KMA to further develop the techniques of typhoon seasonal prediction, and to provide the products of typhoon seasonal prediction for TC Members.
  - c. To request CMA and TCS to invite TC Members to assign staff as moderators of the web-based typhoon forum, to announce the forum in TCS Facebook page to attract the public to join the forum, and to make the forum serve as an exchange platform of

real-time information (extra observations data, operational forecast products, NWP data, pictures, video etc.).

- d. To request CMA and TCS to call for more contributions to the TC Journal Tropical Cyclone Research and Review (TCRR), particularly for special issue for TC50<sup>th</sup>, from TC Members and Working Groups. The contributions can include technical summaries and operation innovations, research achievements associated with Strategic Plan and AOP (and POP), and other research results and summaries in the past 50 years or few decades.
- e. To request KMA to train the typhoon forecasters of TC Members on the use of TAPS upon request, and provide follow-on technical assistance on the implementation of TAPS.
- f. To request CMA to continue post-season verification and reliability analysis on the operational forecasts of tropical cyclones, to provide real-time verification on tropical cyclone track and intensity through WMO-TLFDP website, and to further improve the evaluation system for tropical cyclone forecast in conjunction with WMO-TLFDP (to be included in the TC Fellowship Scheme).
- g. To request RSMC Tokyo to provide tropical cyclone genesis guidance of other global ensembles if necessary NWP data are available.
- h. To request CMA to increase model products and enhance the application of TRAMS, and to further improve the forecasting ability of TRAMS, especially for the intensity and precipitation forecasting.
- i. To request NHMS of Viet Nam to provide tropical cyclone track, intensity and severe weather forecasting charts based on global and regional NWP models, to extend forecast domain of regional NWP models to cover the east sea of Philippines and Myanmar.
- j. To request JMA to update quality control techniques applied to TMD and MMD radar network, to introduce the calibration process for QPE into operation of TMD radar and to request JMA, TMD and MMD to continue experimental test of radar data sharing among the three participating Members, and to share the experiences of the test with the RA II WIGOS radar project in southeast Asia.
- k. To request SMG to collaborate with TCS to conduct a survey on tropical cyclone impacts in TC region, and to organize an expert meeting for draft AR3-TC in 2017.
- l. To request JMA to provide astronomical tide estimate for stations in which the information is not available, to add storm surge time series to prediction points on the request of TC Members, and to verify storm surge predictions.
- m. To request CMA and HKO to implement the EXOTICCA field campaign collaboration among participating Members, to demonstrate research on tropical cyclone intensity change in conjunction with WMO-TLFDP (to be included in the TC Fellowship Scheme).
- n. To request RSMC Tokyo to set up a task team to review and finalize the draft tropical cyclone forecast competency, and to organize a task team meeting if funds are available.
- o. To request CMA to develop wind structure estimation method based on available surface observations.
- p. To endorse the action plans in 2017 (including 5 POPs, 8 AOPs and 2 PPs) as listed in Annex II of Appendix I – Summary Report for the WGM Parallel Meeting at the

11th IWS, which summarizes the above recommendations with additional action items.

- q. To endorse the WGM budget request included in the budget proposal to be submitted by AWG for TC's approval.
- r. To re-appoint Dr. LEI Xiaotu (China) as the Chair of WGM, Dr. Vincente B. MALANO (Philippines) and Ms. CHE Gayah Ismail (Malaysia) as Vice-chair of WGM.
- s. To appoint Mr. Chiashi MUROI as the new rapporteur of TOM.

## **8.2. Hydrological Component**

- 52. The Committee reviewed the activities of the Members related to the implementation of the TC Strategic Plan and its annual operating plan (AOP) for the hydrological component during the past year. Details can be found in the **Appendix XV**.
- 53. The Committee noted that, the Members conducted a series of activities in 2016 on hydrological component and achieved remarkable progresses on capacity building of flood forecasting and warning; the serious water-related disaster events, including river flood, urban flood, flash flood and debris flow, and drought happened in some Members such as China, Laos, Japan, Malaysia, Philippines, Viet Nam, etc. The hydrological departments in the Members provided valuable service of flood forecasting and warning to the decision-making departments of the Governments.
- 54. The Committee noted with pleasure that, the 5th WGH working meeting was successfully held from 5 to 8 September 2016 in Seoul, the Republic of Korea with theme of "Extreme Flood Forecasting System and Practical Guidelines for the TC Region". Mr. Sung Eun KIM, the officer of Disaster Risk Reduction Section of UN-ESCAP, presented the "Building Resilience in Asia-Pacific: ESCAP Initiatives and Activities on Disaster Risk Reduction". The information and Requests/Recommendations from ESCAP Member States in his presentation definitely would play very important role for WGH to propose new cooperation project under the framework of ESCAP disaster risk reduction. The Committee expressed its appreciation to the Ministry of Land, Infrastructure and Transport (MOLIT) of the Republic of Korea (ROK), through Han River Flood Control Office (HRFCO) with cooperation of Korea Institute of Civil Engineering and Building Technology (KICT), for kindly hosting the meeting.
- 55. The Committee was informed on the implementation status in 2016 and future activities of on-going projects (AOPs):
  - a. SSOP-II: Implementation of Achievement of Project of Synergized Standard Operating Procedures (SSOP) for Coastal Multi-hazard Early Warning System.
  - b. Extreme Flood Forecasting System (EFFS).
  - c. Estimation for Socio-economic Impact of Sediment-related Disaster.
  - d. Development and Application of Operational System for Urban Flood Forecasting and Inundation Mapping (OSUFFIM) for TC Members.
  - e. Extension of Xin'anjiang Model Application in Selected River Basins in TC Members.
  - f. Guidelines for extreme flood risk management in TC Region.
- 56. The Committee noted that, the contribution from WGH to the project on SSOP-II: Implementation of Achievement of Project of SSOP for Coastal Multi-hazard Early Warning System. The Committee also noted the WGH is willing to cooperate with and integrated its



activities into the proposed SSOP-II, however, considering the final version of this initiative does not have any activity directly related to the Group, WGH agreed to remove the project from its AOP2017 list.

57. The Committee was informed that, the operation system for EFFS project, which is led by the HRFDO of ROK, has been established as Level-1 (stage method), Level-2 (Rainfall-Runoff model), Level-3 (Flood Forecasting using radar data) with PC-version, and Level-4 (Establishment of Emergency Action Plan) module will be completed in 2017. The Committee also was informed the report of field survey on EFFS in pilot Members, namely Lao PDR, Philippines and Thailand, is under drafting and hopefully be published in 2017 with combination of the Guideline for Extreme Flood Risk Management.
58. The Committee noted that, the project on Estimation for Socio-economic Impact of Sediment-related Disaster, which was proposed by Japan in 2013 and should be completed and closed in 2016, could not be moved forward because enough data regarding sediment-related disaster had not been collected from the Members in the past years; and WGH agreed the proposal to terminate this AOP from Japan-side at 11th Integrated Workshop which was held in Cebu, Philippine in October 2016.
59. The Committee noted with pleasure that, the project on OSUFFIM, which was led by China, made remarkable progresses and achievement in 2016, including:
  - The field Surveys for OSUFFIM pilot study in TC Members were conducted in Hat Yai, Thailand from 16 to 19 May 2016; in Dongguan, China from 25 to 28 August 2016; in Davao and Cebu, Philippines from 24-28 October 2016; and in Vientiane, Lao PDR from 29 November to 4 December 2016, respectively. Prof. Yangbo CHEN, and the staff from RID, Thailand; PAGASA, Philippines and DMH, Lao PDR joined the events, respectively.
  - The OSUFFIM has been put into operation in flood control office of Dongguan city government.
  - The English version of the System is on the stage of updating and the Guidelines of OSUFFIM is under drafting.
60. The Committee also was informed that, the project on OSUFFIM made ambitious implementation plan for 2017, including:
  - The pilot study in Hat Yai of Thailand will be continued and the operation system of OSUFFIM for Hat Yai is proposed to be installed in RID office for operation in trial in first quarter of 2017.
  - The field survey for pilot study in Malaysia with invitation from DID Malaysia is proposed to be conducted in first quarter of 2017 with present of Prof. Yangbo CHEN. DID Malaysia is willing to have a short technical seminar or training course during the field survey.
  - A training course on operation of OSUFFIM for selected piloting Members was proposed in March-April 2017 with funding support from SYS University of China.
  - A working meeting or seminar on Thai OSUFFIM application is proposed to hold in Guangzhou in third quarter of 2017.
  - The team will accomplish the Guideline drafting and publishing, and distribute at the 12<sup>th</sup> IWS to be held in Jeju, the Republic of Korea, from 30 October to 3 November 2017.
  - A 3-day conclusion workshop and training course on OSUFFIM application are proposed to be held in SYS University, Guangzhou, China at the end of 2017. China-side expressed its willingness to consider providing partially funding support for the participants from under-developed TC Members. China-side also expressed that the self-funded participants from all TC and PTC Members are welcome. If funding is available from extra resources (such as ESCAP, WMO), the participants from PTC

Members are welcome to join the proposed workshop/training course as one activity of enhancing the cooperation of two regional bodies.

61. The Committee noted that, considering this project was proposed to be closed in 2017, SYS University was requested from Members to conduct phase-II for OSUFFIM so that to extend the achievement of OSUFFIM to more TC Members. The Committee also noted with appreciation that Prof. CHEN Yangbo from SYS University, as chief scientist of OSUFFIM, is willing to contribute his knowledge and share his expertise on urban flood forecasting and inundation mapping to the Members.
62. The Committee noted that, the request to SYS University of China from Members to consider conducting phase-II for OSUFFIM to extend the application in selected pilot cities from more Members starting from 2018 after the current OSUFFIM project to be closed at 50th Annual Session of TC.
63. The Committee was informed that, the project on Extension of Xin'anjiang Model Application in Selected River Basins in TC Members, which is led by Bureau of Hydrology (BOH) of China, will be closed at TC 49th Session to be held in Japan in February. The final report drafted by BOH of China in cooperation with DID Malaysia was published as TC publication (TC/TD-No. 0012) of 2016. The Committee also noted that BOH, China is willing to provide the technical support to the interesting Members after this project.
64. The Committee noted the progresses achieved on the project of Guidelines for Extreme Flood Risk Management in 2016 led by of HRFCO in cooperation with KICT and Members. The Committee was informed that WGH set up a working team at 5th TC WGH meeting for reviewing and drafting Guidelines which is expected to be published in 2017.
65. The Committee noted the result of evaluating the effectiveness of on-going activities in WGH with the target to develop Members' capacity following the decision of the Committee made at 48th Session. The evaluating result indicated that, generally, most of the activities in WGH have very good effectiveness with the target to develop Members' capacity, and also have very important roles on enhancement of the close collaboration among Members.
66. The Committee noted that, WGH established the project-bank for next years under TC Strategic Plan and the strategic framework of ESCAP and WMO on water-related disaster reduction, which mainly focuses on enhancing the knowledge and capacity building on the management of water-related disaster risks for a resilient future in Typhoon Committee region, including:
  - Innovative flood forecasting for non-data river basin;
  - Flash flood (landslide, mud-flow) prediction and warning using QPE/QPF;
  - Extension the application of urban flood forecasting and inundation mapping;
  - Rainfall-runoff inundation mapping for river basins;
  - Radar and satellite data utilization in flood forecasting and warning;
  - Long-term forecasting for water resource management and drought monitoring and warning under climate change;
  - Data-sharing in transboundary rivers;
  - Dam operation for flood risk management under climate change.
67. The Committee noted that WGH requested and encouraged Members to propose and profile new cooperation projects on hydrological component. The Session was informed currently some initiatives have been under consideration, including:
  - ICHARM of Japan proposed a new project on Flash Flood Risk Information for Local Resilience to be officially launched at TC 49th Annual Session as WGH AOP 1 for the period from 2017 to 2019 with objective to develop a guidance tool for enhancing

local resilience to flash flood disaster risks and disseminate it among the WGH member countries.

- HRFCO of the Republic of Korea proposed two initiatives: (1) Application of Hydrological Data Quality Control System in TC Members, and (2) Enhancement of Flood Forecasting Reliability with Radar Rainfall Data and Stochastic Technique as two new WGH AOPs for the period from 2018 to 2022. Korea side will give shape to a work plan for these activities in 2017 through further discussion at 6<sup>th</sup> WGH working meeting, and will be officially launched at TC 50<sup>th</sup> Annual Session in 2018.
  - BOH of China proposed a new project on Impact Assessment of Climate Change on Water Resources Availability in TC Members as WGH new AOP for the period from 2018 to 2020 with the objective to predict quantitatively the water resources availability, particularly drought trend in TC members in the context of climate change.
68. The Committee noted that Dr. OKAZUMI, Toshio, Director of Ministry of Land, Infrastructure, Transportation and Tourism, MLITT being on behalf of Japan Focal point of WGH announced that MLITT will enhance its support to Typhoon Committee collaboration with ICHARM International Flood Initiative project, which Prof. KOIKE introduced at the Technical Presentation and other related projects of JICA and ADB.

### **Conclusions of WGH**

69. On the basis of the outcomes 5th WGH working meeting and the discussion of the WGH Parallel Session at 11th IWS, the following conclusions were reached:
- The working meeting of WGH is very important to review hydrological activities, deep technical discussion and implementation status of WGH AOPs, and also is very necessary to prepare IWS and annual session. The funding support and contribution from the Republic of Korea played the vital role in organizing the annual working meeting. WGH encourages the more and wider resources to support the activities to keep its sustainability.
  - The proposal of the Project on SSOP-II: Implementation of Synergized Standard Operating Procedures (SSOP) for Coastal Multi-Hazards Early Warning System, under the ESCAP Trust Fund for Tsunami, Disaster and Climate Preparedness in Indian Ocean and Southeast Asian Countries, has been shortlisted and forwarded to the final step in the hardworking and efforts of TCS. This initiative has both a regional and national-level components with the major objective to training Members on how to prepare SSOP by using the Manual so that to promote the capacity building on multi-coastal disaster early warning. To ensure the effectiveness of implementation and measure the outcomes indicators at the evaluate stage, the Committee with the RSMC Tokyo and New Delhi could focus on project implementation at regional level, and the national level component can be implemented with the support from RIMES. Such collaboration may facilitate successful outcomes at both levels. The close cooperation from beneficiary countries and target countries is very important to a successful project.
  - It is recognized that, to promote the capacity of forecasting, early warning and risk management for urban flood is an urgent need among TC Members, especially the real-time operational system on urban flood forecasting and inundation mapping. As the subsequent activity of TC first Cross-cutting project of Urban Flood Risk Management (UFRM), the on-going project of WGH on Development and Application of Operational System for Urban Flood Forecasting and Inundation Mapping (OSUFFIM) is a tangible measure on this aspect and it will play very meaningful and important role for TC Members to promote the capacity on the technique of urban flood forecasting and warning. To extend the achievement of pilot study in the region is necessity and meaningful to promote the capacity on urban flood risk forecasting and warning. It also could be considered as an activity under the cooperation mechanism of TC and PTC.

- To develop the Extreme Flood Forecasting System and the Guidelines for Extreme Flood Risk Management will be definitely beneficial for the TC Members to strengthen their capacity on extreme flood risk reduction, especially under climate change. To enhance the achievement of development, the situation and needs on flood risk management in the Members should be considered and integrated into the System and Guidelines.
- It is a consensus on that, to draw up a plan on considering and proposing a bank of new cooperation projects under the umbrella of TC Strategic Plan in a linkage with the initiatives and activities of ESCAP and WMO would be an urgent matter at present for WGH since all on-going AOPs of WGH will be closed in 2016 and 2017. In order to conduct the cooperation projects sustainably in TC Members, WGH discussed and determined the list of topics as the priority cooperation activities for long-term direction to develop the Member's Capacity on water-related disaster risk forecasting and warning.

### **Recommendations of WGH**

70. On the basis of the outcomes of 5th WGH working meeting and the discussion at the Parallel Session of 11th IWS and subsequent discussion, the WGH made the following recommendations:
- a. To appoint Mr. Yoshio TOKUNAGA from ICHARM of Japan as Chairperson, Dr. CHO Hyo Seob from HRFCO of the Republic of Korea and Dr. HOU Aizhong as Vice-Chairpersons of WGH, until the group selects a Chairperson and Vice-Chairpersons for the term of next two years to 51st Annual Session.
  - b. To request US\$14,000 from TCTF in total for supporting overall WGH activities for 2017 calendar year.
  - c. To request US\$6,000 special budget to support hosting OSUFFIM final workshop in SYS University, Guangzhou, China in the end of 2017.
  - d. To remove the SSOP-II from the list of WGH AOP2017 list.
  - e. To approve the proposal from ICHARM, Japan on Flash Flood Risk Information for Local Resilience by ICHARM of Japan as WGH AOP for the period from 2017 to 2019.
  - f. To request HRFCO, MOLIT of Republic of Korea to host WGH 6th working meeting with funding support in 2017.
  - g. To request SYS University, China to organize the final workshop on urban flood forecasting and inundation mapping with finding supporting. The workshop may be considered as one activity of enhancing the cooperation mechanism of two regional bodies of TC and PTC. The participants from PTC Members could be involved in the workshop if the funding is available from extra resources (such as ESCAP, WMO).
  - h. To request SYS University of China to consider the possibility of conducting phase-II for OSUUFIM to extent the application in more Members starting from 2018 after the current OSUFFIM project.
  - i. To request the Republic of Korea to draft the detail proposal for two initiatives, namely, the Application of Hydrological Data Quality Control System in TC Members, and the Application of Stochastic Flood Forecasting in TC Members as WGH new AOPs for the period from 2018 to 2022.
  - j. To request BOH of China to schedule the detail implementation plan for the initiative on Impact Assessment of Climate Change on Water Resources Availability in TC Members as WGH AOP for the period from 2018 to 2020.

- k. To encourage Members proposing and leading the cooperation projects for hydrological component.
- l. To request ESCAP and WMO to continue the support to implement further the on-going project of real-time Operational System for Urban Flood Forecasting and Inundation Mapping (OSUFFIM), which can be used in PTC and TC region.
- m. To encourage the Beneficiary Countries and Target Countries to cooperate closely and forwardly with TCS on implementing SSOP-II should the funds become available.
- n. To request ESCAP and WMO to provide guidance and assistance to TC proceeding with the project of SSOP-II should funds become available.
- o. 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**

- 71. The Committee took note of the activities; relevant major progress and issues related to Working Group on Disaster Risk Reduction (WGDRR) as presented in WGDRR report 2016.
- 72. The Committee took note of the outcome of Parallel Session of WGDRR at the 11th IWS that was held in Cebu, Philippines from 24 to 27 October 2016, details of which are presented in the **Appendix XVI**, which are included the progress of implementation of Annual Operating Projects of (AOPs) 2016 of WGDRR.
- 73. The Committee was informed that 11th WGDRR Annual Workshop was successfully held in Ulsan, Republic of Korea from 24 to 27 May 2016 with the theme of “Promoting Knowledge Sharing”, which was hosted and funded by National Disaster Management Institute (NDMI) and AWG Members were invited to join the meeting. Details can be found in the **Appendix XVI**.
- 74. The Committee expressed its appreciation to National Disaster Management Institute (NDMI) for their kind contribution and continued support on WGDRR activities.
- 75. The Committee expressed its appreciation to Dr. SHIM Jaehyun from Republic of Korea for his remarkable contribution as the Chair of WGDRR in the past year and his acceptance for the recommendation by DRR Members to continue to serve as the Chair of WGDRR for the next term of two years.
- 76. The Committee expressed its appreciation to Dr. OH, Keumho from Republic of Korea for his contribution and effort serving as Vice Chair of WGDRR in the past year.
- 77. The Committee expressed its appreciation to Ms. LEONG Fong Peng, from Macao, China for her contribution and effort serving as the Vice Chair of WGDRR in the past year and her commitment to continually serve as the Vice Chair for the next term of two years by the recommendation from WGDRR Members.
- 78. The Committee was informed that the projects (AOPs) for 2017 recommended by WGDRR as follows:
  - a. AOP1: Expert Mission- the project aims to exchange and share information related to DRR policies and technologies among the Members in order to improve the capacities on DRR.
  - b. AOP2: Promote international cooperation DRR project- (a) Setting up early warning and alert systems related to typhoon disaster in the participating members and such

project is contributed by NDMI. (b) iCowin project- HKO provides training workshop with the basic equipment for setting up the community weather station in the participating member countries to engage the public in severe weather issues.

- c. AOP3: Benefit evaluation of typhoon disaster prevention and preparedness project- this project is led by Shanghai Typhoon Institute (STI), China that functions to establish a set evaluation index and provide an evaluation report that assists in decision-making basis for the optimization of typhoon disaster behavior. China will provide fellowship program to the Members for this project in 2017.
- d. AOP4: Supporting SSOP II Project- The SSOP Project Phase II that is aimed at implementing the Synergized Standard Operating Procedures (SSOP) for Coastal Multi-Hazards Early Warning System. The execution of this project (phase II) will be mainly focused on the training on how to establish an appropriate standard operating procedure (SOP) based on the published SSOP Manual and on promoting the TC and PTC Members' capacity building on Multi-hazards Risk early warning based on existing technical achievement for National Meteorological and Hydrological Services (NMHSs) in the 10 beneficiary countries. WGDRR will fully support this project.
- e. AOP5: Sharing information related to disaster risk management- In order to improve the capacities for Members' Disaster Management, WGDRR proposed a project to exchange information and experience regarding the use of IT in disaster management among Members in 2017.
- f. AOP6: Making the education videos related to DRR- WGDRR planned to produce education videos related to disaster management and share with the Members.

### **Conclusions of WGDRR**

79. On the basis of the information provided by the Members, the reports presented by project leaders and findings of the parallel session on WGDRR, the following conclusions were reached:
80. In 2016, NDMI is working for upgrading the functions of TCDIS and the design of TCDIS website. The upgrade of TCDIS includes new function that users could get the site information from the existing CCTV. Also, it includes auto-reporting function. This function could provide the report, which consists of the results of similar typhoon search. NDMI will discontinue the work related to the update of TCDIS and will share the ID and password to member countries so that they can upload their damage data and operate TCDIS by themselves.
81. The expert mission was successfully conducted in China to share the updated information on the operation of TCDIS and exchange information regarding new technology and policy related to the field of DRR among NDMI, NDRCC, and CMA. The concept of expert mission will be changed as Knowledge Sharing including DRR technologies and policies among member countries. In 2017, Expert Mission was planned to conduct in Hawaii and Member countries agreed with the invitation of one member country's expert to join the 2017 expert mission.
82. The project to promote the international cooperation for disaster risk management, which is led by NDMI, will be continued in 2017 for Lao PDR and Viet Nam. In September, NDMI dispatched the experts to Lao PDR for installing the Automatic Rainfall Warning System (ARWS) and Flash Flood Alert System (FFAS) in Vang Vieng Province in Lao PDR. NDMI will also install FFAS and ARWS in Viet Nam in March 2017. The project will be continued in 2017 for Lao PDR and Viet Nam and NDMI encourage the participation of other member countries in this project.

83. Regarding the iCowin project that aims to raise public awareness of weather hazards and climate change through installation of community weather station: the system has been installed in Mindanao Island in the Philippines and Guam (2012) and in Viet Nam (2015) respectively. Though the training workshops in HK were successfully implemented, some Members did not successfully implement the project. There were various reasons, including those, which were related to local data communications constraints that would need assistance from local instrument experts even though advice could be provided by HKO. (E.g. Lao PDR sent representative to attend the training and got the equipment from HK in 2014 but the installation has not been started. HK suggested that Lao PDR could send instrument experts to HK to learn about the installation and data communication issues.). In 2016, Malaysia had expressed interest in participating in this project but no confirmation was received by Hong Kong until now, HKO suggested the training workshop for Malaysia to be postponed to 2017. In addition, for the cost effectiveness, HKO also suggested conducting the training with at least 2 Members' participation. During the parallel meeting, Lao PDR, USA and Malaysia indicated their intention to join the project in 2017. It will be confirmed in the upcoming session with the interested members.
84. SWIget Project (led by HKO): The project is considered successfully completed as many Members have joint. It will continue to operate and be available on the World Meteorological Organization Severe Weather Information Centre (SWIC) website for download by users. As such, HKO suggested removing regular reporting of this project from WGDRR AOPs After the discussion, WGDRR agreed with Hong Kong's suggestion to remove the project from AOPs next year.
85. Benefit evaluation of Typhoon Disaster Prevention and Preparedness: These improvements are: (1) To collect intensity forecast data of CMA from 2002 to 2013 and renew the analysis of the relationship between direct economic loss and track or intensity forecast errors based on cases during 2002 - 2013. (2) To study the impact of track and intensity forecast on damage assessment based on data from China; (3) the benefit evaluated from track and intensity forecast based on data from China has finished and a paper in Chinese was published this year. During the WGDRR expert mission this year in Beijing, China in September 2016, NDMI had requested China to provide a list to Members regarding the data collection required for this project. In the parallel meeting, some Members indicated their interest in this project and asked whether China could provide the English version of this report. In this regard, China had agreed and sent the English version of the report for Members' reference and TCS will follow up with the coordination.
86. SSOP (phrase II) project: TCS is waiting for the response from ESCAP regarding the approval for SSOP II revised proposal. If the proposal has been approved and finalized, WGDRR will fully support the implementation of the project.
87. Regarding the 2016 WGDRR AOP 6 of sharing information (e.g. legal framework, policy framework through member countries), what sort of information and how to share it were discussed. Member countries agreed with sharing information of disaster law and disaster management framework In addition, it was suggested to use the TC website for Members to upload their disaster law and disaster framework information. After 11th IWS, TCS has developed a forum as requested by Working Group in November 2016 and has informed the DRR Members that the forum is available for sharing the relevant information.
88. It was suggested to share the information of smart disaster management system including social media or IT solutions. Also, members will share the successful examples after improving DRR regulation or policies. These information would be shared in 2017 WGDRR annual meeting in Korea.
89. Regarding the research of benefit evaluation of Typhoon Disaster Prevention and Preparedness, STI agreed with the operation of the fellowship program for co-research between STI and member countries.

90. Regarding sharing information, NDMI suggested the sharing of existing educational materials related to DRR. In 2017, NDMI will modify and translate its existing video-material to English.

#### **RECOMMENDATIONS of WGDRR**

91. On the basis of the conclusion of discussion and deliberations, the WGDRR made the following recommendations:
- a. To allocate US\$ 21,500 budget of TCTF in 2017 for i) supporting the participation of TCS and one member country in Expert Mission; ii) supporting the community based weather station pilot project to provide a training workshop in HK or dispatch experts to interested members by HK to install the weather stations and to provide technical documentation on installation, maintenance and data processing and display; iii) supporting the fellowship program for co-research work between Shanghai Typhoon Institute and member countries about benefit evaluation of Typhoon disaster prevention and preparedness; iv) supporting modifying and translating NDMI's existing educational materials(video) to English.
  - b. To remove the update of TCDIS project from WGDRR AOPs.
  - c. To request NDMI to conduct the Expert Mission that aims to exchange knowledge and information related to DRR (technologies and policies) among member countries. Tentatively, WGDRR decided to conduct the Expert Mission in Hawaii in 2017 and invite one member country's DRR expert to join.
  - d. To request HKO to conduct training workshop for the iCowin Project. Lao PDR, Malaysia and USA had expressed their interest to participate in the project.
  - e. To request NDMI to continue to conduct the installation project of early warning and alert system related to typhoon disaster in Lao PDR and Viet Nam.
  - f. To request STI, China to conduct a fellowship program on the project of benefit evaluation of Typhoon Disaster Prevention and Preparedness for Members, which was tentatively planned for two Members' participation.
  - g. To remove the SWiget Project from WGDRR AOPs.
  - h. To request the Members to share the information related to disaster risk management. WGDRR will continue to collect the information regarding the use of IT technologies in Disaster Management, such as social media or apps in order to improve Members' DRR policies. It was suggested the discussion topic of WGDRR annual meeting 2017 could be related to this subject.
  - i. To encourage Members to fully support and contribute to SSOP Project Phrase II.
  - j. To request NDMI of Republic of Korea to continue to host the 12th WGDRR annual meeting with the funding support in Republic of Korea.
  - k. To request NDMI to make a video related to DRR education sharing with the Members.
  - l. To reappoint Dr. SHIM, Jaehyun (ROK) as the Chair of WGDRR and Ms. LEONG, Fong Peng as the Vice-chair of WGDRR.
  - m. To appoint Ms. MILLER, Genevieve (USA) as Vice-Chair of WGDRR replacing the current Vice-Chair, Mr. OH, Keumho (ROK) .



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

92. The Committee took note of the progress made in training and research activities as presented in the TRCG Report 2016. **(Appendix XVI)**
93. The Committee expressed its appreciation to the National Hydro-Meteorological Service of Viet Nam (NHMS) for hosting the Roving Seminar in Ha Noi, Viet Nam and the support of resource persons by Japan, USA and Hong Kong, China.
94. The Committee thanked China, Hong Kong, China and Republic of Korea for hosting research fellowship programs in 2016.
95. The Committee took note of the successful completion of the RSMC Tokyo training attachment of six forecasters from TC and PTC Members, including Lao PDR, the Philippines, Viet Nam, Oman, Pakistan and Sri Lanka, and expressed its appreciation to JMA and WMO TCP for continuously supporting this capacity-building initiative.
96. The Committee thanked China for offering Typhoon Forecaster Training for four forecasters from Thailand, Viet Nam and DPR Korea.
97. The Committee took note the proposal of organizing the 3rd TRCG Forum in the form of a “technical conference like” event in conjunction with the 50th Session of the Typhoon Committee (TC50) in 2018 with the proposed main theme on “Embracing new technologies and knowledge to meet the challenges in the 21st century”.
98. The Committee appreciated TRCG’s input in support of training and research activities in connection with TC’s cross-cutting projects.

#### **RECOMMENDATIONS of TRCG:**

99. On the basis of the conclusions reached by the deliberation of Members, the TRCG made the following recommendations:
  - a. To re-appoint Dr. T.C. LEE (Hong Kong, China) and Mr. Roger EDSON (USA) as Chairperson and Vice Chairperson of TRCG respectively.
  - b. To request Members to confirm their respective focal points as members of TRCG and update the list of resource persons as appropriate.
  - c. To endorse the priority training and research areas as proposed in TRCG Report 2016.
  - d. To endorse the organization of Technical Conference (TECO) in conjunction with the TC50 to be held in Viet Nam in 2018.
  - e. To endorse the TRCG AOP and budget request which are included in the budget proposal to be submitted by AWG.

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

#### **9.1 Activities of TCS**

100. The Committee took note of the report of the Typhoon Committee Secretariat **(Appendix XVIII)**.
101. The Committee noted with appreciation the TCS’s activities 2016 in order to enhance support to Members, increase the visibility of Typhoon Committee, and to improve the TC

website to share the forecast products and information, and to coordinate Working Groups to evaluate the effectiveness of the activities in the Committee.

102. The Committee expressed appreciation to Members for their donation for the Typhoon Committee Trust Fund and in-kind contributions, and encourage Members to continue support activities of the Committee.

#### **RECOMMENDATIONS of TCS**

103. Based on the experience of routine operation in 2016 and in the past years, and considering needs and possibility, TCS made the following recommendations to TC 49th Session for consideration:
  - a. To allocate US\$28,000 from TCTF for supporting overall TCS activities; US\$3,000 for supporting IWS hosting in 2017 and US\$2000 for IWS related activities;
  - b. To express appreciations to Members for their donation for the Typhoon Committee Trust Fund and in-kind contributions, encourage Members to continue support activities of the Committee.
  - c. To thank Members for their cooperation on SSOP project and encourage continuing the support SSOP phase II to benefit all Members of the TC and PTC.

#### **9.2 Activities of AWG**

104. The Committee was informed of the activities of the AWG as presented in the AWG Report 2016. **(Appendix XIX)**
105. The Committee was briefed on the major issues discussed at the AWG meeting in Cebu, Philippines on 28 October 2016.
106. The Committee was informed of the preparation of the budget for 2017, including items in support of activities for the celebration of 50th Anniversary of Typhoon Committee as well as other non-recurring items for special funding consideration.
107. The Committee was informed of the progress and proposals relating to the review and update of the Typhoon Committee Strategic Plan for the next 5-year period of 2017 - 2021.
108. The Committee expressed its sincere appreciation to AWG for offering advice and support to TC Chairperson and TCS in following up the key issues identified at the last Session and in coordinating key TC activities.

#### **RECOMMENDATIONS of AWG**

109. AWG recommended the Committee to:
  - a. Take note of the progress and recommendations made in the planning and implementation of TC activities, including the preparation of the budget for 2017.
  - b. Consider and adopt the proposed Strategic Plan for 2017 – 2021 (refer to Agenda Item 13).

#### **X. APPOINTMENT OF AWG CHAIR AND VICE CHAIRS (agenda item 10)**

110. The Committee took note of the Terms of Reference of AWG and the nominations of AWG Chair and Vice Chairs. **(Appendix XX)**

111. The Committee received two nominations for AWG Chair and three nominations for Vice-Chairs. One of the Chair and Vice-Chair nominations declined consideration.
112. The Committee approved Mr. Raymond TANABE from USA as the Chairperson of AWG; Mr. Chiashi MUROI from Japan and Dr. T. C. LEE, from Hong Kong, China to serve as vice-chairpersons of AWG.
113. The Committee expressed highly appreciation to Mr. Edwin S. T. LAI from Hong Kong, China for his excellent contributions when he served as the Chair of AWG since the 45th Session of the Committee in 2013.

**XI. REVIEW OF THE LONG TERM MECHANISM FOR TC SECRETARY APPOINTMENT (agenda item 11)**

114. The Committee took note the presentation made by AWG Chair, with the revised procedures on the Long Term Mechanism following the 11th IWS in the Philippines.
115. The Committee expressed high appreciation to the Members in reaching a consensus on this important issue.
116. The Committee approved the Long Term Mechanism for TC Secretary Appointment, as revised, in **Appendix XXI**.

**XII. HOSTING NEXT TCS FROM 2019 TO 2022 (agenda item 12)**

117. The Committee took note of the information on the issue for hosting next TCS from 2019 to 2022. **(Appendix XXII)**
118. The Committee expressed highly appreciation to the Government of the Macao Special Administrative Region of the People's Republic of China, and the Macao Meteorological and Geophysical Bureau for hosting and continued supporting to TCS.
119. The Committee accepted the offer as received in the letter to the TCS from Macao, China to host TCS for another four-year period from 2019 to 2022.

**XIII. STRATEGIC PLAN 2017-2021 (agenda 13)**

120. The Committee was informed of the proposal and amendments for the revised Strategic Plan 2017-2021 submitted by the Focal Points designated for the Strategic Plan. **(Appendix XXIII)**
121. The Committee also took note the suggestions and comments by Members at the Session.
122. The Committee reviewed and agreed with the revised Strategic Plan Structure, Key Results Areas and Targets. The priorities will become a living document.

**XIV. PUBLICATIONS (agenda item 14)**

123. The Committee took note of the publications of the Typhoon Committee in 2016.
124. The Committee noted with appreciation all Member's contributions to the publications of Typhoon Committee which have promoted the visibilities and transparencies of TC. The Committee further urged Members to take measures and actions for continuing to support the TC publication, and making contributions especially to the TCRR Journal.

## **XV. PROGRAMME FOR 2017 AND BEYOND (agenda item 15)**

### **15.1. TC50 Anniversary**

125. The Committee was informed of the proposed activities for the TC50 Anniversary as presented in **(Appendix XXIV)** by TCS and AWG Chair.
126. The Committee noted the proposal in creating two Task Teams. The first for the TECO, which will be composed by the 3 secretariats (ESCAP, WMO and TCS), TRCG Chair, Viet Nam representative and other Members from TRCG. The second for the TC50 Session, which will be composed by the 3 secretariats (ESCAP, WMO and TCS), AWG Chair, Viet Nam representative and other interested Members. TCS will send letters to Members to inform them about these two task teams and to invite Members to join. Terms of Reference are included in **Annex I of Appendix XXIV**. The dates accepted for the TECO are 26 to 27 February 2018 and for TC50 Session from 28 February to 03 March 2018.
127. The Committee agreed that sponsors and other funding sources should be sought in helping to organize the social activities that could not be otherwise covered by TCTF with due consideration given to WMO's restrictions.

### **15.2. Retired and new tropical cyclone names**

128. The Committee noted Japan provided HAKUCHO, KOGUMA and KOINU as replacement names for KOPPU.
129. The Committee noted Malaysia provided CEMPAKA, SEROJA and DAHLIA as replacement names for MELOR.
130. The Committee noted USA provided SAUDEL, LEPEN, DAUK, ENIAR and NAMADAU as replacement names for SOUDELOR.
131. The Committee noted DPR Korea provided SURIGAE, DULGUKHWA and PADO as replacement names for MUJIGAE.
132. The Committee noted the request from the Philippines to retire the names of tropical cyclone HAIMA, SARIKA and NOCK-TEN and request China, Cambodia and Lao PDR to provide replacement names.
133. The Committee noted the request from China to retire the name of tropical cyclone MERANTI and request Malaysia to provide replacement names.

## **XVI. COORDINATION WITH OTHER ACTIVITIES OF THE WMO TROPICAL CYCLONE PROGRAMME (agenda item 16)**

134. The Committee was presented by WMO representative about activities under, and those requiring coordination through, TCP. It appreciated the comprehensive presentation, and thanked WMO support to endeavours of the Committee.
135. The Committee was informed by the WMO Secretariat that the 17th WMO Congress endorsed/approved the TCP Programme to arrange and take necessary actions particularly for the following:
  - to expand and consolidate further the regionally coordinated systems to cover all Members prone to tropical cyclones;

- to enhance the capacities of Members to provide more accurate forecasting and warning services which are impact-based and in multi-hazard approach (which was also a decision of EC-66);
  - to improve forecasting and warning capabilities of Members through advances in sciences and technologies, and capacity development; and
  - to reduce damage and loss of lives through the above institutionalized activities and arrangements, and in step with the developmental goals of the Sendai Framework.
136. The Committee was further informed by the WMO Secretariat about decisions made by the 68th session of WMO Executive Council (EC-68). Under the initiative of the Tropical Cyclone Regional Specialized Meteorological Centres (RSMC)/TCWC, and in collaboration with Members with experience in impact-based tropical cyclone forecast and warning services, new products be developed and corresponding training opportunities be provided to assist Members in accelerating their implementation of impact-based tropical cyclone forecasts and warnings (Decision 10).
137. The Committee was informed that the sixteenth Session of Regional Association II (RA II-16) (12–16 February 2017, Abu Dhabi, United Arab Emirates) made a decision to enhance the capacity and competencies of the NMHSs RA II Members prone to tropical cyclones in their tropical cyclone forecasting and warnings through the following two primary aspects:
- necessary arrangements being made to mobilize resources for providing training opportunities to forecasters from those RA II Members through the existing training programmes under the WMO Tropical Cyclone Programme and Education and Training Programme;
  - calling for satellite operators of the Members (for details see the Memorandum on AOMSUC (Asia-Oceania Meteorological Satellite Users Conference)) to devise, coordinate and establish an appropriate protocol under which Members can request event-driven rapid-scanning satellite data covering their national area of interest for Disaster Risk Reduction in accordance with the concept of the Jakarta Declaration, and requesting the Members who signed the Memorandum on AOMSUC to foster cooperation among satellite operators and users in the Region to improve regional capacity in exploiting satellite data for Disaster Risk Reduction.
138. The Committee was informed that TCP activities during the inter-sessional period were mainly focused on following aspects:
- Training and Capacity Development
  - Support to Operational Forecasting
  - Global and Regional Coordination of Forecasting Services
  - Storm Surge Services
139. The Committee was informed that the scope of activities of the regional Tropical Cyclone Committees had been expanded through involvement with the WMO's cross-cutting projects such as the Severe Weather Forecasting Demonstration Project (SWFDP), Coastal Inundation Forecasting Demonstration Project (CIFDP) and Disaster Risk Reduction projects for Early Warning Systems in Regions I, II, IV and V. Those Committees' annual/biennial sessions serve as venues for information sharing for the projects and their technical plans have incorporated collaborative actions with those projects. Wider cross-cutting project coverage is further needed to reach all the Member countries of the regional TC committees. In addition, a synergistic relationship with other UN agencies and international/regional entities has also been developed.
140. The Committee was informed that the web version of Global Guide to Tropical Cyclone Forecasts was reformatted, and printable version (in PDF format) will be available for download before May 2017.
141. The Committee was informed that collaborative efforts were made by the TCP and World Weather Research Programme (WWRP) for promoting application of research outcomes to

operational forecasting within the framework of the Typhoon Committee to implement the Typhoon Landfall Forecast Demonstration Project (TLFDP) including EXOTICCA. The project was also endorsed by the WMO Working Group on Tropical Meteorological Research for extension until 2018. The project was aimed at enhancing the timeliness and accuracy of typhoon forecasts, particularly during the landfall process, with focus on the verification of TC forecast guidance produced in the Typhoon Committee region to assess the currently available forecast techniques.

## **XVII. SUPPORT REQUIRED FOR THE COMMITTEE'S PROGRAMME (agenda item 17)**

### **17.1. Technical Cooperation**

142. The Committee was presented a review of research activities under the WMO Working Group of Tropical Meteorological Research (WGTMR) of the Commission for Atmospheric Sciences in 2016 and the WGTMR planned activities in 2017 and beyond. The Members of the Committee were encouraged to participate in the WMO research activities with particular relevance to the region.

### **17.2. In-kind Contributions**

143. The Committee expressed appreciation for the in-kind contributions from some Members, namely China; Hong Kong, China; Japan; The Philippines; Republic of Korea; Thailand and Viet Nam. 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 XXV**).

144. The Committee also expressed the importance of having in-kind contributions with correspondence values.

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

145. The Committee reviewed the statement of account of TCTF for the period of 1 January to 31 December 2015 and the provisional statement for 1 January to 31 December 2016 submitted by the representative of the WMO Secretariat as shown in **Appendix XXVI**.

146. The Committee was informed by TCS, the summary of income and expenditure from 1 January to 31 December 2014 and 2015 and the provisional summary of income and expenditure for 2016 related to the execution of the Work Plan 2016. (**Appendix XXVII**)

### **17.4. Approval of Typhoon Committee Trust Fund (TCTF) 2017/2018**

147. The Committee took note that the reallocation from special budget by WG's to be approved by Chair of Typhoon Committee and Secretary of Typhoon Committee.

148. The Committee discussed and approved the budget proposal for 2017. (**Appendix XXVIII**)

149. The Committee discussed and approved the change of TC financial period from 01 January-31 December to 01 April-31 March each year to facilitate the expenditure early in the calendar year required in support of the organization of the annual Session.

150. The transition will occur this financial period which runs from 01 January 2017 to 31 March 2018.

## **XVIII. DATE AND PLACE OF THE 12<sup>TH</sup> IWS and TRCG Meeting (agenda 18)**

151. The Committee was informed that the Republic of Korea will host the 12th IWS, possibly in conjunction with the TRCG Meeting. The proposed dates are 30 October-03 November 2017 in Jeju, Republic of Korea.

**XIX. HOSTING OF THE 13<sup>TH</sup> IWS (agenda 19)**

152. The Committee was informed that Singapore was unable to host the 13<sup>th</sup> IWS. Based on the Mechanism for Hosting IWS, Thailand informed the Committee that they are willing to host the 13<sup>th</sup> IWS in 2018, pending final formal government approval. The final date, preferably in November, and place will be confirmed in due course by Thailand and later communicated to TCS.

**XX. DATE AND PLACE OF THE 50<sup>TH</sup> TC SESSION (agenda 20)**

153. The Committee was informed that Viet Nam will host the 50th Session. The proposed date is from 28 February to 03 March 2018 in Ha Noi, Viet Nam.

**XXI. HOSTING OF THE 51<sup>ST</sup> TC SESSION (agenda 21)**

154. The Committee was informed that Cambodia was unable to host the 51<sup>st</sup> TC Session. Based on the Mechanism for Hosting Sessions, China informed the Committee that they will consider hosting the Session and will confirm later.

**XXII. OTHER BUSINESS (agenda item 22)**

155. The Committee noted that new representatives recognized and welcomed.

**XXIII. ADOPTION OF THE REPORT (agenda item 23)**

156. The Committee adopted the report of the session at 12:03 pm, 24 February 2017.

**XXIV. CLOSURE OF THE SESSION**

157. The delegates from the Members of the Typhoon Committee, representatives of WMO, ESCAP and TCS expressed their thanks and appreciation to the JMA, Japan for the successful hosting for organizing the Forty-Ninth Session of the Typhoon Committee. They also expressed gratitude to Dr. Toshihiko HASHIDA, Director General of JMA and his staff for the warm hospitality and excellent arrangements made.
158. The Session was closed by the Chairperson at 12:15 pm, 24 February 2017.