



46th ESCAP/WMO Typhoon Committee Session Report

**Bangkok, Thailand
10-13 February 2014**



ESCAP/WMO
Typhoon Committee

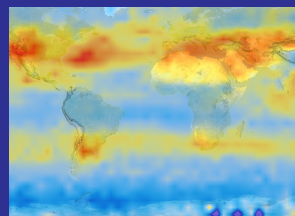
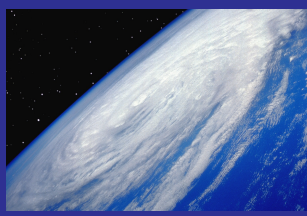


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**REPORT OF THE FORTY-SIXTH SESSION
OF TYPHOON COMMITTEE**

**Bangkok, Thailand
10- 13 February 2014**

PART I – DECISIONS OF THE COMMITTEE

1. The Committee decided to:
 - a. Approve the Typhoon Committee Operational Manual (TOM) with the amendments provided in the **Appendix IX**.
 - b. Approve the recommendations submitted by Credential Committee as provided in the **Appendix III**, future credential letters for Members should be signed by WMO Permanent Representatives (PR) or the Governments.
 - c. Approve the recommendations submitted by Working Group on Meteorology (WGM) as expressed in **paragraph 48**.
 - d. Approve the recommendations submitted by Working Group on Hydrology (WGH) as expressed in **paragraph 79**.
 - e. Approve the recommendations submitted by Working Group on Disaster Risk Reduction (WGDRR) as expressed in **paragraph 84**.
 - f. Request TRCG to develop a budgetary feasible plan in consultation with WMO on RSMC Tokyo attachment training for 2016-2017, to be made available for all Members, with higher priority on capacity development of less developed Members, for submission to 47th Session of TC and approve the remaining recommendations submitted by Training and Research Coordination Group (TRCG) as presented in **paragraph 93**.
 - g. Approve the recommendations submitted by Typhoon Committee Secretariat (TCS) as presented in **paragraph 95**.
 - h. Approve the recommendation submitted by the AWG as expressed in **paragraph 103** and request AWG and TCS to work with WMO in nominating TC representatives to take part in IWTC-8.
 - i. Approve Mr. Olavo Rasquinho to attend the PTC Session in Bangladesh in early March to initiate preparation for the Joint Session in 2015 and to explore other collaboration opportunities where appropriate.
 - j. Approve the nomination of representative of TCS and NDMI to join the WMO expert mission on Haiyan organized by WMO/ESCAP.
 - k. Urge all WGs to submit articles for TC Journal *Tropical Cyclone Research and Review*.
 - l. Approve the Strategic Plan Midterm Review and to request AWG to prepare next cycle with consideration of World Meteorological Organization (WMO) strategic plan and Economic and Social Commission for Asia and the Pacific (ESCAP) comments.
 - m. Approve the offer from Macau, China to host TCS for another four-year period 2015-2018.
 - n. Request the TC Secretary to circulate the nomination by Macao, China of Mr. Yu Jixin as candidate for TC Secretary to all Members for comments and other alternative nominations, if any, within one month of the letter.

- o. Request TCS and AWG to develop procedures for future selection of TC Secretary.
- p. Approve AMPIL as the replacement for BOPHA in the list of the names of tropical cyclones.
- q. Approve retirement of FITOW, SONAMU, HAIYAN and UTOR and request TCS to issue letters to relevant Members requesting the replacement names in accordance with the Committee's procedure.
- r. Approve TCS to submit no cost extension request to ESCAP for the SSOP project until 31 December 2014, instead 31 July 2014.
- s. Request TCS to send letters to Members requesting the nomination of the Organizing Committee (OC) for Experiment on Typhoon Intensity Change in Coastal Area (EXOTICA).
- t. Approve to participate in the project proposed to 9th round of applications for ESCAP Trust Fund by Intergovernmental Oceanographic Commission (IOC)/ United Nations Educational, Scientific and Cultural Organization (UNESCO), if the application is approved.
- u. Request TCS include in-kind contributions in value numbers as an information paper at the next Session.
- v. Approve the 2014 Budget as presented below (see **Appendix XXIII** for detail):

By Group	2014
	Proposed
TCS	33,000.00
TRCG	20,000.00
WGM	26,000.00
WGH	23,000.00
WGDRR	23,000.00
AWG	7,000.00
TOTAL	132,000.00
Plus	
Special Request Budget for WGs	28,000.00
Total	28,000.00
Total Proposed Budget plus Special Request Budget	160,000.00

- w. Request TCS communicate with Malaysia on possibility of hosting the 9th IWS and disseminate to Members.
- x. Accept the kind offer of ESCAP to provide a meeting venue and basic technical support for the 47th Session of TC in conjunction with the 42nd Session of Panel on Tropical Cyclones (PTC). Request TCS to work with PTC Secretariat and WMO on potential funding and logistics issues.
- y. Request TCS to confirm with ESCAP if the meeting venue and basic technical support still can be provided for a regular TC Session, if PTC is unable to attend the Joint Session.

PART II – PROCEEDINGS OF THE COMMITTEE

I. ORGANIZATION OF THE SESSION

2. The Forty-Sixth Session of the ESCAP/WMO Typhoon Committee (TC) was held at the Maple Hotel, Bangkok, Thailand, from 10 to 13 February 2014.
3. The Session was attended by **72** participants from 10 of 14 Members of the Typhoon Committee, namely: China; Hong Kong, China; Japan; Malaysia; Philippines; Republic of Korea; Singapore; Thailand; the United States of America (USA); and the Socialist Republic of Viet Nam.
4. The Session was attended by nine observers from Asian Disaster Preparedness Center (ADPC), Asian Disaster Reduction Center (ADRC), International Civil Aviation Organization (ICAO), International Telecommunication Union (ITU), Joint Typhoon Warning Center (JTWC) and Tohoku University. Representatives of the Economic and Social Commission for Asia and the Pacific (ESCAP), WMO and Typhoon Committee Secretariat (TCS) also attended the Session. The list of participants is given in **Appendix I**.

Opening of the Session (agenda item 1)

5. The Session was declared open at 09:30 am on Monday, 10 February 2014 in Bangkok, Thailand in the presence of the Members' representatives. Mr. Worapat Tiewthanom, Director-General of Thai Meteorological Department (TMD) and Permanent Representative of Thailand with WMO, in representation of His Excellency the Minister of Information and Communication Technology officiated the opening ceremony.
6. The following welcoming addresses were delivered at the opening ceremony by:
 - a. Mr. Songkran Agsorn, Deputy Director-General of TMD.
 - b. Mr. Edwin Lai, Chair of the AWG, in representation of Mr. CM Shun, Chair of the Typhoon Committee.
 - c. Mrs. Shamika Sirimanne, Representative of United Nations Economic and Social Commission for Asia and the Pacific (ESCAP).
 - d. Mr. Taoyong Peng, Representative of World Meteorological Organization (WMO).
 - e. Mr. Worapat Tiewthanom, Director-General, TMD on behalf of His Excellency, Group Capt. Anudith Nakornthap, Minister of Information and Communication Technology.
 - f. Mr. Olavo Rasquinho, Secretary of the Typhoon Committee.
7. The above-mentioned statements are provided in **Appendices II.a, II.b, II.c, II.d, II.e and II.f**, respectively.
8. Dr. Roman L. KINTANAR Award for Typhoon related Disaster Mitigation was presented to the Shanghai Typhoon Institute of China Meteorological Administration (CMA) by Mr. Worapat Tiewthanom. In recognition of their commitment and outstanding contribution towards the typhoon-related disaster mitigation, particularly, the publications "Tropical Cyclone Research and Review" and the assessment on the impacts of climate change on tropical cyclones in Typhoon Committee's region.

II. ELECTION OF OFFICERS (agenda item 2)

9. Mr. Worapat Tiewthanom, Director-General of TMD was elected Chairperson and Mr. Alui Bahari, Deputy Director-General of Malaysian Meteorological Department was elected Vice-Chairperson of the Committee. Mr. Raymond Tanabe, Acting Regional Director National Oceanic and Atmospheric Administration (NOAA), National Weather Service, Pacific Region was elected Chairperson of the Drafting Committee.
10. Mr. Lei XiaoTu, Chair of WGM, Mr. Minoru Kamoto, Chair of WGH and Dr. Jaehyun Shim, on behalf Chair of WGDRR were appointed as members of the Credential Committee. Summary report of the Credential Committee is on Appendix III.

III. ADOPTION OF THE AGENDA (agenda item 3)

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

IV. TECHNICAL PRESENTATIONS (agenda item 4)

12. The Committee took note with appreciation the review of the 2013 typhoon season provided by the RSMC Tokyo as provided in Appendix V.
13. The Committee noted that in the western North Pacific, 31 named tropical cyclones (TCs) formed in 2013, which is more than the 30 year average of 25.6 for the period, 1981-2010. 13 reached typhoon (TY) intensity. 13 named TCs hit the continent.
14. The mean genesis point of the named TCs in 2013 was 16.2°N and 135.6°E, showing deviation to the west from the 30-year average (16.2°N and 137.4°E). Mean duration of TCs in 2013 was 4.2 days, which was shorter by 1.8 days that that in 2012.
15. Two named TCs formed from January to February. Sonamu (1301) formed over the Sulu Sea in January and Shanshan (1302) formed over the South China Sea in February. They damaged the Philippines.
16. Seven named TCs formed from June to July. Bebinca (1305) formed over the South China Sea in June and damaged China and Viet Nam. Rumbia (1306) formed east of the Philippines in June and brought damage to the Philippines and China. Soulik (1307) formed around the Mariana Islands in July and damaged Japan and China. Cimaron (1308) formed north of Luzon Island in July and damaged the Philippines and China. Jebi (1309) formed over the South China Sea in July and damaged China and Viet Nam.
17. Six named TCs formed in August. Manghkut (1310) formed south of Hainan Island and damaged Viet Nam. Utor (1311) formed east of the Philippines and brought heavy damage to China, and some damages to the Philippines. Trami (1312) and Kong-rey (1315) formed and damaged the Philippines, Japan and China.
18. Eight named TCs formed in September. Toraji (1317) formed over the East China Sea and Man-yi (1318) formed south of the Ogasawara Islands. Both TCs damaged Japan. Usagi (1319) formed east of the Philippines and brought damage to the Philippines and China. Wutip (1321) formed over the South China Sea and damaged the Indochina Peninsula. Fitow (1323) formed east of the Philippines and damaged Japan and China.
19. Six named TCs formed in October. Nari (1325) formed east of the Philippines and damaged the Philippines and the Indochina Peninsula. Wipha (1326) formed west of the Mariana Islands and brought heavy damage to Japan. Krosa (1329) formed east of the Philippines and damaged the Philippines.

20. Two named TCs formed in November. Haiyan (1330) formed south of the Chuuk Islands. Moving westward, it reached a central pressure of 895 hPa and brought massive damage to the Philippines. After the Philippines, Haiyan damaged China and Viet Nam. Podul (1331) formed over the South China Sea and heavily damaged Viet Nam.
21. The technical lectures were presented as shown in Appendix VI. The Committee expressed its appreciation to all the lecturers and requested the TCS to post it all the lecture papers/PowerPoint presentations on the TC website.
22. The Committee was briefed by Dr. Yihong DUAN, the representative of WMO Commission for Atmospheric Sciences, the outcomes from CAS-16 and TECO that were held from 18 to 26 November 2013 in Antalya, Turkey. It was informed that the High impact weather, water, Integrated Greenhouse Gas Information System, aerosol, Urbanization and Evolving Technologies would be significant challenges and opportunities over the next decade and beyond. The Committee noted with appreciation the actions taken on the implementation of WWRP FDPs/RDPs such as the Typhoon Landfall Forecast Demonstration Project (TLFDP), the South China Monsoon Rainfall Experiment (SCMREX), and the North Western Pacific Tropical Cyclones Ensemble Forecast Project (NWP-TCEFP), and stressed the significance of these projects in light of recent extreme weather events and their impacts on society and benefits for the Committee Members. The Committee Members were encouraged to send their forecasters and researches to attend the 8th WMO International Workshop on Tropical Cyclones that will be held in Jeju, Republic of Korea, 2 to 10 December 2014 in conjunction with the 3rd WMO International Workshop on TC Landfall Processes.
23. The Committee took note on the presentation on the Cross Cutting Projects on Synergized Standard Operating Procedures for Coastal Multi-Hazards Early Warning System (SSOP), Experiment on Typhoon Intensity Change in Coastal Area (EXOTICA), Verification of Tropical Cyclone Forecast in 2013 Typhoon Season.
24. The Committee discussed the presentation provided by Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) and the issues/concerns related to the typhoon Haiyan, Regional Specialized Meteorological Center (RSMC) Tokyo and WMO-TCP, on the emergency response for current initiatives and follow-up actions. The Committee took note the importance on having a joint expert mission with WMO and ESCAP to the Philippines.
25. The Committee took note the emergency assistance provided to Viet Nam presented by WMO and expressed the need of a fact-finding mission to fully analyze the response, including whether it made difference in Vietnam emergency responses, and if so, how it might be improved for future emergency response in similar situations. It also felt that the proposal by WMO secretariat be carefully discussed at appropriate decision making bodies such as Executive Council and relevant Technical Commissions, if it may change, in emergency situations, the roles and responsibilities of the secretariat and WMO members stated in its Regulations and/or Manuals. It further noted that follow-up activities by Typhoon Committee be discussed at the next TC session based on the finding of the mission to Viet Nam.

V. REPORT ON TC'S KEY ACTIVITIES AND OVERVIEW SUMMARY OF MEMBERS' REPORTS (agenda item 5)

26. The Committee took note the key events in 2013 of TC Chairperson's Report and would consider the ideas and proposals of the TC Chair in formulating the future AOPs, initiatives and recommendations submitted by the TC Chair.
27. The Committee noted with appreciation the proposal by Mr. Edwin Lai, on behalf of TC Chair the recommendation that Chairpersons' report should be prepared and presented at every TC Session in the future.

28. The Committee took note of the major progress and issues in meteorology, hydrology, DRR, training and research aspects as reported by Members in 2013. (http://www.typhooncommittee.org/8IWS_2TRCG/Members.html)
29. The Committee reviewed the Overview Summary of Members Report in Appendix VII, reflecting Members experiences of Typhoon-related hazards in 2013 and reviewed the Members' efforts to study and mitigate the impact arising from such hazards.

VI. REVIEW OF THE ACTIVITIES OF RSMC TOKYO AND AMENDMENTS OF TOM (agenda item 6)

6.1 Review of the activities of the Regional Specialized Meteorological Center (RSMC) Tokyo 2013(Appendix VIII)

30. The Committee was informed that RSMC Tokyo developed objective tropical cyclone satellite analysis using MTSAT called "Cloud grid information objective Dvorak analysis (CLOUD)" and introduced it into operation on 21 January 2014. Details on the methods and systems, including verification results, are found in the Technical Review in 2013. (<http://www.jma.go.jp/jma/jma-eng/jma-center/rsmc-hp-pub-eg/techrev.htm>).
31. The Committee was pleased that RSMC Tokyo has commenced provision of storm surge forecast for the extended region and time series charts at more forecasting points. The forecasting region has been extended to almost twice as large as the previous one, including the Mariana Islands and most of the Caroline Islands. The added stations for the time series charts are Chumphon (Thailand), Boryeong, Busan, Incheon, Jeju, Mokpo and Sokcho (Republic of Korea). Responding to the requests from Members RSMC Tokyo is planning to provide storm surge time-series forecasts at 30 more stations (U.S.A.: 1 station, the Philippines: 9 stations, Vietnam: 20 stations). Members were requested to provide extended tidal data for RSMC Tokyo to verify the storm surge forecasts for the further improvement of its storm surge model. 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 was informed on the effectiveness of Ensemble Prediction Systems (EPS) for TC operational forecast, which was confirmed by the questionnaires, sent to TC Members from WMO in December 2011 and 2012. Products of EPS are provided through Tropical Cyclone Ensemble Forecast Information Home Page (NWP-TCEFP Home Page) operated by JMA since 2010 as guidance of tropical cyclone forecasts in near real-time for TC Members, using the TIGGE (THORPEX Interactive Grand Global Ensemble) Cyclone XML (CXML) data, under the joint project of World Weather Research Program (WWRP) and Tropical Cyclone Program (TCP), North Western Pacific Tropical Cyclone Ensemble Forecast Project (NWP-TCEFP). The NWP-TCEFP performed evaluation of cyclogenesis prediction over the western North Pacific on medium-range timescales for TCs generated between July and October in the period from 2009 and 2012 using ensemble predictions from ECMWF, JMA, NCEP, and UKMO. The results indicate all ensemble systems successfully predicted TC genesis events with a lead time of at least five days. For further evaluation of tropical cyclogenesis predictability over the western North Pacific up to medium-range timescales, NWP-TCEFP has been extended to 2015 at Sixteenth Session of the Commission for Atmospheric Sciences (CAS-16) in November 2013.
33. The Committee reaffirmed that the Center participates in a sub-regional project in Southeast Asia (SWFDP-SeA) as the Regional Center for Tropical Cyclone / Typhoon Forecasting Support to provide typhoon related products, including NWP-TCEFP products at the NWP-TCEFP Home page. The Center dispatched two experts to the joint training workshop of SWFDP-SeA and the subproject in South Asia (Bay of Bengal) held from 8 to 19 April 2013 in Macao, China. One more expert of the Center also gave a webinar (a lecture using a telecommunication tool) to the said joint training workshop. The Center is planning to provide guidance on tropical cyclone ensemble forecast over the western North Pacific in real time to

TYC Members including those of SWFDP-SeA, based on the success of NWP-TCEFP, in order to further promote the operational use of such ensemble guidance.

34. 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 over the period from 1987 to 1996 is being implemented to be completed by the end of 2014.
35. 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) since 12 November 2012. The experimental CAP messages are served in an Atom feed (sometimes called as RSS), enabling recipient centers to retrieve updates by polling (periodically accessing) the feed at <http://www.data.jma.go.jp/fcd/yoho/cap-rsmctk/atom.xml>.
36. The Committee was pleased that RSMC Tokyo organized a technical meeting on radar composite techniques for TMD experts, from 25 to 28 November 2013, at the JMA Headquarters based on the TMD's progress report that states TMD successfully worked on the development of quality-assured radar echo intensity data on the lowest level at one radar site. TMD is developing nationwide composite maps with the transferred technique with continued assistance of the Center in 2014. A preliminary study on application of QPE technique is also planned.
37. The Committee was informed that based on the techniques utilizing the cloud grid information for the analysis of existing CB areas, TCAC Tokyo plans to provide graphical Tropical cyclone advisories (TCAs) according to MODEL TCG in the Appendix 1 of ICAO Annex 3 in a few years.
38. The Committee was pleased that RSMC Tokyo conducted the 13th Attachment Training from 17 to 26 July 2013 inviting two forecasters from Cambodia and Thailand.

6.2 Typhoon Committee Operational Manual (TOM)

39. The Committee noted that the Typhoon Committee Operational Manual (TOM) rapporteur requests WMO to publish and upload the 2014 edition of TOM on the Tropical Cyclone Programme (TCP) Website as submitted by the Rapporteur, with the amendments given in Appendix IX.
40. The Committee expressed its appreciation to the rapporteur for update of TOM.

VII. REPORTS OF TC WORKING GROUPS AND TRCG (agenda item 7)

41. Prior to the plenary session for the Committee, parallel sessions of the Working Groups on Meteorology, Hydrology and Disaster Risk Reduction were convened during the 8th IWS/2nd TRCG to review progress of work during the past year, identify priorities for cooperation and make recommendations to the Committee.
42. The outcomes of the parallel sessions of the three Working Groups were reported to the plenary session as given in the following sections.

7.1. Meteorological Component

43. The Committee took note of the Members activities and major progress and issues in meteorology component in 2013 as reported by Members at the 8th IWS. (http://www.typhooncommittee.org/8IWS_2TRCG/Members.html)

44. 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 VII.
45. The Committee took note the outcomes of the parallel session of the WGM on 5 December 2013 (Appendix X). With the help of TCP of WMO and TCS, and the absolute sincere cooperation of all Members, WGM has successfully completed the tasks in 2013 with the significant outcomes as follow:
- a. WGM has completed all the action plans (include 10 AOPs, 3 POPs and 3 PPs), which were endorsed at the 45th session.
 - b. The second assessment report on the impacts of climate change on tropical cyclones has been published in February 2013 and it is available on the TCS website (<http://www.typhooncommittee.org/documents-tc-publications/>). The two papers related to the second assessment report published in the Journal of Tropical Cyclone Research and Review, were cited three times in Chapter 14 of IPCC AR5 (Climate change 2013: The physical science basis, the WGI report).
 - c. With the support of all Members, the editorial office together with WGM has successfully published the journal Tropical Cyclone Research and Review (Vol.2, No.1-4) under the name of Typhoon Committee in 2013.
 - d. WGM has provided help in the WMO Typhoon Landfall Forecast Demonstration Project (TLFDP) and NW Pacific Tropical Cyclones Ensemble track Forecast Project (NWP-TCEFP) concerning related Members. Both projects have been put into service of Members from 2010, and have been extended to 2015.
 - e. WGM has drafted the proposal of the field experiment - EXOTICA based on the recommendation at the 45th TC Session. The revised draft proposal was submitted to the Session for discussion from Members.
46. The Committee further noted the following outcomes of the WGM parallel meeting at 8th IWS/2nd TRCG Forum:
- a. Members made important progress in the implementation of the TC Strategic Plan during the year 2013.
 - b. Members made significant progress during 2013 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. Successful completion of the WGM action plans in 2013.
 - d. The 6th China-Korea Joint Workshop on Tropical Cyclone was held successfully in Shanghai, China on May 2013. The 7th Workshop will be held in Republic of Korea.
 - e. The inputs from the beneficiary Members of the SSOP project contributed significantly to the implementation of the SSOP.
 - f. The role of the ensemble prediction products in tropical cyclone forecasts for effective warning is increasing through the effective tools provided in the WMO-TCEFP web page.
 - g. JMA has made significant progress in the research on TC genesis prediction skills. The results of the comparison of the Brier Scores of ECMWF, JMA, NCEP and UKMO with the climatology for Day1-Day3, Day3-Day7 and Day7-Day14 indicated that all

EPS successfully predicts genesis events with a lead-time of five days over the investigated period from July to October in 2009 to 2012 by using TIGGE data.

- h. The Committee was informed that JMA plans to launch Himawari-8 which will start its operation in 2015 replacing MTSAT-2. Himawari-9 will also be launched in 2016. Both satellites will be located at around 140 degrees east, and will continue to observe the East Asia and Western Pacific regions for a period of 15 years. Himawari-8/9 will provide true-color images by utilizing visible channels, and observation frequency will be enhanced with full-disk imagery obtained every 10 minutes. In addition rapid scanning will be conducted in several regions, one of which will be a targeted observation of tropical cyclones. All imagery from Himawari-8/9 will be distributed via the Internet. For Members with limited Internet access, JMA will also disseminate primary imagery data necessary for meteorological operational services via a telecommunication satellite, now tentatively scheduled in 2015, in parallel with the direct dissemination of imagery from MTSAT-2 via MTSAT-1R.
- i. Forecasts of tropical cyclone tracks from six global models during 2010-2012 were assessed by STI/CMA to study the current capability of track forecast guidance over the western North Pacific. It is concluded that certain improvements have been made for the six global models in their prediction accuracy and stability in the past three years.
- j. The performance of the South China Sea Typhoon Model (TRAMS) has been improving in 2013. For example, the genesis of UTOR is predicted 30 hours before named, and the 24h, 48h and 72h track forecast error are 43km, 67km and 135km.
- k. KMA has made significant progress in providing seasonal typhoon prediction information by constructing a web-based portal system. The information is produced by three models such as statistical regression model, dynamical and statistical-dynamical hybrid model, and will be provided through the portal system before summer and fall typhoon seasons.
- l. With the technical assistances from JMA, TMD has made significant progress on the project of the Development of Regional Radar Network according to the roadmap.
- m. The in-depth QPE/QPF training organized with the Typhoon Committee Research Fellowship Scheme was much appreciated by the participants from the UFRM pilot cities. Follow-on technical assistance to participating Members on the adaptation of the QPE/QPF technique is necessary.
- n. The expansion of the forecasting region of the storm surge model (the region now cover 95-160oE in longitude and 0-46oN in latitude) and its improvement as well as the addition of the stations from Members for storm surge time series forecasting services will further contribute to the early warning capabilities of storm surge in the TC Region.
- o. With the technical assistance from KMA, Vietnam has made significant progress in the typhoon analysis and prediction capacity. However, there is still need from Members to continue the transfer of this technology and knowledge of analysis among Members as well as the assistance to implement the system.
- p. Higher priority should be put to developing Members of the Committee as the target of the RSMC attachment training to reduce widening gaps between the developed and developing members; and the needs of developing Members for training opportunities to enhance their capacity in the storm surge forecasting should be considered as well.

- q. The web-based typhoon forum could be very useful in terms of providing a convenient platform for both forecasters and researchers with more registered users from the Members.
- r. The publication of the Typhoon Committee Journal “Tropical Cyclone Research and Review” plays an important role in providing an effective way to exchange the knowledge and the latest progress in tropical cyclone research, forecasting technique and warning system as well as to enhance the visibility of Typhoon Committee.
- s. The digitization of CI numbers from different warning centers is in progress. The exchange of best-track datasets including digitized CI numbers and conduct cyclone by cyclone analysis of CI numbers will be useful to narrow down the differences between warning centers on tropical cyclone intensity assessment.
- t. With the significant advances in observations and numerical prediction modeling of typhoon, there has been significant improvement in typhoon track forecast while no significant progress has been made in typhoon intensity forecast. Therefore, strengthening coordination of observations, cooperative efforts on research, and integrating the resources to carry out scientific experiments around common scientific issues and operational objectives, with the focus on the intensity changes of offshore and landfalling tropical cyclones, is very important.
- u. Aircraft reconnaissance project by KMA is in progress. The aircraft (model: King Air 350 H/W) will be equipped with several instruments for the purpose of observing severe weather like typhoon. KMA will start the target observation from 2016 and the collected data could be used for operational and research purpose.

Conclusions of WGM:

47. On the basis of the information provided by Members and the respective coordinator of the AOPs (refer to Appendix X) and based on the discussion during the session, the following conclusions were reached:
- a. AOP item 1 – 7 and 9 in 2013 will be continued in 2014.
 - b. Rename 2013 AOP item 8 as “Training attachment to HKO on QPE/QPF” and to be included in 2014 as AOP 11. 2013 AOP item 10 will be included in the Perennial Operating Projects (POPs) as new POP item 4 in 2014. POP item 1 – 3 in 2013 will be continued in 2014.
 - c. To move the 2013 Preliminary Project (PP) item 1 “Assessment report on the impact of climate change on tropical cyclone in TC region” to AOPs as AOP item 8 in 2014.
 - d. Establish the new AOP item 10 of “Contribution for EXOTICA” in order to support the implementation of this experiment. The project of High Resolution Typhoon Model (HRTM) will be undertaken as the new PP item 1 in 2014.
 - e. PP item 2 – 3 will be continued in 2014.
 - f. The total budget proposed by WGM, which was adjusted at the AWG meeting after the 8th IWS, for undertaking the actions plans (AOPs, POPs and PPs) in 2014 is USD\$15,000. In addition, the budget of USD\$11,000 will be allocated for the support of the next Integrated Workshop. Thus the total budget for WGM for year 2014 is USD\$26,000. The financial support of USD\$5,000 for AOP item 10 will be allocated through the “Special funding request”, considering the necessity to hold a meeting in early 2014 with the participation of the concerned Members and experts for

preparing the implementation of this project, and no extra WGM budget can be made available for this purpose.

- g. Intensify the field campaign on tropical cyclone in TC region and jointly carry out special scientific experiment on the difficult (hard to forecast) but important issues, for example, the structure and intensity changes of tropical cyclone in the coast area and landfall in TC region.
- h. Develop high-resolution typhoon model and reinforce the forecast capability of intensity, wind (gale) and quantitative precipitation.
- i. Reinforce the research of techniques for medium and long range forecasting of TC, evaluate and recommend the short-term climate prediction techniques of TC.
- j. Strengthen the cooperation with WGH and WGDRR towards evaluation of TC impact and risk management.
- k. Enhance the collaboration with TRCG towards the exchange of latest developments and techniques related to tropical cyclone research and operational forecast, as well as the effectiveness of typhoon early warning system.
- l. Improve the quality and influence of the TC journal Tropical Cyclone Research and Review.

Recommendations of WGM:

48. On the basis of the outcomes of the WGM parallel session at 8th IWS/2nd TRCG Forum in Macau, China and subsequent discussion, the WGM made the following recommendations:
 - a. To endorse the WGM project proposal of EXOTICA as shown in Appendix X (Appendix II – EXOTICA), to encourage the active participation of the Members and WGs, and watch for opportunities to collaborate with other field experiments in the area.
 - b. To establish the expert team on the impact of climatic change on tropical cyclone in TC region; and to carry out a preliminary review on the latest research development on the impacts of climate change on tropical cyclones to identify key areas that needed to be addressed in the 3rd Assessment.
 - c. To encourage Members, in particular the SSOP beneficiary Members to collaborate with the SSOP project.
 - d. To request RSMC Tokyo to provide storm surge time series forecasts if so requested by Members, and to enhance training contents on storm surge forecasts during the annual TC attachment training responding to requests from Members.
 - e. To request Members to provide tidal data archive to RSMC Tokyo for verification of the storm surge time series forecasts and further improvement of the storm surge model.
 - f. To further improve QPE/QPF techniques of Members and request RSMC Tokyo to conduct QPE/QPF training during annual TC attachment training.
 - g. To request RSMC Tokyo to explore possible ways to enhance guidance on tropical cyclone ensemble forecasts over the western North Pacific for Members including those of the SWFDP-SeA, based on the success of NWP-TCEFP in order to further promote the operational use of such ensemble guidance.

- h. To request RSMC Tokyo further examines TC genesis prediction skills to identify potential of its operational use in the future.
- i. To request KMA to further improve the typhoon information processing system (TAPS of KMA) project; and to collaborate with the Typhoon Committee Research Fellowship Scheme to provide training for the typhoon forecasters on the use of TAPS as well as to provide follow-on technical assistance on the implementation of TAPS as requested by Members.
- j. To promote the web-based typhoon forum among members and to encourage more forecasters and researchers from Members to register to the forum.
- k. To request TMD to apply radar composite technique provided by JMA to the nationwide radar network in Thailand and to conduct preliminary works on the application of QPE techniques with technical assistance of JMA. To request TMD and JMA to hold a technical meeting to identify a way forward on the submission of a progress report by TMD.
- l. To request STI/CMA to carry out post-season verification and reliability analysis on the operational forecast of tropical cyclones and to further improve the evaluation system for tropical cyclone forecast with special attention on genesis and ensemble forecast in conjunction with WMO-TLFDP.
- m. To request STI/CMA to further improve the editorial procedures of the TC Journal Tropical Cyclone Research and Review.
- n. To request WMO and ESCAP to promote the TC Journal Tropical Cyclone Research and Review and to encourage Members and WGs to submit articles to the Journal.
- o. To collaborate with TC Research Fellowship Scheme to provide QPE/QPF training to Member.
- p. To request CMA to further improve the numerical prediction system TRAMS model of the project of Improvement of South China Sea Typhoon Forecast as well as to provide more related products through its website.
- q. To request KMA to further develop the techniques of typhoon seasonal prediction as well as to improve the web portal web page to provide the products of typhoon seasonal prediction to Members.
- r. To request National Hydro-Meteorological Service of Viet Nam to further improve the SWFDP-Sea portal web page to include more products.
- s. To request STI/CMA to carry out the preliminary study on the High Resolution Tropical Cyclone Model (HTCM).
- t. To continue the study on the methodology to compare the best track datasets based on the recommendations of the best track consolidation meeting with the consideration on the progress of digitization of CI numbers in hardcopy.
- u. To exchange best-track datasets including digitized CI numbers for the period 2004-2013 by the end of June 2014. To conduct cyclone-by-cyclone comparison analysis of CI numbers with preliminary report of findings, if digitization of CI numbers of the said period are completed.
- v. To continue the work of the Taskforce on TC Intensity Analysis for upgrading TD.

- w. To request WMO to publish the 2014 edition of TOM on the Tropical Cyclone Programme (TCP) Website by March 2014.
- x. To endorse the action plans (including the 11 AOPs, 4 POPs and 3 PPs) as shown in Appendix X (Annex II of Appendix I - Summary report of the WGM Parallel Meeting) at the 8th IWS, which summarizes the above recommendations with additional action items.
- y. To endorse the WGM budget proposal included in the budget proposal to be submitted by AWG for TC's approval.
- z. To appoint Mr. Tsukasa Fujita (Japan) as the TOM Rapporteur.
- aa. To appoint Dr. Vicente Malano (Philippines) as the Vice-Chairperson, replacing Dr. Nathaniel Servando. Dr. Malano's appointment will last for remainder of the term (one year)

7.2. Hydrological Component

49. The Committee reviewed the activities of the Members related to the implementation of the TC Strategic Plan and its AOP for the hydrological component during the past year. Details can be found in the **Appendix XI**.
50. The Committee noted the great efforts and progress in effective hydrological monitoring and flood early warning that have been made by some Members in 2013, such as perfecting a reporting system of hydrological information for medium and small-sized reservoirs in China; developing dynamic hydrological and hydraulic computer models for the drainage systems in Hong Kong, China; creating a video monitoring system to observe streams affected by debris flow in Japan; an urban flooding monitoring in Macao, China; an Integrated Flood Forecasting and River Monitoring System (IFFRM) in Malaysia; the Integrated Real-time Discharge Measurement System and the waterfront zone flood information provision system based on GIS in Republic of Korea.
51. The Committee noted that the Ministry of Water Resources (MWR) of China issued the National Standard of Hydrological Early Warning Signals and the National Standard of the Measures for Publicizing Hydrological Early Warning Signals and Relevant Management in 2013 to enhance public awareness of flood and drought risks, which may be shared with Members.
52. The Committee was informed with pleasure that the WGH successfully held its second working meeting with the theme of "Extreme Flood and Flood Forecasting System in TC" at the Han River Flood Control Office (HRFCO) of Korea, in Seoul from 14 to 17 October 2013 at the kind invitation of the Ministry of Land, Infrastructure and Transport (MOLIT), Korea with generous offering of financial support. The Committee expressed its appreciation to the Government of Republic of Korea for hosting WGH working meetings annually since 2012.
53. The Committee was informed about the Guidelines of Urban Flood Risk Management (UFRM), as the final technical report of TC first cross-cutting project on UFRM in the TC area, was published as TC/TD-No. 0008 in December 2013 and distributed at 8th IWS/2nd TRCG Forum. The Committee expressed its appreciation to all drafters from China; Hong Kong, China; Japan; Republic of Korea, and Philippines who contributed to the Guidelines, and in particular recognized Dr. Zhiyu LIU from Bureau of Hydrology (BOH) of China as chief drafter.
54. The Meeting was informed that HRFCO in cooperation with KICT initiated a webpage (<http://tcwgh.hrfo.go.kr>) for WGH, which will enhance the technical information exchange related to the hydrological component of the TC.

55. The Committee was informed that the Vice-Chair of the WGH, Dr. Lee Sang Heon was invited with TC Secretary to attend the first IWS of Panel of Tropical Cyclone (PTC), held in Bangkok from 27 to 29 November 2013, and that he had assisted PTC in drafting the Terms of Reference (ToR) for the PTC WGM, WGH, and WGDRR referencing the ToR of the TC WGs.
56. The Committee was informed about the progress in 2013 of the following on-going projects and their future activities:
- a. Assessment System of Flood Control Measures on Socio-economic Impacts (ASFCM).
 - 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 Selected Pilot City.
 - e. Extension of Xin'anjiang Model Application in Selected River Basins in TC Members.
 - f. Guidelines for Extreme Flood Risk Management in TC Region.
 - g. Study on Prediction of Debris flow and Shallow Landslide by the Satellite Rainfall Data.
57. The Committee noted that HRFCO of MOLIT of the Republic of Korea, in cooperation with Korea Institute of Construction Technology (KICT) drafted the Guideline of Structural Flood Control Measure Assessment System for ASFCM (AOP1) in February 2014 and will be available at 9thIWS.
58. The Committee was informed that the project of ASFCM (AOP1) will be extended one more year to the 47th Session for further case studies in TC Member's countries including Malaysia, Philippines, and Thailand.
59. The meeting noted that the progress made in 2013 for EFFS (AOP2), led by HRFCO of Korea, including: (a) comparative analysis of the flood characteristics in TC members; (b) flood vulnerability analysis in 4 selected river basins with linkage of WGH AOP6; (c) investigation of the flood forecasting system with on-line and field survey; and (d) proposal of the establishment direction for the appropriate Extreme Flood Forecasting System.
60. The Committee was informed that HRFCO of MOLIT of Republic of Korea, in cooperation with KICT and K-water successfully conducted the second field survey from 27 October to 02 November 2013 with 8 participants from Republic of Korea, Lao PDR, Thailand and Philippines for the purposes of data collection for the project of EFFS in selected river basins including Nakdong river in Republic of Korea, Chao Phraya river in Thailand, Pampanga river in Philippines, and Nam Ngum River in Lao PDR.
61. The Committee was informed the plan for EFFS (AOP2) in 2014 and beyond including: (a) conducting the 3rd field survey for data collection in selected Members; (b) confirmation of the establishment direction for the appropriate extreme flood forecasting system; and (c) computational design of the suitable extreme flood forecasting system with PC-version.
62. The Committee noted that the SABO Center of Japan in 2013 fixed the procedure and the data collecting format for surveying sediment-related disasters for the project on Estimation for Socio-economic Impact of Sediment-related Disaster (AOP3). Also, the Committee was informed about the implementation plan of AOP3 in 2014 which recommended (a) a survey of sediment-related disasters based on the procedure and the data collecting format from Members; and (b) establishment of the "Sediment-related Disaster Record Database" for sharing the records among Members.

63. The Committee was informed that the grand application from the Science and Technology Development Fund (STDF) of Macao Government in 2013 for implementing the project of OSUFFIM, which had been approved at 45th Annual Session, held in Hong Kong, as WGH AOP4 was withdrawn. The Committee also noted the importance and necessity of developing a prototype real time OSUFFIM for Members to promote the early warning of urban flood and emergency response, particularly urban flood forecasting and inundation mapping. The Committee expressed its appreciation to Royal Irrigation Department (RID) of Thailand and Sun Yat-Sen University of China for their strong cooperation and support to the project during the preparatory phase. Also the Committee noted that the initial work conducted in 2013, should be a kind of fundamental preparatory work model for developing OSUFFIM in future.
64. The Committee was informed that China is willing to take the role of leading country for the project of OSUFFIM starting from 2014. The Committee also noted that Sun Yat-Sen (SYS) University of China is willing to contribute this cooperation project to the Committee based on its existing achievement on urban flood inundation mapping. Prof. CHEN Yangbo, the head of the Laboratory of Water Disaster Management and Hydro-informatics (Laboratory of WDMH) of SYS University expressed that his Laboratory will seek the possibility of using the budget of its own project on UFRM to start necessary preparatory work for development of OSUFFIM prototype system.
65. The Committee was informed that the kick-off meeting for OSUFFIM implementation was held in Sun Yat-Sen University, Guangzhou, China from 27 to 28 December 2013 with participants from Bureau of Hydrology (BOH) and SYS University of China, Department of Irrigation and Drainage (DID) of Malaysia, Royal Irrigation Department (RID) of Thailand, National Center for Hydro-Meteorological Forecasting (NCHMF) of Vietnam and hydrologist of TCS. The Committee noted that the kick-off meeting achieved following results:
- a. The participants affirmed the mechanism and structure of OSUFFIM implementation and identified the specific roles for System Development Team (SYS Uni., CHINA), Members of Pilot Cities and TCS in OSUFFIM implementation.
 - b. The Members of pilot cities are encouraged to set up Working Groups at national level for the pilot study of OSUFFIM application in their countries.
 - c. The Technical Committee was set up with the role of provision of technical guidance to this project and was proposed to be composed of experts from China, Japan, Republic of Korea, USA and the Project Leaders of Working Groups in Members of pilot cities. Prof. CHEN Yangbo was confirmed as the Chief Scientist of Technical Committee.
 - d. These pilot cities were proposed by participants based on the data availability:
 - China: Dongguan city and/or other city.
 - Malaysia: Kuala Lumpur city in Klang valley or Kuantan City in Kuantan river basin.
 - Thailand: Chiang Mai city in Mae Nam Ping river basin.
 - Viet Nam: Hanoi city in Red river delta or Phu Yen city in Ba river basin.
 - e. The road map of OSUFFIM was developed initially taking into consideration the various situations of the Members as below:
 - 2014: the phase of technical preparation, including establishment of working groups in the Members; prototype system perfecting; guidance material preparing; field survey; data collection.

- 2015: the phase of application and technical training, including perfection of English version for the system; preparing technical documentation; training course; data collection and processing, model setting up and system configuration.
 - 2016: the phase of system testing, including: system installation and trial running in selected pilot cities; documentations drafting and training course.
 - 2017: the phase of system application and project finalization, including real-time operation; inundation mapping; workshop; and publication of technical report.
- f. The tentative implementation plans for the period of 2014 to 2017 were proposed. It was described for 2014 as below:
- Technical preparation, set up of national working group in Members of pilot cities.
 - Field investigation and data collection in selected pilot cities.
 - Prototype of OSUFFIM Chinese version design and development.
 - Prototype of OSUFFIM implementation in pilot city of China.
 - Short training course on data processing.
- g. The participants recognized that the proposed activities will be conducted from 2014 to 2017 subject to the availability of data, human resources and funding support from Members of pilot cities. The Members of pilot cities are encouraged to explore mobilization of the self-funding for supporting the activities related to the pilot studies of development and application of OSUFFIM in the countries.
66. The Committee was informed that the project on Xin'anjiang Model Application in Selected River Basins in TC Members (AOP5), led by BOH, Ministry of Water Resources (MWR) of China in cooperation with DID of Malaysia, fully achieved the goals of implementation plan in 2013, including:
- a. BOH, in cooperation with Hohai University of China, accomplished the improvement and perfection of the English version of application platform for Xin'anjiang Model, and provided the instruction of Model.
 - b. The training course was successfully conducted in Kuala Lumpur, Malaysia from October 21 to 25, 2013. China-side sent 2 resource persons from BOH and Hohai University to the course, and about 25 participants from Malaysia attended the course.
 - c. DID, Malaysia has commenced developing flood forecasting system by using Xin'anjiang Model for Segamat River Basin of Malaysia. The system has been used on trial in the river basin and hopefully will be used in operation in 2014.
67. The Committee noted that, as requested by DID of Malaysia, BOH of China will conduct one week on-job-training in Beijing or/and Kuala Lumpur on Xin'anjiang Model application for Malaysia and other interested Members in 2014 subject to available funding from TCTF.
68. The Committee noted the progresses of the project on Guidelines for extreme flood risk management in TC region (AOP6), led by HRFCO of Korea, in 2013 including: (a) confirmed

- the definition of Extreme Flood in hydrologic and socio-economic aspects; (b) conducted comparative flood vulnerability analysis in 4 selected river basins; and (c) conducted investigation of flood features for the 4 selected Rivers in Laos, Korea, Philippines and Thailand.
69. The Committee was informed the implementation plan of AOP6 in 2014, including: (a) to investigate the flood features for the 4 selected Rivers and analysis of the flood characteristics; (b) comment and suggest the structural and non-structural countermeasures for extreme flood control; and (c) draft the guideline for extreme flood risk management with consulting Members.
70. The Committee was informed the initial roadmap from 2013 to 2017 for the project of Study on Prediction of Debris flow and Shallow Landslide by the Satellite Rainfall Data (AOP7) led by International Centre for Water Hazard and Risk Management (ICHARM) of Japan as:
- a. 2013: Developing prototype system (ICHARM) and surveying of test fields.
 - b. 2014: Developing prototype system (ICHARM), correcting ground truth data on test fields, analyzing on test fields, and workshop on test fields.
 - c. 2015: Feasibility study of system on test fields, workshop on test fields, and developing system (ICHARM).
 - d. 2016: Feasibility study of system on test fields, workshop on test fields, developing of system (ICHARM), and developing training program.
 - e. 2017: Improvement of system (ICHARM), developing training program, workshop and training.
71. The Committee noted the WGH recognized the outcome and achievement of Project of SSOP for Coastal Multi-hazard Early Warning System could greatly benefit the Members, and the Members should be encouraged to contribute to this project. Also the Committee noted WGH reaffirmed its commitment to contribute to the SSOP project, as cross-cutting project of TC.
72. The Committee noted that the Change of Probable Maximum Precipitation (PMP) in the typhoon-affected region due to climate change could impact Probable Maximum Flood (PMF) and consequently impact infrastructure construction and standard of flood control. The progresses and achievements on PMP research made by Prof. Bingzhang Lin, dean of College of Hydrometeorology, Nanjing University of Information Science & Technology (NUIST) could benefit the Members. The Committee also noted the requirement from WGH to consider the possibility of conducting roving seminar and/or training course for the Members on PMP/PMF review and study taking into consideration climate change.
73. The Committee noted the needs from Members on joint training and research, including the methodologies of inundation simulation modeling and risk mapping considering different phenomenon, satellite data utilization, damage assessment; QPE/QPF products for the purpose of Inundation simulation, and integrated scenario building for emergency response to typhoon-related disasters.
74. The Committee noted the comments of that, one of the innovations that the WGH must pursue is the use or application of satellite based information (SBT) for promoting the accuracy and extending the leading-time of flood forecasting.
75. The Committee noted the discussion the WGH should consider one AOP for dealing with addressing medium to long-term hydrological forecasts in conjunction with WMO's Commission for Hydrology (CHy) and Climate and Water Programme.

76. The Committee noted with appreciation that MOLIT of Republic of Korea through HFRCO provided funding to support two hydrologists to participate in the TC 8th IWS/2nd TRCG Forum held in Macao, China.
77. The Committee was informed that BOH of China is willing to nominate Ms. Li Yan, Deputy Director, Division of the Hydrological Information and Forecast Center, BOH of China, as Vice Chairperson from 46th Session to serve with TC-WGH.

Conclusions of WGH:

78. On the basis of the information of hydrological component provided by Members and findings of the 2nd WGH working meeting in October 2013 and TC 8th IWS/2nd TRCG Forum held in Macao, China in December 2013, the following conclusions were reached:
 - a. The working meeting of WGH is very important to review hydrological activities and implementation status of WGH AOPs and to prepare IWS and annual session. The meeting should be continued.
 - b. To improve the capacity on hydrological phenomena forecasting is a continual challenge in developing Members. WGH needs to continue conducting activities focusing on the capacity building in aspects of flood monitoring, simulation, forecasting, and analysis covering river flood, urban flood, sediment disasters, storm surge, etc.
 - c. UFRM Guidelines, as a final outcome of TC Cross-cutting project of UFRM, was published as TC publication, which collected the expertise and experience on urban flood risk management among TC Members, and will undoubtedly benefit Members. However, Members still expect concrete measure from Committee to promote the capacity on urban flood forecasting and inundation mapping. As the subsequent activity of TC Cross-cutting project of UFRM, development and application of OSUFFIM would play very meaningful and important role for Members to promote the capacity on the technique of urban flood forecasting and warning. Also, technical training courses on urban flood forecasting, inundation mapping and damage assessment should be considered as subsequent activities of the project of UFRM in the Committee.
 - d. Inundation assessment under the combined risks of heavy rain, river flooding, waves and tides, and storm surge should be considered not only in coastal region but also in urban area in the Members with considering the damage assessment so that more relevant information could be provided to decision-makers of disaster risk reduction. The joint training and research among three components of meteorology, hydrology and disaster risk reduction.
 - e. There is agreement on the necessity and importance to conduct PMP/PMF review and study in TC Members considering the change of rainfall pattern under climate change, which surely impacts the standard design for flood control, infrastructure construction, strategic plan, and consequently impact the effectiveness and efficiency of DRR emergency response. The scenario building under new PMP/PMF is necessary for promoting the capacity of typhoon-related DRR among Members.
 - f. The Project of SSOP was successfully implemented in 2013. The outcome and achievement could greatly benefit the Members and the contribution from Members is also very important for achieving the expected goals. WGH will continue contributing to the implementation of this project.
 - g. Enhancement of the close collaboration with WMO CHy, WMO RA II Working Group on Hydrological Forecasts and Assessments and RA V Working Group on

Hydrological Services in several themes of common interest provides significant benefits to the Committee.

Recommendations of WGH:

79. On the basis of the discussion and outcomes at 2nd WGH working meeting and parallel session of TC 8th IWS/2nd TRCG Forum, the WGH made the following recommendations to the Committee:
- a. To appoint Ms. Li Yan, Deputy Division Director of BOH of China as co-Vice Chairperson of WGH. Ms. Li's appointment will last for remainder of the term (one year).
 - b. To endorse the WGH budget proposal included in the budget proposal to be submitted by AWG for TC's approval.
 - c. To endorse the action plans as listed in Annex II of the Appendix – Summary report of the WGH Parallel Meeting at the 8th IWS, which summarizes the above recommendations with additional action items.
 - d. To continue conducting the project of OSUFFIM as one of subsequent activities of TC cross-cutting project of UFRM and request Members of Pilot Cities exploring mobilization the self-funding support for the pilot studies of development and application of OSUFFIM.
 - e. To request TRCG to consider the possibility of organizing the seminar and/or training course for Members on urban flood forecasting, inundation mapping, PMP/PMF review and study taking into consideration climate change as subsequent activities of TC cross-cutting project of UFRM.
 - f. To request Members explore mobilization of self-funding support for the pilot studies and application of Xin'anjiang model in selected river basins to promote the capacity of flood forecasting and warning.
 - g. To request HRFCO, MOLIT of Republic of Korea to host WGH third working meeting in appropriate time with funding support.
 - h. To request HRFCO, MOLIT of Republic of Korea to perfect WGH webpage and set up the linkage with TC website in cooperation with TCS and Members.
 - i. To encourage Members to contribute the cross-cutting project of SSOP.
 - j. To re-appoint the hydrologist of TCS Mr. Jinping Liu and the focal point of WGH, Ms. Hwi-Rin KIM, Republic of Korea as the liaison to WMO RA II and RA V WGHs for the Committee.
 - k. To request WMO continue taking actions to facilitate involvement of WGH in the activities of WMO water and hydrology issues.
 - l. To request WGH continue taking the action on the closest linkages between the two working groups of WMO RAI and the Committee which were identified at the Committee 43rd Session as:
 - UFRM and flash flood/debris flow/landslide prediction/warning under the RA II theme of Disaster Mitigation – Implementation of the WMO Flood Forecasting Initiative including Flash Flood Forecasting Capabilities; and

- Assessment of the variability of water resources in a changing climate under the RA II theme of Water Resources Assessment, Availability and Use (surface water and ground water).
- m. To support WGH activities continue focusing on improving the ability to forecast hydrological phenomena and provide measures for the effectiveness of the improvements.

7.3. Disaster Risk Reduction Component

80. The Committee took note of the activities as presented in WGDRR Report 2013 and reviewed the outcome of the Parallel Session of the WGDRR during the 8th IWS that was held in Macao, China in December 2013. (Refer to **appendix XII**)
81. The Committee reviewed the activities related to the implementation of the TC Strategic Plan and its AOP of WGDRR during the past year, details of which are presented in Appendix VII.
82. The Committee was informed the WGDRR AOP are included as follows:
 - a. Extend the WEB GIS based Typhoon Committee Disaster Information System (WGTCDIS) for upgrading the search option for finding similar Typhoon and collecting disaster information from TC Members.
 - b. Provide the training program for disaster prevention policies including WGTCDIS.
 - c. Promote the international cooperation research by dispatching the experts of NDMI and TCS to Philippines for installing the Flash Flood Alert System (FFAS) and Automated Rainfall Alert System.
 - d. Promote and extend the dissemination of warnings and alerts by Members through SWIC (Severe Weather Information Center).
 - e. Set up community weather stations for raising public awareness on climate change and extreme weather.
 - f. Benefit Evaluation of Typhoon Disaster Prevention and Preparedness.
 - g. The SSOP project related to disaster risk management.

Conclusions of WGDRR:

83. On the basis of the information provided by the Members and findings of the parallel session on WGDRR, the following conclusions were reached:
 - a. The WGDRR will continue to collect disaster information from Members for WGTCDIS.
 - b. National Disaster Management Institute (NDMI) will continue the upgrade of WGTC DIS in 2014.
 - c. Expert mission will be continued in 2014. It will provide training on the operation of WGTCDIS by NDMI in collaboration with TCS. 2014 Expert Mission will also provide the training program for disaster prevention technologies and policies. The contents of the expert mission program will consist of Flash Flood Alert System (FFAS), Frequency Analysis for Rainfall Data (FARD), application of radar for urban flood warning, and Soil Erosion Model for Mountainous Area (SEMMA).

- d. 2013 Northern Mindanao Project for Philippines led by NDMI will be continued in 2014. In project, it will expand the installation of ARWS (Automatic Rainfall Warning System) in Cagayan de Oro and enhance the function of FFAS (Flash Flood Alert System).
- e. Hong Kong, China had made preparations for the installation of automated weather stations for the pilot project for Community Weather Station in 2014. Regarding this, Hong Kong Observatory (HKO) will coordinate with interested members DPR Korea and Viet Nam to set up community weather stations in their country.
- f. CMA and NDMI will continue the research project in 2014 namely "Benefit Evaluation of Typhoon Disaster Risk Reduction" proposed in 45th TC session.
- g. The 9th WGDRR Workshop will be held in Seoul, Republic of Korea on 22-23 May or 26-27 May 2014. Korea will send the information to Members to confirm the date.
- h. HKO proposed the project for increasing public awareness on tropical cyclone related hazards by making information (by means of short video) more understandable to the public. This project is included in AOP9 of WGDRR.
- i. In WGDRR parallel session, it was discussed about media response to disaster. Members agreed the importance of the role of the media during the disaster. The research for media response to build the trust with media will be conducted by NDMI in 2014.

Recommendations of WGDRR:

84. On the basis of the information provided by the Members and deliberations, the WGDRR made the following recommendations:
- a. To endorse the WGDRR budget proposal included in the budget proposal to be submitted by AWG for TC's approval.
 - b. To endorse the action plans as listed in Annex II of the Appendix – Summary report of the WGDRR Parallel Meeting at the 8th IWS, which summarizes the above recommendations with additional action items.
 - c. To collect the disaster information from TC Members for extending TCDIS, the continuity of such collection should be maintained and this project will be continued in 2014.
 - d. To conduct expert missions in Guam and Thailand for WGTCDIS, disaster prevention technologies, and policies in 2014.
 - e. To start new project for increasing public awareness led by HKO.
 - f. To begin the new research for building the trust with media.
 - g. To make the plan for the exhibition booth and side event in 2014 AMCDRR meeting in Bangkok, Thailand.
 - h. To continue the benefit evaluation of Typhoon disaster prevention and preparedness led by CMA and start new research of benefit evaluation of disaster risk reduction led by NDMI.
 - i. To request HKO to coordinate the setting up of automatic weather stations for the community based weather station project in the 2 interested Members of DPR Korea and Viet Nam in 2014.

- j. To re-appoint Dr. Yeo, Woon Kwang (Republic of Korea) and Ms. Leong Fong Peng (Macau, China) as respective Chairperson and Vice-Chairperson of WGDRR.

7.4. Training and Research Coordination Group

85. The Committee took note of the progress made in training and research activities as presented in the TRCG Report 2013, including the successful completion of the 2nd TRCG Forum in conjunction with 8th IWS in Macao, China. (Appendix XIII)
86. The Committee expressed its appreciation to Macao Meteorological and Geophysical Bureau for hosting the 2nd TRCG Forum, and to the Macao Foundation and the Ministry of Land, Infrastructure and Transport of the Republic of Korea for their generous support of the event.
87. The Committee took note of the planning and recommendations made in the TRCG Planning Meeting held on 5 December 2013 after the 2nd TRCG Forum, particularly with respect to the revised priority research and training areas and the formulation of a new 4-year work plan for 2014-2017. The Committee thanked TRCG members for their continuing effort and commitment in support of TRCG initiatives.
88. The Committee thanked Hong Kong, China and Republic of Korea for hosting research fellowship programs in 2013.
89. The Committee took note of the successful RSMC Tokyo training attachment of forecasters from Cambodia and Thailand in July 2013, and thanked JMA and WMO TCP for continuously supporting this capacity-building initiative.
90. The Committee was informed of the proposed changes with respect to the organization and implementation of future forecasters' attachment to RSMC Tokyo.
91. The Committee was informed of the proposed changes with respect to the organization and implementation of future Roving Seminars.
92. The Committee appreciated TRCG's input in support of training and research activities in connection with TC's cross-cutting projects.

RECOMMENDATIONS of TRCG:

93. Based on the discussion in the TRCG Planning Meeting on 5 December and as presented in the TRCG Report 2013, TRCG recommended the Committee to:
 - a. Take note of TRCG Report 2013, including report on the 2nd TRCG Forum.
 - b. Endorse the priority training and research areas as proposed in TRCG Report 2013.
 - c. Approve the changes in the arrangements with respect to RSMC Tokyo forecasters' attachment.
 - d. Approve the changes in the arrangement with respect to the Roving Seminar.
 - e. Endorse the TRCG Work Plan for 2014 – 2017.
 - f. Endorse TRCG AOP 2014.
 - g. Appoint Dr. T.C. Lee of Hong Kong, China as the new Chair of TRCG, replacing Mr. Edwin Lai for the remainder of the term.

VIII. REPORTS OF THE TCS AND AWG (agenda item 8)

8.1 Activities of Typhoon Committee Secretariat

94. The Committee took note of the activities report given in **Appendix XIV** prepared by the Secretary of the Typhoon Committee and appreciated the efforts of the TCS for executing the decisions of the TC and supporting its activities.
95. On the basis of the experience of routine operation of TCS in 2013, and considering 2014 is the last year of 2nd term of TCS in Macao, TCS made the following recommendations:
 - a. To endorse the TCS budget proposal included in the budget proposal to be submitted by AWG for TC's approval.
 - b. To recognize the kind offer from Macao Government for continuing to host TCS for the 3rd four-year term from 2015 to 2018.
 - c. To recognize the Macao Government for continuing to second the meteorologist of TCS, Mr. Leong Kai Hong (Derek), through the Macao Meteorological and Geophysical Bureau (SMG), and for seconding, through the Macao Fire Service Department (MFSD), the DRR expert of TCS Mr. Lei Pun Chi (Barrie).
 - d. To recognize the Government of China, through the Bureau of Hydrology (BOH), for providing Mr. Jinping Liu serving with TCS as seconded hydrologist, and request BOH to continue seconding Mr. Jinping Liu to work in TCS for the 3rd term from 2015 to 2018 with a letter of agreement between BOH and TCS.
 - e. To submit to ESCAP the no cost extension of the SSOP project until 31 December 2014, instead 31 July 2014.
 - f. To encourage Members continuing cooperation on SSOP in 2014 including appointing focal points for SSOP purposes and assisting the manual drafting and training workshop.
 - g. To request TC to cooperate with IOC/UNESCO in the project proposed by IOC under the 9th round of funding for the ESCAP Trust Fund, if the corresponding application is approved.
 - h. To encourage AWG members to continue playing their active role on the issues of the Committee.

8.2 Activities of AWG

96. The Committee was informed of the activities of the AWG as presented in the AWG Report 2013. (**Appendix XV**)
97. The Committee was informed of the preparation of the budget for 2014 and that non-recurring items would be put up separately for special funding request consideration.
98. The Committee was informed of the plan to hold a joint PTC/TC Session in early 2015 hosted by ESCAP in Bangkok.
99. The Committee was informed of the need for following up on the case of Haiyan to study how DRR aspects could be effectively integrated into operational warning systems.
100. The Committee was informed of the opportunity for TC to be involved in the IWTC to be held in Jeju, Republic of Korea in early December and the possibility of presenting the case of Haiyan based on the findings from the mission.
101. The Committee was briefed on the plans to organize activities in 2014 in support of the SSOP project.

102. The Committee expressed its sincere appreciation to the AWG members for their work in organizing and coordinating key TC activities, the annual operating plans and the budget.

Recommendations of the AWG

103. Based on the outcomes of the AWG meeting in Bangkok and the AWG post-IWS meeting in Macao, AWG recommended the Committee to:

- a. Take note of the progress and recommendations made, including the preparation of the budget for 2014.
- b. Approve and nominate TC representative(s) to attend the PTC Session in Bangladesh in early March to initiate preparation for the Joint Session in 2015 and to explore other collaboration opportunities where appropriate.
- c. Approve and nominate TC representative(s) to join the mission on Haiyan organized by WMO/ESCAP.
- d. Request AWG and TCS to work with WMO to nominate TC representative(s) to take part in the IWTC meeting in Jeju, Republic of Korea in early December and to share findings on the mission of Haiyan where appropriate.
- e. Approve the organization of a SOP workshop in Nanjing and to endorse the adoption of SSOP-related themes for the 9th IWS.

IX. STRATEGIC PLAN MIDTERM REVIEW (agenda item 9)

104. The Committee took note the changes on the Strategic Plan Midterm Review. (**Appendix XVI**). The Committee also noted that AWG will prepare next cycle with consideration of WMO's new SP and ESCAP comments.

X. PUBLICATIONS (agenda item 10) - Appendix XVII

105. The Committee noted with appreciation that the RSMC Tokyo - Typhoon Center published the "Technical Review No.15" in March 2013 and the "Annual Report on the Activities of the RSMC Tokyo - Typhoon Center in 2012" in December 2013. These are available on the Web page of JMA/RSMC Tokyo at http://www.jma.go.jp/jma/jma-eng/jma-center/rsmc-hp-public/RSMC_HP.htm.

106. The Committee took note of the coordination by STI/CMA and TCS in the publication of the TC Journal TCRR (Vol. 2 No. 1-4).

107. The Committee expressed its appreciation to STI/CMA for supporting the ongoing operation of the editorial office, online manuscript submission and review system, the great contribution on editing and publishing the Journal, and thanks to the visiting editor from Republic of Korea.

(a) Technical report of TC cross-cutting project on Urban Flood Risk Management (UFRM) in the Typhoon Committee Area

108. The Committee took note of the coordination by TCS on the publication of "Guidelines on Urban Flood Risk Management (UFRM)" (TC/TD 0008).

109. The Committee expressed its appreciation to the contributors for the UFRM Project.

XI. PROGRAMME FOR 2014 AND BEYOND (agenda item 11)

11.1. Hosting TCS 2015-2018

110. The Committee discussed and approved the offer from Macau, China to host TCS for the four-year period 2015-2018. (Appendix XVIII)

111. The Committee noted that Mr. Olavo Rasquinho, TC Secretary, has expressed his wish to retire in early 2015 after the TC-47 Session. According to Rules of Procedure of the Committee, rule 10, "In implementing Article 3 of the Statute of the Typhoon Committee, the Typhoon Committee shall review regularly the appointment of the TC Secretary and any issues related to TCS hosting arrangement" and Terms of Reference of the Typhoon Committee, paragraph 14, "The Committee shall appoint the TC Secretary."

112. The Committee was informed through TC Secretary, the Government of Macao, China submitted an official letter to nominate Mr. Yu Jixin from CMA as a candidate of new TC Secretary for the period 2015 – 2018. The Committee also noted and appreciated the support of China in this nomination.

11.2. New Tropical cyclone names as replacement of removed from the list

113. The Committee noted Cambodia provided AMPIL, KOULEN and KANDIENG as possible replacements for BOPHA.

11.3. Retirement of Tropical Cyclone Name from the list (APPENDIX XIX)

114. The Committee noted the request from the Philippines to retire the names of the tropical cyclones HAIYAN and UTOR.

115. The Committee noted the request from Malaysia to retire the names of the tropical cyclone SONAMU.

116. The Committee noted the request from China to retire the name of the tropical cyclone FITOW.

11.4. Experiment on Typhoon Intensity Change in Coastal Area (EXOTICA)

117. The Committee noted with appreciation the submission of the project EXOTICA to the 46th Session by WGM in accordance with the decision on the WGM recommendation at the 45th Session.

118. The Committee noted the organization structure of EXOTICA and recognized that the OC should be at the top of the organization structure.

119. The Committee noted the implementation plan as well and recognized that the OC should be established as soon as possible to start up the implementation of the project.

120. The Committee noted that The Scientific Steering Committee (SSC) will be established to provide guidance on the design and implementation of this field experiment. SSC will comprise the renowned typhoon experts. All the members of the SSC will be nominated by the OC.

121. The Committee further noted the following:

- the OC will develop the detailed implementation structure and procedures.
- to complete the nomination of members of SSC, Chief Scientists, and members of Research Group as soon as possible after the establishment of the OC.

- Piloting (spin-up) the field campaign (including the trial target observations for 1-2 tropical cyclones) and testing of instruments, demonstration research in 2014.

11.5. Joint Project with IOC/UNESCO

122. The Committee noted the invitation to participate in the project proposed by IOC/UNESCO to ESCAP Trust Fund.

XII. COORDINATION WITH OTHER ACTIVITIES OF THE WMO TROPICAL CYCLONE PROGRAMME (agenda item 12)

123. The Committee was informed by the WMO Secretariat that, at its 16th Congress (Cg-XVI) of WMO gave priority on the following:

- a. Global Framework for Climate Services (GFCS).
- b. Capacity Building.
- c. WMO Integrated Global Observing System (WIGOS) & WMO Information System (WIS).
- d. Disaster Risk Reduction.
- e. Aeronautical meteorology.

124. The Committee was also informed that Cg-XVI gave following guidance to the Tropical Cyclone Programme (TCP):

- a. To assist Members in their efforts to implement Tropical Cyclone Programme activities for the safeguard of life and property from tropical cyclones and related hazards to the maximum extent possible within the available budgetary resources.
- b. To continue to support the capacity building programmes for developing countries, especially for Least Developed Countries and Small Island Developing States.
- c. To maintain and further enhance the collaboration between the Tropical Cyclone Programme and relevant WMO Programmes and technical commissions, particularly in relation to the development of tropical cyclone forecasting competencies.
- d. To continue close cooperation with other international as well as relevant national organizations at the global and regional levels to promote a multidisciplinary and multi-hazard approach towards the attainment of the humanitarian goals of the Programme.

125. TCP activities during the inter-sessional period were highlighted as follows.

- a) Training and Capacity Development

Workshops on TC Forecasting and Public Weather Service in Miami, Florida, USA from 11 to 22 March 2013, in Nadi, Fiji, 23 September to 4 October 2013, and in La Reunion, France, 28 October to 8 November 2013.

RSMC attachment training for tropical cyclones in New Delhi, India from 11 to 22 February 2013, and in Tokyo, Japan from 19 to 28 July 2013, and for storm surge in Indian Institute of Technology, Delhi, India from 9 to 20 December 2013.

Development of the tropical cyclone forecaster competencies for ensuring the quality of tropical cyclone forecasting services, and meeting the users' requirements. The WMO/ESCAP Panel on Tropical Cyclones, RA V Tropical Cyclone Committees, and RA IV Hurricane Committee discussed the standards during their annual/biennial sessions, respectively, and started to set up expert teams to propose a set of competencies in their respective Regions.

b) Support to Operational Forecasting

TCP launched the WMO Tropical Cyclone Forecaster Website (TCFW) in April 2013. TCFW is hosted and maintained by the Hong Kong Observatory of Hong Kong, China on behalf of WMO and is now accessible at <http://severe.worldweather.wmo.int/TCFW>. It is aimed to assist forecasters of all the basins in their operational forecasting of tropical cyclones. It functions as a portal to navigate the forecasters to various websites offering data/products of tropical cyclone analyses and forecasts. TCFW will also provide research outcomes and training materials, and thus serve as a comprehensive source of information for the forecasters.

The updated WMO Global Guide to Tropical Cyclone Forecasting is in the final stage of review for its web-based version with Mr. Chip Guard of the United States as Chief Editor. It is hosted by the Bureau of Meteorology in Australia, and will be accessible after completion of the review. The web-based new Global Guide will allow for revision/update when necessary in an easier manner so that it will be kept in step with new developments of tropical cyclone forecasting techniques.

c) Coordination of Forecasting Services

The seventh TC RSMCs/TCWCs Technical Coordination Meeting (TCM) (Indonesia, 11-15 November 2012): 1) recommended to promote the uniformity and standardization of tropical cyclone forecasting services; 2) conducted a thorough review of the application of Common Alerting Protocol (CAP) to tropical cyclone warnings and advisories, with particular attention paid to the tropical cyclone advisories in CAP format which RSMC Tokyo started to develop on a trial basis in 2012; 3) recommended to explore and therefore established an ad hoc team, comprised tentatively of RSMCs La Reunion, Miami, New Delhi, Tokyo and TCWC Perth as members, and the National Climatic Data Center of NOAA as an observer, to investigate the feasibility of developing a globally-unified classification of tropical cyclones including a category system, including an in-depth review of the current warning practices in all the regions and a careful consideration for the acceptability to the users who are familiar with existing classifications over the years; 4) recommended to implement by the seven Tropical Cyclone Advisory Centers (TCACs) the Amendment 75 to ICAO Annex 3/WMO Technical Regulations [C.3.1] concerning provision of the graphical format of tropical cyclone advisories became effective in November 2010.

d) Storm Surge Watch Scheme

After the WMO/ESCAP Panel on Tropical Cyclones, and ESCAP/WMO Typhoon Committee which have implemented the Storm Surge Watch Scheme, RA IV Hurricane Committee has decided during its annual session (Willemstad, Curacao, 6 – 12 April 2013) decided to implement the scheme and provide the storm surge advisories starting from the hurricane season 2015.

126. The Committee was informed that the scope of activities of the regional TC 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. The 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, e.g. the recent cooperation between the RA V Tropical Cyclone Committee and the ICG/PTWS Regional Working Group on Tsunami Warning and Mitigation in the South West Pacific.

127. The Committee was informed of WMO Emergency Response to Typhoon Haiyan, including the recommendation by the meeting of the Presidents of Technical Commissions in Geneva, Switzerland, 20 – 21 January 2014.

128. The Committee noted WMO Secretary General's invitation for the TC to help and play important roles in the development and implementation of follow-up actions after Typhoon Haiyan.

129. WWRP and TCP have planned to organize the 8th International Workshop on Tropical Cyclones (IWTC-VIII) in Jeju, Korea, in early December 2014. The IWTC-VIII is a quadrennial forum for tropical cyclone community (both researcher and forecasters) to discuss together with virtually all aspects related to tropical cyclones with particular focus on motion, evolution, intensity, precipitation patterns, structure, and societal impacts.

XIII. SUPPORT REQUIRED FOR THE COMMITTEE'S PROGRAMME (agenda item 13)

13.1. Technical Cooperation

130. The Committee was informed that the technical cooperation activities of WMO were not presented by WMO.

13.2. In-kind Contributions

131. The Committee expressed appreciation for the in-kind contributions from some Members, namely China; Hong Kong, China; Japan; Macao, China; 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 XX).

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

13.3. Typhoon Committee Trust Fund (TCTF)

133. The Committee reviewed the statement of account of TCTF for the period of 1 January to 31 December 2012 and the provisional statement for 1 January to 31 December 2013 submitted by the representative of the WMO Secretariat as shown in Appendix XXI.

134. The Committee was informed by TCS, the summary of income and expenditure from 1 January to 31 December 2011 and 2012 and the provisional summary of income and expenditure for 2013 related to the execution of the Work Plan 2013. (Appendix XXII)

13.4. Approval of Typhoon Committee Trust Fund (TCTF) 2014

135. The Committee discussed the budget proposal for 2014. (Appendix XXIII)

XIV. DATE AND PLACE OF THE 9TH IWS (agenda 14)

136. The Committee was informed the consideration by Malaysia to host the 9th IWS. The final dates will be confirmed in due course by Malaysia and later communicated to TCS.

XV. DATE AND PLACE OF THE FORTY-SEVENTH SESSION – JOINT PTC/TC SESSION (agenda 15)

137. The Committee discussed to have a Joint Session with PTC, and expressed the need to have an effective arrangement in organizing a Joint Session.

138. The Committee noted that ESCAP would provide the meeting venue and technical equipment for the Joint Session but not in position to offer financial support to participants or coffee breaks/meals.

139. The Committee was informed by the USA the intention to host the 48th Session in Honolulu, Hawaii, USA, tentatively.

XVI. OTHER BUSINESS (agenda item 16)

140. The Committee noted that no other business to discussed.

XVII. ADOPTION OF THE REPORT (agenda item 17)

141. The Committee adopted the report of the session at 13:04pm, 13 February 2014.

XVIII. CLOSURE OF THE SESSION

142. The delegates from the Members of the Typhoon Committee, representatives of ESCAP, WMO and TCS and observers expressed their thanks and appreciation to the TMD for the successful hosting for organizing the Forty Sixth session of the Typhoon Committee. They also expressed gratitude to Mr. Worapat Tiewthanom, Director General of TMD and his staff for the warm hospitality and excellent arrangements made and also for organizing the technical tour.

143. The Session was closed by the Chairperson at 13:10pm, 13 February 2014.