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FOR ASIA AND THE PACIFIC

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COORDINATION WITH OTHER ACTIVITIES OF THE WMO TROPICAL CYCLONE PROGRAMME

(Item 10 of the Provisional Agenda)

Note by the WMO Secretariat

INTRODUCTION

This document provides information on the activities carried out under the WMO Tropical Cyclone Programme (TCP) during the inter-sessional period after the 43rd session to assist the Committee in its consideration of coordination within the TCP (see Annex I).

ACTION PROPOSED

The Committee is invited to:

(a) Review the activities carried out within the TCP since the Forty-third session of the Typhoon Committee (Jeju, Republic of Korea, 17 to 21 January 2011) and offer the proposals for the future, which are indicated in Annex I to this document or otherwise reported to the session;

(b) Consider what further measures, if any, may be taken to strengthen coordination between its own activities and those conducted under other parts of the TCP.

Annex 1: Activity Rreport on the Implementation of the WMO Tropical Cyclone Programme (31 December 2011)

Activity Report on the Implementation of the WMO Tropical Cyclone Programme

(31 December 2011)

1. INTRODUCTION

1.1 The WMO Tropical Cyclone Programme carries out its activities in accordance with Congress (Cg) resolutions and Executive Council (EC) decisions to achieve the Expected Results 1, 6, 9 of the WMO Strategic Plan. The resolutions and decisions at the recent Cg and EC with particular relevance to the Programme are highlighted in the following sections.

1.2 The WMO Congress at its sixteenth session (Geneva, May 2011) adopted the resolution 4.3/1 (Cg-XVI), which decided:

(1) That the WMO Tropical Cyclone Programme shall be further strengthened to enable the Members to fulfil the increasing role and to address the new challenges;

(2) That the substance of the Tropical Cyclone Programme shall comply with the WMO Strategic Plan;

(3) That the WMO Strategy for Service Delivery should guide the implementation of the Tropical Cyclone Programme;

In this connection, Congress urged Members to ensure that their Meteorological and Hydrological and Disaster Risk Reduction Services take whatever steps which are within their competence and coordinate with the appropriate authorities:

(1) To promote awareness of the risks associated with tropical cyclones and related hazards;

(2) To continue to strengthen their forecasting and warning capabilities and ensure wide dissemination, understanding and utilization of their products, particularly at the community and local levels;

(3) To ensure that the measures necessary to save human lives and reduce damage are carried out at all levels, including the community level, as a consequence of tropical cyclone forecasts and warnings;

(4) To strengthen the partnership with other Members and relevant national agencies such as disaster and emergency management through sharing of knowledge, skills, experience and resources to save human lives and reduce damaging impacts; for tropical cyclone and other multi-hazard inundation events, such as those from tsunamis;

(5) To utilize the WMO Strategy for Service Delivery to further Improve their early warning services and products and their dissemination;

And the Congress requested the Secretary-General:

(1) To keep Members concerned fully informed of progress and of developments in the planning and implementation of the Programme;

(2) 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;

(3) To continue to support the capacity building programmes for developing countries, especially for Least Developed Countries and Small Island Developing States;

(4) 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;

(5) 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.

1.3 Cg XVI noted the achievements of the Tropical Cyclone Programme during the WMO fifteenth financial period (2008-2011) as follows.

Training and Capacity Development

1.3.1 Congress was pleased to note that a number of training programmes were successfully implemented by the Tropical Cyclone Programme (TCP) to upgrade the warning capabilities of developing countries subject to tropical cyclones. Congress noted with appreciation that the TCP/PWS joint training workshops hosted by Météo-France, NOAA and the Bureau of Meteorology in RAs I, IV and V, respectively, made a significant contribution in that regard, covering a wider range of operational forecasting, including service delivery. It welcomed the recent development in the training workshops in RAs I and V in which the TCP collaborated with the DPFS to create a link with the Severe Weather Forecast Demonstration Project (SWFDP) being implemented in these Regions. Congress encouraged the TCP to continue its collaboration with the CBS Severe Weather Forecast Demonstration Project (SWFDP), towards the efficient and effective propagation of Tropical Cyclone forecasts and warnings in developing countries.

1.3.2 Congress noted and supported the request of EC-LXII to the technical commissions to work with the EC Panel of Experts on Education and Training to develop competence standards in their areas of expertise. In light of this, Congress recognized the need for TCP to work closely with these groups and the Commission for Basic Systems to establish top level Tropical Cyclone forecasting competence standards.

1.3.3 Congress also took note of the effectiveness of the attachment training at TC RSMCs which allowed forecasters to acquire practical techniques and expertise through on-the-job experience. Congress was of the view that developing countries, especially SIDSs and the LDCs, continue to be in urgent need of improving the tropical cyclone forecasting skills and competencies required for effective operational capacity. To that effect, Congress recommended that the WMO Secretariat should continue to give high priority to capacity building in tropical cyclone forecasting.

Support to Operational Forecasting

1.3.4 Congress recognized that the field of tropical cyclone forecasting had been rapidly changing due to increased availability of observational data and advances in NWP models and products, evolving new technologies, and the growing demand of users for greater accuracy and longer lead times of forecasts. These developments have brought new challenges to the forecasters to keep pace with the scientific and technological advances and, in particular,

upgrade their forecasting capacities and ability to manipulate and integrate into the forecasting process large quantities of information. In this regard, Congress endorsed the measures undertaken through the TCP to support tropical cyclone forecasters, which was targeted particularly at those of developing countries.

1.3.5 Congress noted that the *Global Guide to Tropical Cyclone Forecasting* (WMO/TD-No. 560) was being updated to provide comprehensive guidance on tropical cyclone forecasting from a multi-hazard point of view. The updated Guide will be web-based with a view to timely updating and easier access. In addition, the WMO Tropical Cyclone Forecaster Website has been developed to provide a readily accessible source of forecast tools and analytical data necessary for operational forecasting. These two information sources would be linked with the TCP page of the WMO Website to serve as a comprehensive source of information/material/data that was expected to be of great value to operational forecasters. In view of the consolidation and usefulness of the overall system, it urged the Secretariat to complete the update of the Global Guide as early as possible and to carry out the enhancement of the Tropical Cyclone Forecaster Website in full consultation with the NMHSs.

Application of Research and Development (R&D)

1.3.6 Congress noted that TCP and the World Weather Research Programme jointly organized various fora where operational forecasters and researchers exchanged their views and shared knowledge and identified the direction of their collaborations for the future. Those included the Workshop on Tropical Cyclone Research in RA I (May 2008 in La Réunion), the 2nd International Workshop on Tropical Cyclone Landfalling Processes (IWTCLP-II; October 2009 in China), the 3rd International Conference on Quantitative Precipitation Estimation and Quantitative Precipitation Forecast (October 2010 in Nanjing, China) and the 7th International Workshop on Tropical Cyclones (IWTC-VII; November 2010 in La Réunion).

1.3.7 Recognizing the growing importance of ensemble techniques and probabilistic forecasts, Congress took note of the Typhoon Landfall Forecast Demonstration Project and the NW Pacific Tropical Cyclones Ensemble Forecast Project as outcomes of the IWTCPL-II, which were implemented jointly with WWRP in the Typhoon Committee region. It acknowledged the significance of improving the utility of Ensemble Prediction System (EPS) products by considering the views and feedbacks of tropical cyclone forecasters.

1.3.8 Congress also noted with interest that the TCP, in response to the recommendation of IWTC-VII, organized the Workshop on Satellite Analysis of Tropical Cyclones in Hawaii, US in April 2011 in conjunction with the 2nd workshop of the International Best Track Archive for Climate Stewardship (IBTrACS) held by the National Climatic Data Center of NOAA. Linking with the effort to produce a globally-unified best track dataset, the workshop set out to promote the sharing of expertise in satellite analysis of tropical cyclones between forecasters and researchers and helped facilitate their discussions on its future improvement to meet the emerging needs for homogenization of the tropical cyclone data base.

1.3.9 Congress recognized that a consensus among different meteorological services in satellite analysis should be reached (e.g. through verification of different methods using the best available observations) so that in future a globally unified best track dataset could be attained. At the same time, operational tropical cyclone intensity estimation based on the Dvorak method should be updated and harmonized among RSMCs, TCWCs and Members taking into account new and emerging techniques such as microwave satellite observation.

1.3.10 Congress also recognized the need of further research on the impact of tropical cyclone, both for direct and remote impacts.

1.3.11 Congress encouraged the WMO Secretariat to take measures to further strengthen the linkages between operational forecasters and researchers through various gatherings on

both global and regional levels to ensure transfer of research and development outcomes to forecasters for enhanced forecasting capability.

Storm Surge Watch Scheme

1.3.12 Congress noted with satisfaction the substantial progress made towards the establishment of the Storm Surge Watch Scheme (SSWS) which was recommended by the Executive Council at its sixtieth session (EC-LX, June 2008) after the devastations by storm surges associated with the Tropical Cyclones Sidr and Nargis in the Bay of Bengal. EC-LX requested the TCP to cooperate with the Marine Meteorology and Ocean Affairs Programme for extension of the SSWS to all regions exposed to tropical cyclones including incorporating the Scheme in the tropical cyclone advisory arrangements and in regional operational plans and manuals.

1.3.13 Congress was encouraged by the response of Regions to the EC request noting that in RA V, the Tropical Cyclone Committee set up an SSWS Action Team and formulated a regional 1st SSWS plan in December 2008. Congress also took note of the storm surge advisory service implemented by the RSMC New Delhi in 2009 in cooperation with Indian Institute of Technology (IIT). RSMC Tokyo started provision of the storm surge forecast map in 2011. RSMC La Réunion implemented a study on the application of Météo-France's storm surge model to RA I SSWS.

1.3.14 Congress noted with pleasure that TCP also actively worked to raise the storm surge warning capabilities on a national level. TCP collaborated with JCOMM to organize the 5th Storm Surge Workshop in Australia for the Members of RA V Tropical Cyclone Committee (TCC) in December 2008 and the 6th Workshop in the Dominican Republic for the RA IV Hurricane Committee Members in February 2011. TCP continued annual attachment training at IIT Delhi for the Members of the WMO/ESCAP Panel on Tropical Cyclones. Congress emphasized that both regional and national approaches were imperative to assure the establishment of SSWS globally. In that respect, it requested the WMO Secretariat to continue the effort of building capacity in storm surge forecasting to cover every Member subject to tropical cyclones.

Global Coordination

1.3.15 Congress noted that the Sixth Tropical Cyclone RSMCs/TCWCs Technical Coordination Meeting (TCM-6) took place in Brisbane, Australia in November 2009. The Meeting is held every three years for promoting the harmonious development of regional warning services and the global standardization of the operational procedures. Congress noted with pleasure that TCM-6 completed the study on suitable conversion factors between the wind speeds of different time ranges and its outcome was distributed as a WMO Technical Document (WMO/TD-No. 1555) to all the members of five regional TC bodies in October 2010. Arrangements were underway to include a summary of the report in the regional tropical cyclone operational plans/manuals. Congress recognized that the incorporation of the conversion factors in the regional TC operational plans/manuals should be an important first step towards an international common standard of wind averaging period for TC maximum sustained winds. This is considered essential to ensure harmonized practices in TC forecasting operations and post analysis.

1.3.16 The TCM-6 also established a cooperative relationship with IBTrACS and agreed to support this project by providing regional best track data and adequate guidance for integration of the data. For aviation users, the TCM-6 reaffirmed that it would cooperate with ICAO to change the format of tropical cyclone advisories from the text to the graphic in response to the request of the users. Congress also noted the continued need to work in close collaboration with ICAO to optimize tropical cyclone services in the TCAC areas of responsibility to ensure the most efficient and effective delivery of these services.

1.3.17 Congress recognized that, with the advance of globalization, it is increasingly important to promote the sharing of technologies and expertise and the standardization of procedures and products between the Regions. In this regard, Congress recalled its discussions on the Disaster Risk Reduction Programme during this session (agenda item 11.5) and stressed that there is an urgent need to develop a standardized format for exchange of tropical cyclone advisories issued by RSMCs and TCWCs, so as to improve the accessibility and understanding of the information by members of the public and international media. In that context, Congress underlined the significant role of TCM for securing the coordination among the RSMCs and TCWCs as an essential mechanism to meet the users' requirement from the global point of view.

Regional TC Bodies

1.3.18 Congress recognized that regional TC bodies played an important role in the various regional projects of relevant WMO Programmes such as DRR, DPFS, MMOP, WWRP and HWR in addition to SSWS development. The RA IV Hurricane Committee supported the development and implementation of the DRR Central American Pilot Project on Early Warning Systems and DRR Initiative to Strengthen MHEWS Capacity in the Caribbean. RA V Tropical Cyclone Committee (TCC) developed the basic framework of the Severe Weather Forecast and Disaster Risk Reduction Demonstration Project (SWFDDP). The ESCAP/WMO Typhoon Committee established linkages with the RA II Working Group on Hydrology through joint activities, including for the management of urban floods and flash floods in their region. Pilot projects of Coastal Inundation Forecasting Demonstration Projects (CIFDP) in the Caribbean and the North Indian Ocean would be linked with the activities of the Hurricane Committee and the WMO/ESCAP Panel on Tropical Cyclones, respectively.

1.3.19 Congress noted with pleasure that the regional TC bodies were also active in forming a partnership with international agencies. It is represented by the mutual cooperation between the Hurricane Committee and the Intergovernmental Coordination Group for the Tsunami and Other Coastal Hazards Warning System for the Caribbean and Adjacent Regions (ICG/CARIBE EWS) and between the WMO/ESCAP Panel on Tropical Cyclones and the Pacific and Indian Ocean Tsunami Warning and Mitigation Systems (ICG/PTWS and ICG/IOTWS).

1.3.20 Congress recognized the growing role played by the regional TC bodies as the platforms for the development of multi-hazard early warning systems in the respective Regions. To carry out such new assignment, Congress emphasized the need for strengthening the link between the three key areas of regional activities – meteorology, hydrology and disaster risk reduction. From that perspective, Congress encouraged the Secretariat to take further actions to promote the involvement of hydrologists and DRR experts in the activities of regional TC bodies, in particular their annual and biennial sessions, to maximize the synergies between the three areas and thus fully meet the varied regional requirements.

2. TCP EVENTS IN 2011

During the period from January to December 2011, the following events were organized or co-sponsored under the Programme:

- ESCAP/WMO Typhoon Committee, Forty-third Session (Jeju, Republic of Korea, 17 - 21 January 2011);

- Storm Surge Workshop for RA IV Hurricane Committee Members (Santo Domingo, Dominican Republic, 21 – 25 February 2011);

- The Thirty-eighth Session of the WMO/ESCAP Panel on Tropical Cyclones (New Delhi, India, 21 – 25 February 2011);

- Tropical Cyclone Operational Forecasting Training at RSMC New Delhi – Tropical Cyclone Centre (New Delhi, India, 28 February to 11 March 2011);

- RA IV Hurricane Committee, Thirty-second Session (Grand Cayman, Cayman Islands in 2011, 8 to 12 March 2011);

- RA IV Workshop on Hurricane Forecasting and Warning and Public Weather Services (Miami, Florida, USA, 21 March – 1 April 2011);

- 2nd Workshop of the International Best Tracks Archive for Data Stewardship (IBTrACS) (Honolulu, Hawaii, USA, 11 to 13 April 2011);

- International Workshop on Satellite Analysis of Tropical Cyclones (IWSATC) (Honolulu, Hawaii, USA, 13 to 16 April 2011);

- Attachment of Typhoon Forecasters from Hong Kong, China and Singapore for Typhoon Operational Forecasting Training at RSMC Tokyo-Typhoon Center (Tokyo, Japan, 20 to 29 July 2011);

- The Ninth Southern Hemisphere Training Course on Tropical Cyclones and Training Workshop on Public Weather Services (Melbourne, Australia, 5 – 23 September 2011);

- Training Workshop on Wave and Storm Surge Forecasting in RA II (Macao, China, 10 – 14 October 2011);

- International Workshop on Tropical Cyclone Unusual Behavior (Xiamen, China, 18 – 20 October 2011);

- Training Workshop on Application of Superensemble Techniques into Typhoon Track Forecasting (Nanjing, China, 5 – 16 December 2011);

- Storm Surge Attachment Training at IIT (Delhi, India, 12 to 23 December 2011);

3. PROGRAMME IMPLEMENTATION

The TCP Programme comprises two components: a general component concerned with collective issues such as methodology and transfer of technology, and a regional component devoted to the activities of five regional tropical cyclone bodies. The updated list of Members of these bodies is shown in **Appendix 1**.

3.1 GENERAL COMPONENT

3.1.1 The main activities in 2011 under the general component continued to be directed towards the publication of manuals and reports, which provide information and guidance to Members to assist them in the increased application of scientific knowledge and technology for the improvement of warning and disaster prevention and preparedness systems corresponding ERs I and VI of the WMO Strategic Plan on enhanced capabilities of forecasting and warning service delivery and disaster risk reduction. Under this component, attention was also given to the broader aspects of training under the TCP.

3.1.2 Priorities were given to capacity-building to address the issue of sustainable development with emphases particularly on attachments of forecasters from developing countries at the different Regional Specialized Meteorological Centres (RSMCs) during the cyclone season and storm surge/wave experts at the Indian Institute of Technology in Delhi,

India, a number of workshops and a joint training event in cooperation with the Public Weather Service Programme (PWSP), and a number of Working Group (Committee) sessions co-joint with Disaster Risk Reduction (DRR) Programme. These activities were in accordance with the Programme's objective to facilitate the transfer of knowledge and technology to improve the institutional efficiency of the NMHSs leading to the provision of better tropical cyclone track and intensity forecasts and associated flood and storm surge forecasts, and coordinated actions towards tropical cyclone disaster risk reduction.

3.1.3 T The TCP home page within the WMO Website: http://www.wmo.int/pages/prog/www/tcp/index_en.html, was continuously updated. In addition, arrangement was made with Hong Kong, China for their support to enhance the TC Forecaster's Website during 2012 to make it more effective, informative and useful.

3.1.4 The Global Guide to Tropical Cyclone Forecasting has been updated and now in the stage of expert review. It is behind schedule due to unavoidable circumstances. After completion, it will be posted to the TCP Forecaster's website for widespread access by forecasters and researchers around the globe. The printing version will be completed soon afterwards, and distributed to WMO Members of the five tropical cyclone regional bodies.

3.1.5 The first WMO International Workshop on the Satellite Analysis of Tropical Cyclones (IWSATC) was organized TCP in collaboration with the WMO World Weather Research Programme (WWRP), and the World Data Center (WDC) for Meteorology which is maintained by the National Oceanic and Atmospheric Administration (NOAA), in Honolulu, Hawaii, USA, 13 to 16 April 2011. IWSATC was held in conjunction with the 2nd workshop of the International Best Track Archive for Climate Stewardship (IBTrACS) which is run by the National Climatic Data Center of NOAA. Linking with the effort to produce a globally-unified best track dataset, IWSATC set out to promote the sharing of expertise in satellite analysis of tropical cyclones between forecasters and researchers and helped facilitate their discussions on its future improvement to meet the emerging needs for homogenization of the tropical cyclone data base. More details will be found from its final report which will be downloaded from website: http://www.wmo.int/pages/prog/www/tcp/reports.html.

3.1.6 The WMO International Workshop on Tropical Cyclone Unusual Behavior was held in Xiamen, China, 18 – 20 October 2011. The theme of the workshop focused mainly on recent research advances to understand the rapid change in tropical cyclone intensity (intensification & weakening) and movement. It addressed what may be the most challenging aspects of tropical cyclone (TC) prediction: rapid change of TC intensity, abrupt change of TC track, and unexpected rainfall associated with land-falling TCs. It achieved the first and most important objective of this workshop, i.e. sharing information on the unusual behavior of tropical cyclones between an international group of researchers and forecasters. More than 50 participants from several tropical cyclone basins attended the workshop.

3.1.7 C/TCP was invited to the Second Expert Group Meeting on the Great East Japan Earthquake - Learning from the Mega-Tsunami Disaster – which was held in Tokyo, Japan from 16 to 18 December 2011. He presented the current and the future cooperative relationship between the WMO/ESCAP Panel on Tropical Cyclones and the Intergovernmental Coordination Group (ICG) for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWS) and the RA IV Hurricane Committee and the ICG for the Tsunami and Other Coastal Hazards Warning System for the Caribbean and Adjacent Regions.

3.1.8 Typhoon Landfall Forecast Demonstration Project (TLFDP) continued in 2011. A dedicated website http://tlfdp.typhoon.gov.cn/index.php was developed under this project. Some details on progress and development on the project are found from the website. It is expected, as a means of exchanging forecast experiences, a platform for the application of the latest typhoon forecast technology, and a bridge to connect forecast and public service, to promote the implementation of the most advanced landfall typhoon forecast techniques in

Typhoon Committee members which ultimately will be of benefit to other WMO Members as well.

3.1.9 TCP continued the North Western Pacific Tropical Cyclone Ensemble Forecast Project (NWP-TCEFP) for the purposes of; 1) to improve medium range forecast of TC track forecast by exploring and developing effective ways of obtaining and utilizing the track forecast data from TIGGE data providers; 2) to develop software for a real time multi-model tropical cyclone forecasting system from data transfer to verification; 3) to evaluate the utility of multi-model forecasts of tropical cyclones track predictions and provide recommendations on future multi-model ensemble systems and on future GIFS-RDPs; 4) to encourage forecasters of involved Members to utilize the information on this Web and to exchange their experience in use of TIGGE ensembles data for tropical cyclone forecast via "Discussion" page. A survey was carried out in December 2011 to get feedbacks form the Members of the Typhoon Committee to improve/enhance the TCEFP website. Results will be presented at the 44th session of the Committee in 2012.

3.2 REGIONAL COMPONENT

Many activities of the TCP were carried out under the regional component with a view to minimizing tropical cyclone disasters through close regional cooperation and coordination. Major emphasis was placed on improvement in the accuracy of the forecasts, provision of timely early warnings and on the establishment of necessary disaster preparedness measures. Each of the tropical cyclone regional bodies has in place a formally adopted tropical cyclone operational plan or manual, aimed at ensuring the most effective tropical cyclone forecasting and warning system with existing facilities, through cooperative agreement on sharing of responsibilities and on coordinated activities within the respective region. Each of these bodies was giving attention to the implementation of their technical plan for future development of services to meet regional needs for upgrading forecasting and warning facilities and services for tropical cyclones and associated floods and storm surges, as well as for related disaster risk reduction measures and supporting activities in training and research. The detailed activities of regional bodies are described as below.

3.2.1 ESCAP/WMO Typhoon Committee

3.2.1.1 The Japan Meteorological Agency (JMA) organized the an "Attachment Training" at the RSMC Tokyo-Typhoon Center from 21 to 30 July 2010 which was attended by two female forecasters from Hong Kong, China and Singapore.

3.2.1.2 The 7th WMO Training Workshop on Wave and Storm Surge Forecasting was held in Macao, China from 10 to 14 October 2011. This workshop was supported by the Typhoon Committee, Meteorological and Geophysical Bureau and Macao Foundation. Experts from the Members of the Committee and Timor Leste were represented in the workshop.

3.2.2 WMO/ESCAP PANEL ON TROPICAL CYCLONES

3.2.2.1 The Thirty-eighth Session of the WMO/ESCAP Panel on Tropical Cyclones was held in New Delhi, India, from 21 to 25 February 2011. Decisions by the WMO/ESCAP Panel on Tropical Cyclones at its Thirty-eighth Session can be found in its final report which is available in WMO/TCP website.

3.2.2.2 Attachment training for two storm surge experts from Myanmar and Thailand respectively was organized in IIT, from 19 to 30 December 2011, at the IIT Delhi in the implementation and running of a PC-based high-resolution storm surge model.

3.2.2.3 Attachment of three forecasters from Bangladesh, Myanmar and Oman was arranged by WMO and the RSMC New Delhi, India, from 28 February to 11 March 2011, for the on-the-job training at the RSMC on operational analysis and forecasting of tropical cyclones.

3.2.3 RA I TROPICAL CYCLONE COMMITTEE (RA I/TCC) FOR THE SOUTH-WEST INDIAN OCEAN

3.2.3.1 Chair of RA I Tropical Cyclone Committee reported on its recent activities to the Management Group of the Region at its meeting held in Zimbabwe from 14 to 16 November 2011.

3.2.4 RA IV HURRICANE COMMITTEE

3.2.4.1 The Thirty-third Session of the Hurricane Committee was held in Grand Cayman, Cayman Islands, from 8 to 12 March 2011. Decisions by the RA IV Hurricane Committee at its Thirty-third Session can be found in its final report which will be available in WMO/TCP website.

3.2.4.2 Storm Surge Workshop for RA IV Hurricane Committee Members was organized in Santo Domingo, Dominican Republic, 21 – 25 February 2011;

3.2.4.3 RA IV Workshop on Hurricane Forecasting and Warning, and Public Weather Services was organized in Miami, Florida, USA, from 21 March - 1 April 2011. The workshop was conducted in English only, and attended by 22 participants from nineteen Members of RA IV.

3.2.5 RA V TROPICAL CYCLONE COMMITTEE (RA V/TCC) FOR THE SOUTH PACIFIC AND SOUTH-EAST INDIAN OCEAN

3.2.5.1 The Ninth Southern Hemisphere Training Course on Tropical Cyclones and Training Workshop on Public Weather Services was held in Melbourne, Australia, 5 – 23 September 2011. The training Course included one day session on the SWFDDP project in RA V. One participant from each of the RA V Tropical Cyclone Committee Members was invited to attend the event. In addition, Palau was also invited to participate in the workshop.

4. COOPERATION WITH OTHER ORGANIZATIONS

4.1 There has been close cooperation and collaboration with the Economic and Social Commission for Asia and the Pacific (ESCAP), the International Strategy for Disaster Reduction (ISDR) Secretariat, the Asian Disaster Reduction Center (ADRC), Japan International Cooperation Agency (JICA) and Secretariat of the Pacific Regional Environment Programme (SPREP) on a variety of matters of common concern. The main items include ESCAP's co-sponsorship of the Typhoon Committee and the Panel on Tropical Cyclones, as well as the ISDR Secretariat and the ADRC's involvement in the disaster risk reduction component of the TCP, in particular in the context of the ISDR.

4.2 As part of the cooperation between WMO and the International Civil Aviation Organization (ICAO), TC RSMCs and one Tropical Cyclone Warning Centre (TCWC) are designated as ICAO Tropical Cyclone Advisory Centres (TCAC) by ICAO Regional Air Navigation Agreements. Upon request of the ICAO community, arrangements have been made by TCACs to convert their TCAC advisories from text to graphic form. Those TCACs listed below provide specialized tropical cyclone warning services for the aviation community:

RSMC/TCWC	Area(s) of responsibility

Darwin (Australia)	South-eastern Indian Ocean, South-western Pacific Ocean
Honolulu (USA)	Central North Pacific
La Réunion (France)	South-western Indian Ocean
Miami (USA)	North Atlantic, Caribbean, Eastern North Pacific
Nadi (Fiji)	Southern Pacific
New Delhi (India)	Bay of Bengal and the Arabian Sea
Tokyo (Japan)	Western North Pacific, including the South China Sea

5. ACTION PROGRAMME FOR 2012 AND BEYOND

5.1 Major actions of TCP planned for 2012 in the global and regional components are set out below in summary form:

General component:

(a) Training and Capacity Development

- Enhancement of the collaboration with other WMO Programmes in implementing TC training courses and workshops.

(b) Support to Operational Forecasting

- Establishment of the Tropical Cyclone Forecaster Web Site with the support of Hong Kong, China.
- Update of the Global Guide on Tropical Cyclone Forecasting. The web version of the Guide will be completed in 2012.

(c) Application of Research and Development (R&D)

- Implementation of the TCP/WWRP joint projects;
  - North Western Pacific Tropical Cyclone Ensemble Forecast Project
  - (NWP-TCEFP) including its extension to North Indian Ocean Typhoon Landfall Forecast Demonstration Project (TLFDP)
- Development of the guidelines for the improvement of satellite analysis as recommended by the International Workshop on the Satellite Analysis of Tropical Cyclones (IWSATC)
- 2nd WMO International Conference on Indian Ocean tropical Cyclones & Climate Change (New Delhi, India, 14 –17 February 2012).

(d) Global Coordination

- Organization of the 7th TC RSMCs/TCWCs Technical Coordination Meeting (November).
- Development of TC forecaster competency.
- Standardization of the format of TC Warnings and extension of the use of Coordinated Alert Protocol (CAP).

(e) Development and establishment of Storm Surge Watch Scheme.

Regional component

① Tropical Cyclone Operational Forecasting Training at RSMC New Delhi – Tropical Cyclone Centre (New Delhi, India, 20 February to 2 March 2012);

② Thirty-ninth Session of the WMO/ESCAP Panel on Tropical Cyclones (Nay Pyi Taw, Myanmar, 5 to 9 March 2012);

③ RA IV Hurricane Committee, Thirty-forth Session (Orlando, Florida, USA, 11 – 15 April 2012)

④ RA IV Workshop on Hurricane Forecasting and Warning, and Public Weather Forecast (Miami, USA, 12 – 23 March 2012);

⑤ Fourteenth session of the RA V Tropical Cyclone Committee (Brisbane, Australia, Dates to be determined);

⑥ Twentieth session of the RA I Tropical Cyclone Committee (South Africa, 3 – 7 September 2012);

⑦ Forecaster Attachment Trainings in RSMC New Delhi, RSMC Nadi, RSMC Tokyo and Indian Institute of Technology Delhi (dates to be determined).

⑧ The Eighth TCP/JCOMM Workshop on Storm Surge and Wave in Kenya (19 – 23 November 2012).

5.2 Other Important inter-sessional activities will include:

- Editing, updating, publication and distribution of new editions or supplements to the Tropical Cyclone Operational Plans for the Bay of Bengal and Arabian Sea (English only), the South-West Indian Ocean (English and French), the South Pacific and the South-East Indian Ocean (English and French), the Hurricane Committee Region (English and Spanish) and the Operational Manual for the Typhoon Committee Area (English only)

- Update of technical plans/manual for further development of the Regional Cooperation Programmes of the five regional tropical cyclone bodies;

- Publication in hardcopy and distribution of the final report of the "International Workshop on Satellite Analysis of Tropical Cyclones." The electronic version has been already available in WMO/TCP website.

- Publication in hardcopy with limited quantity and in web format with free access of the "Global Guide to Tropical Cyclone Forecasting;"

5.3 In more general terms:

- Activities for the implementation of the Tropical Cyclone Programme section of the WMO Strategic Plan;

- Continued activities for the implementation of the Regional Cooperation Programmes, Technical Plans and other work programmes of the regional tropical cyclone bodies;

- Action on further proposals made by the Sixteenth WMO Congress (Cg-XVI), the Executive Council, the Regional Associations concerned and the regional tropical cyclone bodies.

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TCP REGIONAL BODIES

APPENDIX I

ESCAP/WMO TYPHOON COMMITTEE	WMO/ESCAP PANEL ON TROPICAL CYCLONES	RA I TROPICAL CYCLONE COMMITTEE FOR THE S.W. INDIAN OCEAN	RA IV HURRICANE COMMITTEE	RA V TROPICAL CYCLONE COMMITTEE FOR THE S. PACIFIC AND S.E. INDIAN OCEAN
(14 Members)	**(8 Members)**	**(15 Members)**	**(26 Members)**	**(18 Members)**
CAMBODIA	BANGLADESH	BOTSWANA	ANTIGUA & BARBUDA	AUSTRALIA
CHINA	INDIA@	COMOROS	BAHAMAS	COOK ISLANDS
DEM. PEOPLE'S REP. OF KOREA	MALDIVES	FRANCE@	BARBADOS	FIJI@
HONG KONG, CHINA*	MYANMAR	KENYA	BELIZE	FRENCH POLYNESIA*
JAPAN@	OMAN	LESOTHO	BRITISH CARIBBEAN TERRITORIES*	INDONESIA
LAO PDR	PAKISTAN	MADAGASCAR	CANADA	KIRIBATI
MACAO, CHINA*	SRI LANKA	MALAWI	COLOMBIA	MICRONESIA
MALAYSIA	THAILAND	MAURITIUS	COSTA RICA	NEW CALEDONIA*
PHILIPPINES		MOZAMBIQUE	CUBA	NEW ZEALAND
REPUBLIC OF KOREA		NAMIBIA	DOMINICA	NIUE
SINGAPORE		REP. OF SOUTH AFRICA	DOMINICAN REPUBLIC	PAPUA NEW GUINEA
THAILAND		SEYCHELLES	EL SALVADOR	SAMOA
USA		SWAZILAND	FRANCE	SOLOMON ISLANDS
VIET NAM, SOCIALIST REPUBLIC OF		UNITED REPUBLIC OF TANZANIA	GUATEMALA	TIMOR LESTE
		ZIMBABWE	HAITI	TONGA
			HONDURAS	UNITED KINGDOM
			JAMAICA	USA#
			MEXICO	VANUATU
			NETH. ANTILLES AND ARUBA*	
			NICARAGUA	
			PANAMA	**Non-Members of WMO (4):**
			ST. LUCIA	- MARSHALL ISLANDS
			TRINIDAD AND TOBAGO	- NAURU
			UK	- PALAU
			USA@	- TUVALU
			VENEZUELA	
@RSMC Tokyo - Typhoon Center	@ RSMC-Tropical Cyclones-New Delhi	@ RSMC La Réunion - Tropical Cyclone Centre	@ RSMC Miami - Hurricane Center	@ RSMC Nadi - Tropical Cyclone Centre # RSMC Honolulu - Hurricane Center

* Member Territory