

WORLD METEOROLOGICAL ORGANIZATION
AND
ECONOMIC AND SOCIAL COMMISSION
FOR ASIA AND THE PACIFIC

Typhoon Committee
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29 January to 1 February 2013

FOR PARTICIPANTS ONLY

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COORDINATION WITH OTHER ACTIVITIES OF THE WMO TROPICAL CYCLONE PROGRAMME

(Item 13 of the Provisional Agenda)

Note by the WMO Secretariat

INTRODUCTION

This document provides the 38th status report of the WMO Tropical Cyclone Programme (TCP) which summarised the activities of the Programme in 2012 and its plan for 2013 and beyond (see APPENDIX). At the session, the document will be presented with the focus on the TCP's activities relevant to the Committee after the 44th session (Hangzhou, China). TCP's collaborations with its partner programmes of WMO will also be presented.

ACTION PROPOSED

The Committee is invited to:

- (a) Review the activities of TCP carried out during the inter-sessional period and its plan for the future;
- (b) Consider what further measures, if any, may be taken to strengthen coordination between the activities of the Committee and those conducted under the TCP and other WMO Programmes.

APPENDIX: Thirty-eighth Status Report on the Implementation of the WMO Tropical Cyclone Programme (1 January - 31 December 2012)

Thirty-eighth Status Report on the Implementation of the WMO Tropical Cyclone Programme

(From 1 January to 31 December 2012)

1. INTRODUCTION

1.1 The WMO Tropical Cyclone Programme carries out its activities under the guidance of Congress (Cg) and Executive Council (EC) pertaining to the Expected Results (ERs) 1, 2, 3, and 6 of the WMO Strategic Plan*. Summaries of the discussions at recent Cg and/or EC with particular relevance to the Programme are highlighted in the following sections.

Executive Council – 64th session

1.2 At its 64th session (25 June – 3 July, 2012), the Executive Council noted that the EC-Working Group on Service Delivery has elaborated the agreed strategic priorities for ER 1 to provide further guidance to the expert teams and working groups carrying out related activities. These elaborated priorities relevant to TCP are:

- (a) Improve services for international civil aviation (Aeronautical Meteorology);
- (b) Improve user focus and service delivery capability;
- (c) Improve products and services;
- (d) Increase focus on services that address socio-economic issues;
- (e) Contribute to capacity-building and training to improve service delivery capabilities
- (f) Implementation actions related to Resolutions of Cg-XVI to strengthen the Tropical Cyclone Programme's (TCP) global and regional components;
- (g) Actions being taken as TCP's global component as well as through TCP's regionally coordinated mechanisms to carry out the Congress resolutions to improve tropical cyclone forecasting and warning service quality

1.3 The Council supported the initiatives in capacity development in developing and Least Developed Countries (LDCs) to more effectively deliver quality warning and forecast services. These initiatives are connected with such activities as the Severe Weather Forecasting Demonstration Project (SWFDP), joint training with TCP for the delivery of cyclone warning services, the Radio Internet (RANET) communication, and modernization of NMHSs.

1.4 The Council noted the close collaborations between TCP and other WMO Programmes based on relevant WMO projects being implemented on regional and global bases. (Examples are the 34th RA IV Hurricane Committee guidance to the implementation of DRR's MHEWS projects in the Caribbean, or the links established between the Typhoon Committee and the Panel on Tropical Cyclones with SWFDP and CIFDP in the plans for 2012.) Noting in particular the use by SWFDP of existing NWP/EPS and satellite-based products, the Council acknowledged the benefits of forging stronger links between SWFDP and regional TC committees concerned.

1.5 The Council reiterated that the use of ensemble techniques including multi-model consensus forecasting further improves the forecast performance of the national and regional tropical cyclone warning centres. It also raises the utility of the forecast with inclusion of ensemble-based probabilistic guidance to represent forecast uncertainty which is especially

* See Annex I

useful for disaster risk management in threatened areas. The Council therefore urged NMHSs and regional centres to extend the use of ensemble techniques in tropical cyclone forecasting and examine the feasibility of disseminating probabilistic forecasts in forms and formats suitable for the users. Also, to make TC analyses more objective and reliable, the Council recommended those centres concerned to exploit the various analytical data and tools recommended by the WMO International Workshop on Satellite Analysis of Tropical Cyclones held in Honolulu, US in April 2011.

1.6 The Council thus requested TCP to fully establish the TC Forecaster Website which is aimed at providing a readily accessible source of forecast tools and a portal of analytical data for operational forecasters. The Website has been temporarily developed within the TCP Website as a prototype. In this regard, the Council was pleased to note that Hong Kong, China accepted to host the TC Forecaster Website. Arrangements are being made for the transfer of the Website management from TCP to Hong Kong Observatory and improvements are being carried out in its structure as well as content. The new Website is expected to be inaugurated by the end of 2012. The Council marked its full approval with the support of Hong Kong, China and recommended that the requirements for improvement of TC forecasting as suggested above be fully considered in the establishment of the TC Forecaster Website.

1.7 The Council reaffirmed that for a more reliable and user friendly TC warning service the standardization of operational procedures and products used for Tropical Cyclone (TC) forecasting in different regions is essential. The Council requested the Secretariat to promote the implementation of CAP and the graphical TC advisories at the seventh TCM meeting (Indonesia, November 2012). It also recommended that Members adopt and implement the standardized formats for TCAC advisories as early as possible, if they have not yet done so.

1.8 The Council was encouraged by the efforts for strengthening existing and developing new partnerships and collaborative efforts of the DRR Programme since Cg-XVI to support the implementation of the DRR Work Plan under TCP as strengthening cooperation with UNESCO-IOC through linking the tropical cyclone committees and the ICGs for Tsunami and Coastal Hazard Warning and designation of a WMO GTS/WIS focal point to the UNESCO-IOC.

1.9 With reference to the TCP/JCOMM Storm Surge Watch Schemes, the Council noted the increased utilization of RSMC advisories based on improved graphical presentation of storm surge advisories first piloted by RSMC Tokyo for the Typhoon Committee Members in 2011, and subsequently developed by RSMC New Delhi with the Indian Institute of Technology Delhi and approved by the Panel on Tropical Cyclones in 2012. Efforts to promote such standardization included: (i) presentations on CAP for the members of the Typhoon Committee and the Panel on Tropical Cyclones at their annual sessions in 2012; and (ii) a survey of the change of the format of the advisories from Tropical Cyclone Advisory Centres (TCACs) for aviation from text to graphic which, following a recommendation by the International Civil Aviation Authority (ICAO), was carried out in collaboration with ICAO in 2012. With consideration for these good examples, the Council recommended other regional TC committees to consider the graphical presentation of the regional storm surge advisories in addition to those in text format in enhancement of the regional SSWs.

2. PROGRAMME IMPLEMENTATION

Tropical Cyclone Programme is implemented in two components: the general component concerned with collective issues such as methodology and transfer of technology, and the regional component devoted to the activities of five regional tropical cyclone committees. Main activities in both the components are described in 2.1 and 2.2, respectively. A list of the events organized or co-sponsored under the Programme during the period from 1 January to 31 December 2012 are given in **Annex II** and a list of Members of the regional committees is shown in **Annex III**.

2.1 GENERAL COMPONENT

2.1.1 Main activities in 2012 under the general component continued to be directed towards training and capacity-development of the Members in tropical cyclone forecasting and warning services to address the issue of sustainable development. Emphasis was placed particularly on a number of workshops and training events organized in cooperation with the Public Weather Services Programme (PWS), Data Processing and Forecasting System Programme (DPFS), World Weather Research Programme (WWRP), JCOMM (through Marine Meteorology and Oceanography Programme), and attachment trainings at Regional Specialized Meteorological Centres (RSMCs) including the training on storm surge forecasting at the Indian Institute of Technology. These activities were in accordance with the Programme's objective – facilitation of the transfer of knowledge and technology to improve the institutional efficiency of the Members leading to the provision of better forecasts of tropical cyclones and associated floods and storm surges.

2.1.2 High priorities were also given to publication of manuals and reports to allow the Members to improve their warning and disaster risk reduction systems in a globally/regionally coordinated matter and to provide information and guidance to the Members for applying scientific knowledge and technology to their operational forecasting.

2.1.3 The TCP home page within the WMO Website: http://www.wmo.int/pages/prog/www/tcp/index_en.html, was continuously updated. Further, the Tropical Cyclone Forecaster Website (TCTF) was enhanced significantly with the support of Hong Kong, China to make it more effective and informative. TCTF has made a fresh start in January 2013 with Hong Kong, China as host and is now accessible at <http://severe.worldweather.wmo.int/TCFW>.

2.1.4 Works continued to publish a new Global Guide to Tropical Cyclone Forecasting. Currently, it's on the stage of expert review. The update has been behind schedule due to some unavoidable circumstances. After completion, it will be web-based and linked to the TCP website and TCTF to allow in totally forecasters and researchers for effective access to find latest data/information and useful guidance/tools for tropical cyclone analysis and forecasting. Hard copies of the new Global Guide will also be distributed to the forecasters of developing Member states.

2.1.5 Seventh Tropical Cyclone RSMCs/TCWCs Technical Coordination Meeting (TCM) was held in Jakarta, Indonesia, from 12 to 15 November 2012. The Meeting covered a wide spectrum of issues associated with operational tropical cyclone forecasting and warnings, which requires global coordination, including improvement of dissemination of warnings such as through Common Alerting Protocols (CAP) and standardization in operational procedures such as for classification of tropical cyclones. The outcomes of the meeting will be recommended to the regional tropical cyclone committees for their coordinated actions across the regions.

2.1.6 The WMO International Workshop on Rapid Change Phenomena in Tropical Cyclones was held in Haikou China, 5-9 November 2012 with more than 60 participants from different tropical cyclone basins. The workshop focused mainly on recent research advances to understand the rapid changes in tropical cyclone intensity (intensification & weakening) and tracks, and reinforcement of rainfall, and their forecasting techniques. It achieved the most important objective of the workshop - sharing information on the rapid change phenomena of tropical cyclones between researchers and forecasters.

2.1.7 WMO Typhoon Landfall Forecast Demonstration Project (TLFDP) was implemented with significant progress. A TLFDP Training Workshop on Tropical Cyclone Forecasting was held in Shanghai, China, from 12 to 14 June 2012. A website dedicated to this project was also developed (<http://tlfdp.typhoon.gov.cn/index.php>) to provide details of progress and

development of the project. It serves also as a platform for exchanging knowledge and information to promote implementation of the most advanced techniques of typhoon landfall forecast by the Typhoon Committee Members.

2.1.8 North Western Pacific Tropical Cyclone Ensemble Forecast Project (NWP-TCEFP) was continued in the Committee regions for the purposes of improving medium range forecast of tropical cyclones through the use of TIGGE data. Annual survey was carried out in December 2012 of the utility of the TCEFP Website which was developed and is hosted by the Meteorological Research Institute of JMA. Based on the proposal of Prof R. Elsberry, International TLFDP Scientific Steering Committee (ISSC) decided to explore the feasibility of predicting tropical cyclone genesis through a collaboration TCEFP and TLFDP.

2.2 REGIONAL COMPONENT

2.2.1 Each of the five regional tropical cyclone committees has in place a formally adopted regional operational plan or manual, aimed at ensuring the most effective tropical cyclone forecasting and warning system through sharing of responsibilities and coordinated activities within the respective region. Operational plans/manual were updated regularly at the annual/biennial session of the committees. As the main base of its activities, each committee also placed great importance on the development and implementation of its regional technical plan or strategic plan.

2.2.2 Final reports of the annual/biennial sessions of the committees, which detail their activities, and the latest versions of the operational plans/manual are presented at the WMO/TCP website (<http://www.wmo.int/pages/prog/www/tcp/>). Highlights of their activities and some outcomes of the sessions are briefed below.

ESCAP/WMO Typhoon Committee (Western North Pacific)

2.2.3 The 44th session of the Typhoon Committee was held in Hangzhou, China from 6 to 10 February 2012. At the session, the Committee decided to review the governance of the Committee with a view to achieving its objectives in a more efficient and effective manner. It also accepted the offer of Nanjing University of Information Science and Technology (WMO Regional Training Centre – Nanjing) to serve as a training center for the Committee.

2.2.4 A scientific journal <Tropical Cyclone Research and Review> was inaugurated in February 2012 as an official publication of the Typhoon Committee under the sponsorship of Shanghai Typhoon Institute of China Meteorological Administration.

2.2.5 The 7th Meeting of the Working Group on Disaster Risk Reduction (WGDRR) was held in Seoul, Korea from 30 to 31 May 2012, preceded by the Typhoon Committee Advisory Working Group (AWG) Meeting (29 May 2012).

2.2.6 Attachment training of two typhoon forecasters from Philippines and Vietnam was hosted by RSMC Tokyo-Typhoon Center for typhoon operational forecasting from 18 to 27 July 2012.

2.2.7 Urban Flood Risk Management Training was organized by the Working Group on Hydrology (WGH) in Guangzhou, China from 24 to 26 September 2012.

2.2.8 Roving Seminar was held in Seoul, Republic of Korea (30 October - 1 November 2012) by the Training and Research Coordination Group (TRCG) in cooperation with WGDRR under the theme of “Tropical Cyclone Damage Assessment and Impact Forecast”.

2.2.9 The 7th Integrated Workshop was held in Nanjing, China, from 26 to 30 November 2012 under the theme of “Effective Warnings” and the sub-theme of Common Alerting Protocol (CAP). In conjunction with the Workshop, the Committee conclude an agreement with Nanjing University of Information Science and Technology (NUITST) to designate the University as a Training Centre of the Typhoon Committee.

2.2.10 Efforts were continued by the three Working Groups (MET, HYDRO and DRR) and the Training and Research Coordination Group (TRCG) also on other various activities, which include “Second Assessment of Report of Climate Change on Tropical Cyclone”, “Transfer of the Typhoon Information Processing System Technology”, “Establishment of Radar Composite Map in Thailand”, “QPE/QPF Training”, and “WEB GIS based Typhoon Committee Disaster Information System”.

WMO/ESCAP Panel on Tropical Cyclones (North Indian Ocean)

2.2.11 The 2nd WMO International Conference on Indian Ocean tropical Cyclones & Climate Change was held in New Delhi, India, 14-17 February 2012.

2.2.12 The 39th session of the Panel was held in Nay Pyi Taw, Myanmar from 5 to 9 March 2012. It formulated the 2012 action plans for the Working Groups on Meteorology, Hydrology and Disaster Prevention/Preparedness, which included the regional assessment of climate change and tropical cyclones.

2.2.13 Attachment training of three forecasters from Bangladesh, Myanmar and Oman was arranged by WMO and the RSMC New Delhi, India, from 28 February to 11 March 2012 for operational analysis and forecasting of tropical cyclones.

2.2.14 Attachment training for two storm surge experts from Oman and Sri Lanka was organized at IIT Delhi from 10 to 21 December 2012 for implementation and running of a PC-based high-resolution IIT storm surge model.

2.2.15 Workshop on Case Studies of Tropical Cyclone Analysis and Forecasting was held in Muscat, Oman from 17 to 19 December 2012 with a view to improving the consistency in TC information between RSMC and NMHSs in the Panel region. It recommended that a regional mechanism for real-time exchange of data be established and training on the Dvorak technique be conducted for the Panel Members.

RA I Tropical Cyclone Committee (South-West Indian Ocean)

2.2.16 The 20th session of the RA I Tropical Cyclone Committee (TCC) was held in Maputo, Mozambique from 3 to 7 September 2012. The Committee carried out a complete reformation of its Technical Plan to make it more strategic. It also reconfirmed the full implementation of the new naming procedures where the original storm name be maintained after crossing the border between the South-East and the South-West Indian Ocean regions.

2.2.17 The 8th TCP/JCOMM Workshop on Storm Surges and Wave Forecasting was organized in Nairobi, Kenya, from 19 to 23 November 2012. It was attended by the participants from coastal countries of the RA I TCC. The Workshop made recommendations including the one - Participants will make plans to initiate national/regional activities to develop/improve operational wave and storm surge modelling.

2.2.18 The 6th RA I Training Course on Tropical Cyclones and Public Weather Services (PWS) was decided to be postponed to 2013.

RA IV Hurricane Committee (North Atlantic and Eastern North Pacific)

2.2.19 RA IV Workshop on Hurricane Forecasting and Warning, and Public Weather Services was held at RSMC Miami, Florida, USA, from 12 to 23 March 2012. The workshop was conducted in English with simultaneous interpretation into Spanish, and attended by a total of 23 participants from the nineteen Members of RA IV Hurricane Committee.

2.2.20 The 34th session of the RA IV Hurricane Committee was held in Ponte Vedra Beach, Florida, USA from 11 to 15 April 2012. The Committee re-established the backup arrangements for warning between the Members. It also reviewed the process of the transition from ISCS to GTS Internet File Service (GIFS) and decided to conduct an experiment in forecasting of storms before formation. Members shared clear recognition of the urgent necessity to provide support to Haiti for capacity development.

RA V Tropical Cyclone Committee (South Pacific and South-East Indian Ocean)

2.2.21 The 14th session of the RA V Tropical Cyclone Committee was held in Apia, Samoa from the 16 to 20 July 2012 in conjunction with the 3rd Meeting of the ICG/PTWS Regional Working Group on Tsunami Warning and Mitigation in the South-West Pacific Region (14 July). Noting the full significance of the interactions with the Working Group on Tsunami in reducing the disaster risks in the region, the Committee had the view that future sessions of the two bodies be organized back-to-back.

2.2.22 At the 14th session, RA V TCC also made a thorough review of its Technical Plan and decided to add new thematic areas in the Plan including in-country training for the Severe Weather Forecast and Disaster Risk Reduction Demonstration Project (SWFDDP), upgrade of SWFDDP website, and the tropical cyclone forecaster competencies.

3. COOPERATION WITH OTHER INTERNATIONAL ORGANIZATIONS

3.1 There have been close cooperation and collaboration with the Economic and Social Commission for Asia and the Pacific (ESCAP), United Nations Environment Programme (UNEP), UNESCO Intergovernmental Oceanographic Commission (IOC), International Strategy for Disaster Reduction (ISDR), Asian Disaster Reduction Center (ADRC), Asian Disaster Preparedness Center (ADPC), Japan International Cooperation Agency (JICA), Secretariat of the Pacific Regional Environment Programme (SPREP), Caribbean Institute for Meteorology and Hydrology (CIMH), Caribbean Meteorological Organization (CMO), Regional Integrated Multi lingual Early Warning System (RIMES) on a variety of matters of common concern for mitigation of natural disasters from the multi-hazard point of view.

3.2 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 Tropical Cyclone Advisory Centres (TCAC) by ICAO Regional Air Navigation Agreements. Those TCACs listed in **Annex IV** provide specialized tropical cyclone advisory services for the international air navigation. Migration of the format of the TCAC advisories from text to graphic has been carried out by the respective Centers according to the Amendment 75 to the ICAO Annex 3/WMO Technical Regulations [C.3.1].

3.3 Collaborations with the NOAA's National Climate Data Centre continued for development of the world's single largest repository for tropical cyclone track and intensity data under the International Best Track Archive for Climate Stewardship (IBTrACS) project (see <http://www.ncdc.noaa.gov/oa/ibtracs/>).

4. ACTION PROGRAMME FOR 2013 AND BEYOND

4.1 TCP's major actions planned for 2013 and beyond apart from such annual activities as update of regional operational plans/manual and technical plans are described below in a summary form:

a) Training and Capacity Development

- Increase of the effectiveness of training courses and workshops through cross-boundary participation of the forecasters, remote lectures, and enhanced collaboration with other WMO Programmes including PWS and DPFS.
- Development of TC forecaster competency.

b) Support to Operational Forecasting

- Further Improvement of the Tropical Cyclone Forecaster Web Site with the support of Hong Kong, China.
- Completion of the update of the Global Guide on Tropical Cyclone Forecasting.

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 operational satellite analyses as recommended at the International Workshop on the Satellite Analysis of Tropical Cyclones (IWSATC).

d) Global Coordination

- Standardization of the format of TC Warnings through extension of the use of Common Alerting Protocol (CAP).
- Implementation of the graphical format of the TCAC advisory.
- Consideration of a standardized classification of tropical cyclones under the TC RSMCs/TCWCs Technical Coordination Meeting.

e) Storm Surge Watch Scheme (SSWS)

- Implementation of SSWS for RA I and RA V TCC regions in particular.
- Linkage with the WMO Coastal Inundation Forecasting Demonstration Project - pilot projects in Bangladesh and Fiji.

4.2 Major events planned for 2013 are as listed below:

- i) ESCAP/WMO Typhoon Committee, forty-fifth session (Hong Kong, China, 29 January – 1 February 2013)
- ii) WMO/ESCAP Panel on Tropical Cyclones, fortieth session (Colombo, Sri Lanka, 25 February – 1 March 2013)
- iii) RA IV Workshop on Hurricane Forecasting and Warning, and Public Weather Forecast (Miami, USA, 11 – 22 March 2013)
- iv) RA IV Hurricane Committee, Thirty-fifth Session (Willemstad, Curaçao, 8 – 12 April 2013)

APPENDIX, p8

- v) Attachment Trainings atn RSMC New Delhi, RSMC Nadi, RSMC Tokyo and Indian Institute of Technology Delhi (TBD).
 - vi) Southern Hemisphere Training Course on Tropical Cyclones and Workshop on Public Weather Services (TBD).
 - vii) RA I Training Course on Tropical Cyclones and Public Weather Services (Saint-Denis, La Réunion, dates to be determined)
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Expected Results 1, 2, 3 and 6 of the WMO Strategic Plan (2012 – 2015)

Expected Result 1

Enhanced capabilities of Members to deliver and improve access to high-quality weather, climate, water and related environmental predictions, information, warnings and services in response to users' needs, and to enable their use in decision-making by relevant societal sectors.

Expected Result 2

Enhanced capabilities of Members to reduce risks and potential impacts of hazards caused by weather, climate, water and related environmental elements.

Expected Result 3

Enhanced capabilities of Members to produce better weather, climate, water and related environmental information, predictions and warnings to support in particular disaster risk reduction and climate impact and adaptation strategies.

Expected Result 6

Enhanced capabilities of NMHSS, in particular in developing and least developed countries, to fulfil their mandates

List of the Events Organized or Co-sponsored under the Tropical Cyclone Programme

(1 January to 31 December 2012)

- ESCAP/WMO Typhoon Committee, Forty-fourth Session (Hangzhou, China, 6 - 10 February 2012);
- 2nd WMO International Conference on Indian Ocean tropical Cyclones & Climate Change (New Delhi, India, 14-17 February 2012).
- Tropical Cyclone Operational Forecasting Training at RSMC New Delhi – Tropical Cyclone Centre (New Delhi, India, 20 February to 2 March 2012);
- Thirty-ninth Session of the WMO/ESCAP Panel on Tropical Cyclones (Nay Pyi Taw, Myanmar, 5 to 9 March 2012);
- RA IV Hurricane Committee, Thirty-fourth Session (Jacksonville, Florida, USA, 11 – 15 April 2012)
- RA IV Workshop on Hurricane Forecasting and Warning, and Public Weather Forecast (Miami, USA, 12 – 23 March 2012);
- 7th Meeting of Typhoon Committee Working Group on Disaster Risk Reduction (Seoul, Korea, 30 – 31 May 2012), preceded by the Typhoon Committee Advisory Working Group Meeting (Seoul, Korea, 29 – 29 May 2012);
- RA V Tropical Cyclone Committee, fourteenth session (Apia, Samoa, 16 – 20 July 2012.
- Attachment of Typhoon Forecasters from Philippines and Vietnam for Typhoon Operational Forecasting Training at RSMC Tokyo-Typhoon Center (Tokyo, Japan, 18 to 27 July 2012);
- RA I Tropical Cyclone Committee, twentieth session (Maputo, Mozambique, 3 – 7 September 2012;
- The WMO International Workshop on Rapid Change Phenomena In Tropical Cyclones (Haikou, China, 5-9 November 2012).
- Seventh Tropical Cyclone RSMCs/TCWCs Technical Coordination Meeting (TCM) (Jakarta, Indonesia, 12 to 15 November 2012);
- The Eighth JCOMM/TCP Workshop on Storm Surges and Wave Forecasting (Nairobi, Kenya, 19 – 23 November 2012);
- Storm Surge Attachment Training at IIT (Delhi, India, 10 to 21 December 2012);
- WMO/ESCAP PTC Workshop and Case Study of Tropical Cyclone Analysis and Forecasting (Muscat, Oman, 17 – 19 December 2012.

Regional Tropical Cyclone Committees

(as of 31 December 2012)

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

* Member Territory

**Tropical Cyclone Advisory Centers for International Air Navigation
and Areas of Responsibility**

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