

## REVIEW OF ESACP/WMO TYPHOON COMMITTEE DEVELOPMENT IN PAST 50 YEARS

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### ABSTRACT

The ESCAP/WMO Typhoon Committee (TC) is an intergovernmental regional organization, established by Governments of ESCAP Member Countries (or Member Territory) under the joint auspices of ESCAP and WMO in 1968 to minimize the typhoon-related disaster risk reduction and damage mitigation in the region and to facilities closer regional and international cooperation. As of 2017, there are 14 Members. The Typhoon Committee has been repeatedly recognized as an outstanding regional body who has integrated the actions and plans of the meteorological, hydrological, and disaster risk reduction (DRR) components to produce meaningful results. Its work is primarily centered on reduction the damage caused by typhoons and floods, and focus on the following: 1) review the progress made in the various fields of typhoon damage prevention; 2) recommend the participating governments on plans and measures the improvement of community preparedness and disaster prevention; 3) promote the interested Governments and other interested organization for the coordination of research on typhoons; and 4) provide financial and technical support for plans and programs upon request. The paper reviewed the development of the Committee in the past 50 years in the aspects of establishment; membership, secretariat and programme components; strategic plan; and cooperative mechanism. The paper also states the areas of technical activities to be enhanced in the region and the proposals to enhance the Typhoon Committee's regional and international collaboration mechanism on typhoon-related disaster risk reduction and damage mitigation.

*Keywords:* Typhoon Committee, development, review

### 1. Background

Typhoons (hurricanes, tropical cyclones) are one of the world's most devastating natural disasters causing significant casualties and billions of dollars in damages to homes, building and infrastructure annually. The Asia and Pacific Region is one of the most vulnerable areas to natural disasters and around 38% tropical cyclones are generated in the Region (see figure 1). The region of Asia occupies 30% of the world's land mass, but 40% of the world's disasters occurred in the region in the past decade, resulting in a disproportionate 80% of the world's disaster deaths. The Statistical Yearbook for Asia and the Pacific 2016: SDG Baseline Report revealed that, the 687 climate-related disasters that occurred in the Asia-Pacific region in 2011-2015 accounted for 45% of global disasters; and the 61 deaths per climate-related disaster in the region is 20 more than the global average. The most mega-disasters caused

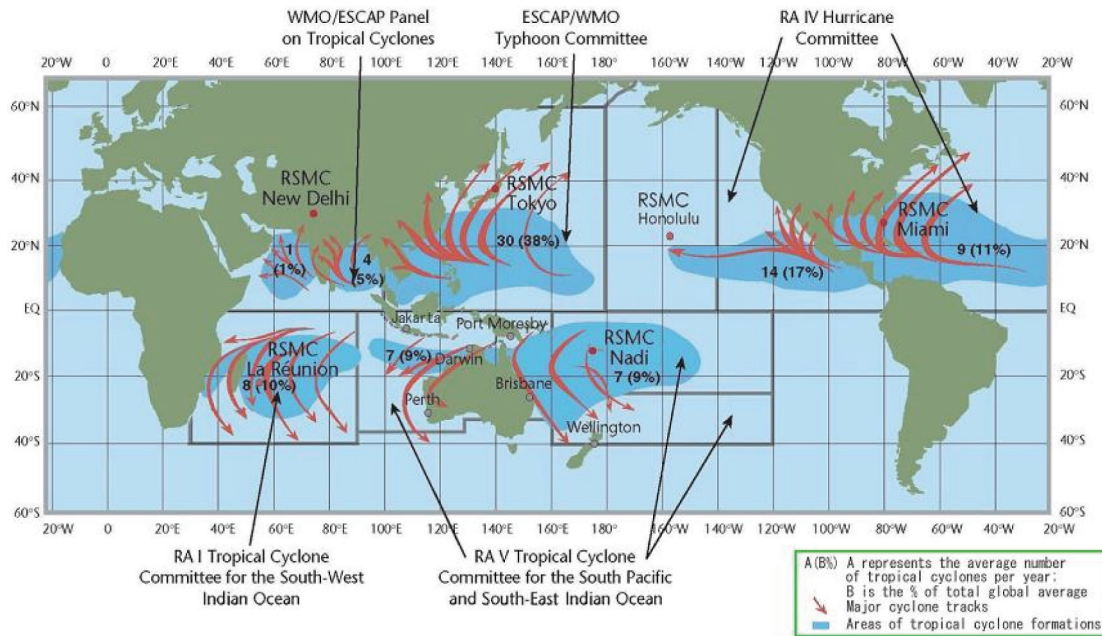
by tropical cyclones usually happened in TC region in the past few years. For example, the super typhoon Haiyan, locally known as typhoon Yolanda entered the Philippine Area of Responsibility (PAR) on 6 November 2013 and created new history for the Philippines. It affected a total of 3,424,593 families or 16,078,181 persons, killing 6,318 persons, 28,689 were injured and 1,061 were missing. It destroyed 1,140,332 houses and damaged a total of 19.6B pesos worth of Infrastructures and 20.3B pesos worth of Agriculture.

To mitigate the damage caused by typhoon in this region, the Economic and Social Commission for Asia and the Pacific (ESCAP), in cooperation with the World Meteorological Organization (WMO), established the Typhoon Committee in 1968. The year of 2018 will be its 50th anniversary.

In the past 50 years, the Committee has been developed into the world's preeminent inter-governmental, regional organization for improving the quality of life of the Members' populations through integrated cooperation to mitigate impacts and risks of typhoon-related disasters and to

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FIG. 1. Tropical Cyclone Distribution by Region

enhance beneficial typhoon-related effects. The Committee achieved its mission to integrate and enhance regional (Meteorological, Hydrological, and Disaster Risk Reduction) activities of Members within international frameworks to reduce the loss of lives and minimize social, economic, and environmental impacts by typhoon-related disasters.

To celebrate its 50th anniversary as a big and meaningful event, the Committee decided at its 49th Session, which was held in Yokohama, Japan from 21 to 24 February 2017, to oversee, plan and coordinate the preparation and organization of the TC50 Session and associated celebration activities, including the high-level thematic forum at TC50 Session.

One very important item of a series of celebration activities is to review the development and summarize the achievement of the Typhoon Committee in past 50 years, so that to look forward to its future and promote the effectiveness and efficiency of its governance to fulfill the functions of the Committee as described in the Statute of the Typhoon Committee:

- 1) Review regularly the progress made in the various fields of typhoon damage prevention;
- 2) Recommend to the participating Governments for the improvement of meteorological and hydrological facilities needed for typhoon damage prevention;
- 3) Recommend to the participating Governments for the improvement of community preparedness and disaster prevention;

- 4) Promote the establishment of programmes and facilities for training personnel from countries of the region in typhoon forecasting and warning, hydrology and flood control within the region and arrange for training outside the region, as necessary; and

- 5) Promote, prepare and submit to participating Governments and other interested organizations plans for coordination of research programmes and activities concerning typhoons.

## 2. Establishment of the Committee

Regarding the Establishment of the Committee, the Article 1 of STATUTE OF THE TYPHOON COMMITTEE states that, the Typhoon Committee (hereinafter referred to as the Committee) is established by the Government of regional ECAFE member countries affected by typhoons (hereinafter referred to as the participating Governments) under the auspices of the United Nations Economic Commission for Asia and Far East (hereinafter referred to as the Commission) in cooperation with the World Meteorological Organization with a view to promoting and co-coordinating efforts to minimize typhoon damages in the ECAFE region.

At its twentieth session in March 1964, the Economic Commission for Asia and the Far East (ECAFE, predecessor of the Economic and Social Commission for Asia and the Pacific (ESCAP)) recommended that, the Secretariat, in cooperation with the World Meteorological Organization (WMO), study practical means of initiating a joint

programme of investigations of typhoons in the EACAP region. Accordingly, a meeting of experts on typhoon was organized by ESCAP and WMO in Manila in December 1965 which was attended by experts from China; Hong Kong, China; Japan; Laos; Philippines; the Republic of Korea; Thailand; Vietnam and USA. The meeting recommended that a preparatory mission on typhoon be organized to visit the countries in the ESCAP region and neighboring countries which are affected by typhoon in order to formulate an action programme which would mitigate typhoon damage. It also recommended that a second meeting be convened to examine the report of the mission.

During the period from December 1966 to February 1967, the ESCAP/WMO Preparatory Mission on typhoon was organized with visiting Cambodia; China; Hong Kong, China; Guam, USA; Japan; Laos; the Philippines; the Republic of Korea; Thailand; and Vietnam. Broadly, the report of the mission covered three aspects: meteorology, hydrology and the establishment of a Regional Typhoon Centre.

The second meeting of experts on typhoon was held in Bangkok, Thailand in October 1967 with representatives from China; Hong Kong, China; Laos; the Philippines; the Republic of Korea; Thailand; USA; and USSR. The reviewed and examined the report of the Preparatory Mission and reiterated the need for early action to mitigate typhoon damage as a means of speeding economic development in the region. It also reaffirmed that national as well as joint efforts were necessary to combat effectively the detrimental effect of typhoon; therefore, regional cooperation was of paramount importance in solving common problem associated with typhoon. It was a consensus on that it was a need for comprehensive measures (including data collection, analysis, forecasts, dissemination of warnings and also complementary protective measures) in an integrated approach to deal effectively with typhoon problem. The comprehensive programme recommended was considered practical and realistic and should be implemented. To facilitate expeditious implementation of the programme, it was considered necessary to establish a regional inter-governmental body to promote and coordinate activities relating to typhoon damage control. Accordingly, it recommended: that a Typhoon Committee with a Regional Typhoon Centre as its executive arm be established under the auspices of ESCAP in cooperation with WMO; that the ESCAP and WMO Secretariat draft jointly the Statute and Rule of Procedure of the proposed Typhoon Committee and convene an ad hoc meeting of government representatives to consider and finalize these drafts.

The ad hoc meeting on the Status of the Typhoon Committee was held at Bangkok from 29 February to 2 March 1968. The meeting was attended by Government representatives from China; Hong Kong, China; Laos; Japan; the Philippines; the Republic of Korea; Thailand; and Vietnam. The representatives of USA and USSR also attended as observers. The meeting reviewed and finalized the Status and

Rules of Procedure of the Typhoon Committee, and recommended that the Statute of the Typhoon Committee be submitted to the 24th Commission Session of ESCAP and the appropriated body of WMO for their consideration.

At its 24th Session at Canberra in April 1968, the UN ESCAP endorsed the establishment of the Typhoon Committee in accordance with the Statute. In a parallel action, the WMO Executive Committee at its 20th Session held at Geneva in June 1968 also endorsed the establishment of the Typhoon Committee.

### 3. Membership of the Committee

Regarding the Membership of the Committee, the Article 2 of STATUTE OF THE TYPHOON COMMITTEE states that, the Committee shall be composed of a representative from each of the participating Governments desiring to participate in co-operative efforts to minimize typhoon damage in the ECAFE region. The Executive Secretary of ECAFE and the Secretary-General of WMO or their representatives shall be ex-officio members of the Committee.

Before the inaugural session of the Typhoon Committee in 1968, the Governments of China; Hong Kong, China; Japan; Lao PDR; the Republic of Korea; the Philippines; and Thailand signified their intention to join the Typhoon Committee, thereupon then became 7 founder Members of the Committee.

Afterwards, the Governments of Cambodia; Malaysia; Viet Nam; DPR of Korea, Macao, China; Singapore; and United State of American became the Members of the Committee successively. The Typhoon Committee is currently composed of 14 Members (See table 1). The abridged general view of the Members' location is shown in figure 2.

**TABLE 1.** the Membership of ESCAP/WMO Typhoon Committee

No.	Member	Joining year	Note
1	Cambodia	1972	
2	China	1968	Founder member
3	DPR of Korea	1992	
4	Hong Kong, China	1968	Founder member; Member Territory
5	Japan	1968	Founder member; RSMC Tokyo Typhoon Center;
6	Lao PDR	1968	Founder member
7	Macao, China	1992	Member Territory
8	Malaysia	1977	
9	Philippines	1968	Founder member
10	Republic of Korea	1968	Founder member
11	Singapore	1997	
12	Thailand	1968	Founder member
13	USA	1998	RSMC Honolulu-Hurricane Center
14	Viet Nam	1979	

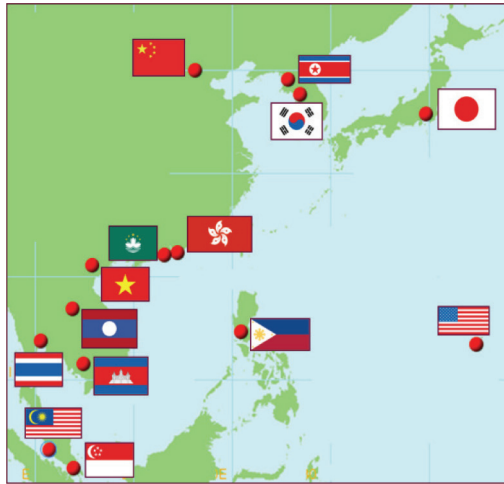


FIG. 2. The sketch map of the Members' location

#### 4. Programme Components of the Committee

Since very beginning of establishment, the Committee focused its programme on three basic components, i.e. meteorology, hydrology, and disaster risk reduction (DRR), even though some period used different titles for each component (such as facilities instead of components; complementary protective measure, community preparedness and disaster prevention, or disaster prevention and preparedness (DPP) instead of DRR). Considering the importance in the cross-cutting activities of three basic components, the Committee also paid close attention to training and research which are regarded as other two components. In a short period, the committee established a working group for resources mobilization. The current structure of the Typhoon Committee is shown in figure 3.

##### a. Meteorological Component

The activities under this field are concerned with the provision of the required basic meteorological data, analyses and other processed products together with the application of appropriate techniques to ensure accurate tropical cyclone forecasting and timely warnings. The WGM will promote cooperation among the Members in the implementation of activities under the Meteorological Component of the Committee's Strategic Plan with the aim to support the socio-economic development process and enhance cooperation among the Members in all the three components (Training and Research are incorporated as part of these three).

##### b. Hydrological Component

The activities under this field are based on the WMO Operational Hydrology Programme (OHP) and are concerned with the provision of the required basic hydrological data and the application of the appropriate techniques to ensure accurate flood forecasting and timely warnings. Within the

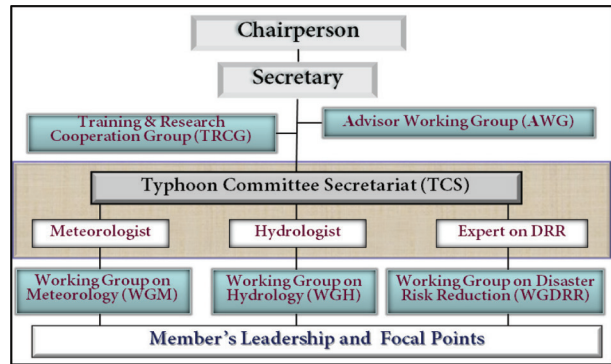


FIG. 3. the Structure of the Typhoon Committee

programmes of the Committee, wider accomplishments in this field, related to flood plain management and hydrological research, were achieved with the cooperation of UN ESCAP. The WGH will promote cooperation among the Members in the implementation of activities under the Hydrological Component of the Committee's Strategic Plan with the aim to support the socio-economic development process and enhance cooperation among the Members in all three components.

##### c. DRR Component

The activities under this field are concerned with all other structural and non-structural measures required to ensure the maximum safety of human life and the reduction of damage to a minimum. The WGDRR will promote the cooperation among the Members in the implementation of activities under the Disaster Risk Reduction Component of the Committee's Strategic Plan with the aim to support the socio-economic development process and enhance cooperation among the Members in all three components.

##### d. Training and Research Component

The activities under this field is to promote research and training activities on various aspects of tropical cyclones analysis, forecasting and assessment of tropical cyclones and their impacts on the socio-economic development process and encourage cooperation of efforts among the Members.

##### e. Working Groups for Components

At its 30th Session which was held in Hong Kong, China from 25 November to 1 December 1997, the Committee endorsed the proposal to assign names to tropical cyclones in the Western North Pacific and South China Sea which should lead to the standardization of the usage of names for tropical cyclones by Members in the Typhoon Committee Region. As a matter of urgency, it directed the Typhoon Research Coordination Group (TRCG) to come up with a detailed proposal for discussion and possible concurrence.



At its 39th Session which was held in the Manila, Philippines from 4 to 9 December 2006, the Committee decided to change the name of “Typhoon Research Coordination Group” to “Training & Research Coordination Group” (with the same acronym TRCG) and updated the TRCG Terms of Reference.

At its 33rd Session which was held in Macao, China from 28 November to 4 December 2000, the Committee decided to establish a Working Group for Hydrological Component (WGH) to be responsible for the planning and implementation of a comprehensive review of the hydrological component and disaster preparedness and prevention.

At its 37th Session which was held in Shanghai, China from 16 to 20 November 2004, the Committee decided to establish the Working Group on Meteorology (WGM), and the Working Group on Disaster Prevention and Preparedness (WGDPP). At 42nd Session which was held in Singapore from 25 to 29 January 2010, the name of WGDPP was changed to the Working Group on Disaster Risk Reduction (WGDRR), and approved the Terms of References of the Working Groups on Meteorology, Hydrology, DPP and TRCG.

## 5. The Secretariat of the Committee

### a. Location of TC Secretariat

When the Typhoon Committee was founded in 1968, a Regional Typhoon Centre was proposed as the executive body of the Committee. To assist the Committee in its day-to-day work, the ESCAP/WMO Joint Unit on Typhoon was also established in 1968 as the executive arm of the Committee. The Unit was located in ESCAP Secretariat, providing secretariat support to Committee.

Considering the name of “Regional Typhoon Centre” may confuse the people’s interpretation and understanding, the Committee decided at its 2nd Session which was held in Manila, Philippines from 2 to 8 December 1969 that: (1) The name of “Regional Typhoon Centre” to be changed to “Typhoon Committee Secretariat (TCS)”; (2) “Functions and Duties of the Typhoon Committee Secretariat” to be defined; and (3) Acceptance of the offer of the Government of the Philippines to provide facilities for the Secretariat of the committee in Philippines.

On 25 March 1971, the Typhoon Committee Secretariat was transferred from Bangkok to Manila, located in Philippines Weather Bureau in Quezon City.

At its 38th Session, which was held in Hanoi, Vietnam from 14 to 19 November 2005, the Committee made decision on that, the Typhoon Committee Secretariat (TCS) would be hosted by the Special Administrative Region of Macao of China, for a period of at least four years from the 39th Session of the Typhoon Committee. The “Host Country Agreement between the Government of People’s Republic of China and the Typhoon Committee Regarding the Typhoon Committee Secretariat” was signed on 7 December 2006 in Manila, Philippines during the 39th Ses-

sion of the Committee. The Secretariat of the Committee was transferred from Manila, Philippines to Macao, China in February 2007. The signing ceremony of the “Agreement between the Government of the Macao Special Administrative Region of the People’s Republic of China and the Typhoon Committee Regarding Administrative, Financial and Related Arrangements for the Typhoon Committee Secretariat” was held in Macao, China on 13 February 2007.

### b. The staffing of TC Secretariat

In the first three years after the establishment of the Committee, ESCAP and WMO jointly provided experts working in the ESCAP/WMO Joint Unit on Typhoon located in ESCAP Secretariat. Mr. S. N. Sen took the post of Chief.

When TCS was transferred from Bangkok to Manila in March 1971, ESCAP and WMO jointly provided 3 experts including Chief Technical Adviser, meteorologist and hydrologist. The supporting staff (including secretaries and drivers) was provided by the Government of the Philippines.

The United Nation Development Program (UNDP) provided the institutional financial support continually to the Secretariat of the Committee through project until 1976. UNDP representative suggested at TC 5th Session, which was held in Bangkok from 15 to 21 November 1972, that “the institutional financial support should come from Members which had established such institutions and that such support should be considered as evidence of their interest and willingness to contribute to their existence”, a working group was appointed to review and revise the draft Request in view of the requirement for showing a five year plan for the assumption of institutional support by Members and a scheme for the secondment of counterpart personnel as that the TCS would at all times have a staff at least three officers.

In 1974, UNDP approved the Technical Support to the Regional Typhoon Programme (TSRTP) to the Committee activities on the condition that the participating Members make professional staff available to TCS. These professionals should gradually replace the present experts under UNDP project (1974-1976), including a chief technical adviser as well as a synoptic meteorologist, a hydrologist, and a telecommunication/electronic expert.

Afterwards, the Philippines Government provided the meteorologist since November 1975 continually working in TCS as a counterpart professional staff member until 2006. The Governments of Japan, Republic of Korea and Philippines seconded the hydrologists since March 1977 to TCS in succession until 2007.

Considering the institutional support, including for the post of Chief Technical Adviser and the telecommunication/electronics experts, would be ended in December 1979, the Committee identified the items regarding the staffing of the Secretariat at its 11th Session, which was held in Bangkok from 3 to 9 October 1978, as requiring support for TCS: (1) the TCS coordinator/manager; (2) TCS meteorologist; (3)

TCS hydrologist; (4) TCS flood control expert; (5) Disaster preparedness expert on short-term assignment.

With the chief technical adviser withdrew from TCS, the Director-General of PAGASA, Dr. Rorman L. Kintanar carried out the function of the post of Coordinator for the Committee with interim nature in 1980. At 14th Session which was held in Manila, Philippines from 10 to 16 November in 1981, the Committee expressed its strong desire that Dr. R. L. Kintanar should continue his exemplary service in that capacity and Dr. Kintanar agreed to serve as coordinator for a further period on the understanding that he did so in a temporary capacity.

Committee decided at its 37th Session, which was held in Shanghai, China from 16 to 20 November 2004, to change the title of the “Coordinator of Typhoon Committee Secretariat” to “Secretary of Typhoon Committee”, and to appoint Dr. Rorman L. Kintanar as Interim Secretary until the appointment of the Secretary. At 39th Session which was held in Manila from 4 to 9 December 2006, the representative of Macao, China nominated Mr. Olavo Rasquinho, former director of the Meteorological and Geophysical Bureau of Macao, China, for Secretary of the Typhoon Committee, and was confirmed by the Committee as the Secretary of TC.

At the 3rd TC/PTC Joint Session (TC 47th Session), which was held in UNCC, ESCAP, Bangkok, Thailand from 9 to 11 February 2015, the Committee agreed Mr. Olavo Rasquinho to retire from the position of Secretary of the Committee in March 2015, and expressed its highest appreciation for his excellent work and great contribution in the past 8 years. The Committee endorsed Mr. Jixin YU to take the post of Secretary of the Committee.

## 6. The Strategic Plan of the Committee

### a. The evolution of Strategic Plan

The Project of Typhoon Operational Experiment (TOPEX), which was conducted in the Committee during the period from 1979 to 1984, laid a good foundation for more effective and closer cooperation among Members. It recommended that the functional cooperation which be maintained in order to further strengthen regional cooperation which formed the basis for the formulation of the Regional Cooperation Programme (RCP). It further agreed on the establishment of a Technical Working Group on the Imple-

mentation of the Regional Cooperation Programme to assist the activities of the Typhoon Committee for a special of one year in the first instance. The Committee adopted the proposal of the Technical Working Group on the “Typhoon Committee’s Regional Cooperation Programme Implementation Plan (RCPIP) for 1989”, which was the first RCPIP of the Typhoon Committee, at its 21st Session which was held in Manila, Philippines from 22 to 28 November 1988. After that, the Typhoon Committee renewed the RCPIP every year at its Annual Session.

At its 32nd Session which was held in Seoul, Korea from 23 to 29 November 1999, the Committee established the Working Group on the structure of RCPIP to review the Regional Cooperation Programme (RCP) of the Typhoon Committee. At its 33rd Session which was held in Macao, China from 28 November to 4 December 2000, the Committee reestablished the Working Group on the structure of RCPIP which would be guided by the WMO Long Term Plan as it relates to Tropical Cyclones, Strategic Plan for the Enhancement of National Meteorological Services in RA II, the proposed project entitled “Integrated System for the Mitigation of Typhoon, Floods and Environmental Disasters in the Western North Pacific Area”, and other Strategic Action Plan for Development of NMSs in the Pacific Region as prepared by the South Pacific Regional Environmental Programme (SPREP) and other relevant documents.

At its 35th Session, which was held in Chiang Mai, Thailand from 19 to 25 November 2002, the Committee decided to establish an Interim Working Group (IWG) on RCPIP for a period of one year to act as a “Think Tank” function to advise and offer options to the Members, the Committee, the TCS Coordinator, and the TCS, including to provide overall options for the framework of priorities for activities of the Typhoon Committee; to provide options and assistance, if required, on reporting format for the five components of the RCPIP for the Typhoon Committee and mechanisms aimed at improving the implementation of the RCPIP; and to provide options and assistance, if required, on collaborative activities among the five components of the RCPIP and priority options to the Typhoon Committee;

At the 36th Session which was held in Petaling Jaya, Malaysia from 15 to 20 December 2003, the IWG on RCPIP submitted a preliminary proposal on the operation

**TABLE 2.** the Evolution of Executive Body of ESCAP/WMO Typhoon Committee

Period	Name of Executive Body	location	Title of the Head	Person
1968-1970	Regional Typhoon Centre, ESCAP/ WMO Joint Unit on Typhoon	ESCAP Secretariat	Chief of Unit	Mr. S. N. SEN
1971-1979	Typhoon Committee Secretariat	PAGASA, Manila, Philippines	Chief Technical Adviser	Mr. S. N. SEN
1980-2004	Typhoon Committee Secretariat	PAGASA, Manila, Philippines	Coordinator of TCS	Dr. Rorman L. KINTANAR
2005-2006	Typhoon Committee Secretariat	PAGASA, Manila, Philippines	Secretary of TC	Dr. Rorman L. KINTANAR
2007-2014	Typhoon Committee Secretariat	Macao, China	Secretary of TC	Mr. Olavo RASQUINHO
2015-	Typhoon Committee Secretariat	Macao, China	Secretary of TC	Mr. Jixin YU

and structure of TC, including: 1) options and proposal on changes to the Methodology and Implementation of New Technologies which may lead to efficiencies of the TC, TC Coordinator and TCS; 2) options for the framework of Priorities for Activities of the TC; 3) options for Reporting Formats for the Five Components for the RCPIP for the Committee together with the Mechanism Aimed at Improving the Implementation of the RCPIP; and 4) options for Collaborative Activities Among the Five Components of the RCPIP. To further evaluate the IWG report at the 37th Session, the Committee decided to establish a Working Group on the Review of the Operations and Structure of the Typhoon Committee (WG ROSTY).

At TC 37th Session which was held in Shanghai, China from 16 to 20 November 2004, the WG ROSTY submitted the proposal on Procedures in Preparation of TC Strategic Plan and Annual Work Plan, as one of items of Report of the Meeting of WG ROSTY. The Committee recognized that the revised RCPIP needs further improvement and be reformatted into a strategic plan to form a more effective basis for preparation of annual plans. At its 38th Session which was held in the Hanoi, Viet Nam from 14 to 19 November 2005, the Committee decided to request Advisor Working Group (AWG, which was formed in 2004), to continue its efforts to translate the RCPIP into a strategic plan and annual work plan and requested AWG to submit the strategic plan and annual work plan to the Committee for its consideration at the 39th session.

At its 39th Session which was held in the Manila, Philippines from 4 to 9 December 2006, the Committee took note of the proposed Typhoon Committee Strategic Plan, which replaces the RCPIP, and discussed the various features, especially the Key Results Areas (KRAs), the Strategic Goals, and the Associated Activities. The Committee then adopted the Typhoon Committee Strategic Plan 2007-2011.

At its 44th Session, which was held in Hangzhou, China from 06 to 11 February 2012, the Committee approved the Typhoon Committee Strategic Plan 2012-2016.

At its 49th Session, which was held in Yokohama, Japan from 21 to 24 February 2017, the Committee approved the Typhoon Committee Strategic Plan 2017-2021.

#### *b. The Strategical Plan for 2017-2021*

The development of the Strategic Plan 2017-2021 was based on various international and regional frameworks, protocols, and action and strategic plans relevant to tropical cyclones in the region. The Strategic Plan presents clear priorities, targets, and Key Results Areas (KRA) of the Typhoon Committee, and it is closely aligned with the Sendai Framework for Disaster Risk Reduction 2015-2030.

The Committee has identified two Targets and five KRAs in addition to the one crosscutting theme and Priorities for special emphasis for the next five years (2017-2021). These are defined as the critical, overarching, priority areas of special interest for the Typhoon Committee.

#### *(1) Targets*

Target 1: Substantially reduce total mortality caused by typhoon-related disasters of the Members in the decade 2020 -2030 compared to the period 2005-2015.

Target 2: Reduce direct economic loss caused by typhoon-related disasters in relation to the total gross domestic product (GDP) of the Members by 2030.

#### *(2) KRAs*

KRA 1: Enhance capacity to monitor mortality and direct economic loss caused by typhoon-related disasters;

KRA 2: Enhance capacity to generate and provide accurate, timely and understandable information using multi-hazard impact-based forecasts and risk-based warnings;

KRA 3: Improve typhoon-related flood control measures and integrated water resource management;

KRA 4: Strengthen typhoon-related disaster risk reduction activities in various sectors, including increased community-based resiliency with better response, communication, and information sharing capability;

KRA 5: Enhance TC's regional and international collaboration mechanism.

#### *(3) The Crosscutting Theme*

To achieve its mission, the ESCAP/WMO Typhoon Committee believes climate change should be viewed as one of the major challenges of our time. Against the background of climate change and a continuous increase in economic damage and disruption by tropical cyclones, the Typhoon Committee has a growing concern on the possible impacts of climate change on tropical cyclone activities and related effects in the region. The Committee considers it a high priority to understand the possible effects brought about by climate change, such as changes in tropical cyclone frequency and intensity and the associated extreme rainfall and coastal inundation impacts from both scientific and socio-economic viewpoints and to share relevant information among Members. Sustainable disaster mitigation efforts against tropical cyclone related impacts, including too much or too little typhoon-induced rainfall, will be needed to address issues across the whole spectrum of climate and weather systems.

#### *(4) Annual Operating Plan (AOP)*

Each year during the 5-year period of this Strategic Plan, the AWG with input from the working groups and TCS will prepare a proposed draft Annual Operating Plans (AOPs) to be approved at the next Typhoon Committee Session. The AOPs will be developed in line with Priorities and contain detailed actions and success indicators to be conducted in that year. Through the completion of the AOPs, the Committee and its Members should accomplish all of the KRAs and Crosscutting Theme, and thus, the Targets contained in this plan.

## **7. Cooperative Activities in the Committee**

### *a. Annual Session*

The RULES OF PROCEDURE OF THE TYPHOON

COMMITTEE states that the Committee shall hold at least one session annually. The venues and dates of its sessions shall be decided by the Committee.

At its Annual Session, the committee reviews the progress made in its programme of work in previous year, mostly focuses on the governance issues of the Committee; and determines the activities which should be undertaken in next year and beyond, together with the support required to implement them. The Hosting Mechanism for Annual Session was adopted at 47th Session which was held in UNCC, Bangkok, Thailand from 11 to 13 February 2015.

The committee is coming to its 50th Anniversary. The 50th Annual Session will be held in Hanoi, Vietnam from 28 February to 03 March 2018.

#### *b. Integrated Workshop*

The Integrated Workshop (IWS) is an annual event for TC Members to review the implementation status of AOPs of the Advisory Working Group (AWG), Training and Research Coordination Group (TRCG) and the Working Groups on Meteorology (WGM), Hydrology (WGH), Disaster Risk Reduction (WGDRR), and to make implementation plan for the coming year.

The Workshop on Integrating Activities of the Hydrology, Meteorology and DPP components of the Typhoon Committee into the Related International Frameworks for Disaster Risk Management for Better Impacts and Visibility: Hydrological Component was held in Macao, China from 4 to 8 September 2006. The Committee adopted the integrated workshop as an annual event of the Committee

with different theme, and the Workshop on Integrating Activities of 2006 was regarded as the first IWS of the Committee. The Hosting Mechanism for IWS was adopted at 47th Session which was held in UNCC, Bangkok, Thailand from 11 to 13 February 2015. The summary of IWS was shown in table 3.

Meanwhile, TRCG members normally meet every four years to draw up training and research work plans for the next 4-year cycle. Since the first ESCAP/WMO Typhoon Committee (TC) Integrated Workshop, which was held in Macao, China in the year of 2006, Macao Meteorological and Geophysical Bureau (SMG) will host for the third time this important annual event for the Typhoon Committee.

#### *c. Working Group Activities*

According to the approved Implementation Plan of AOPs at Annual Session, all Working Groups will conduct a series of activities to achieve the scheduled objectives, and will be evaluated based on the successful indicators. The activities conducted in Working Groups include working meetings, expert missions, field survey, roving seminars, training courses, attachment training, data exchange, research fellowship, and etc.

#### *d. Publications*

As a very important approach for exchanging and dissemination of the knowledge and information among Members, the Committee paid closer attention to its publication, including technical reports summarizing the achievements of WGs AOPs; Typhoon Committee Annual Review

**TABLE 3.** Summary of Integrated Workshops of the Committee

No	Theme	Place	Data
1 <sup>st</sup>	Integrating Activities of the Hydrology, Meteorology and DPP Components of the Typhoon Committee into the Related International Frameworks for Disaster Risk Management for Better Impacts and Visibility: Hydrology Component	Macao, China	04-09 Sep. 2006
2 <sup>nd</sup>	Social Economic impacts of Extreme Typhoon-related Events	Bangkok, Thailand	10-14 Sep. 2007
3 <sup>rd</sup>	Coping with Climate Change in the Typhoon Committee Area	Beijing, China	22-26 Sep. 2008
4 <sup>th</sup>	Building Sustainability and Resilience in High Risk Areas of the Typhoon Committee: Assessment and Action	Cebu, Philippines	14-18 Sep. 2009
5 <sup>th</sup>	Urban Flood Risk Management in a Changing Climate: Sustainable and Adaptation Challenges	Macao, China	6-10 Sep. 2010
6 <sup>th</sup>	Damage Assessment Methodology and Pre-Assessment of Typhoon Landfall Impact	Nha Trang, Vietnam	07-11 Nov. 2011
7 <sup>th</sup>	Effective Warnings	Nanjing, China	26-30 Nov. 2012
8 <sup>th</sup>	Forecasting, Warning and DRR Strategies in the Mitigation of Tropical Cyclone Impact in a Multi-hazard Environment	Macau, China	02-06 Dec. 2013
9 <sup>th</sup>	Synergized, Integrated, Collaborative Standard Operating Procedures Strategies to Improve Early Warning System for Coastal Multi-hazards	UNCC, Bangkok	20-24 Oct. 2014
10 <sup>th</sup>	Innovative Strategy to Improve the Quality of Life for Members' Population through Mitigating Typhoon-related Impacts	Kuala Lumpur, Malaysia	26-29 Oct. 2015
11 <sup>st</sup>	Improving typhoon impact-based forecasting and warning	Cebu, Philippines	24-28 Oct. 2016
12 <sup>nd</sup>	Tropical cyclone related forecast, warning and DRR in the era of big data and social media: challenges and opportunities	Jeju, Korea	30 Oct.-03 Nov. 2017



(TCAR) which was published the first issue in 1985 and discontinued at TC 44th Session in 2012; Newsletter which is issued semiyearly; and the scientific journal Tropical Cyclone Research and Review (TCRR) which was launched at TC 44th Session and takes aim at providing an effective medium to exchange the latest advances in tropical cyclone sciences, forecast techniques, and warning system.

#### *e. Cooperation with WMO/ESCAP PTC*

The Committee established close cooperation relationship with WMO/ESCAP Panel on Tropical Cyclone (PTC) through various activities, including Joint Session, participating in meetings and cooperative projects.

The Committee conducts Joint Session irregularly with WMO/ESCAP Panel on Tropical Cyclone (PTC). TC and PTC have organized three Joint Sessions (the 1st Joint Session was held in Pattaya, Thailand from 18 to 27 February 1992; the 2nd Joint Session in Phuket, Thailand from 20 to 28 February 1997; the 3rd Joint Session in Bangkok, Thailand from 09 to 13 February 2015).

TC and PTC made firmer arrangement for liaisons each other, accordingly the staff participate in meeting of both bodies since 1980's.

TC and PTC also conducted Joint Projects under the umbrella of ESCAP and WMO.

#### *f. Cross-cutting projects conducted in recent years*

With more and more cooperation projects conducted among working groups, the Committee recognized that, the integrated activities should be considered as cross-cutting projects of the Committee to link three components (meteorology, hydrology and DRR) together, particularly in a changing climate, so that to enhance the linkage and collaboration among meteorology, hydrology and DRR on typhoon-related disaster risk monitoring, forecasting and early warning, and damage mitigation. In recent years, The committee conducted number of cross-cutting projects, three of them are briefed below.

(1) Urban Flood Risk Management (UFRM) in TC Region

UFRM was formally launched at the 41st Session in 2009 as the first cross-cutting project of the Committee with the objectives of (1) to exchange the experiences on management and mitigation of floods and typhoon-related disaster in urban area among TC Members; (2) to share the technology of urban flood monitoring and methodology of urban flood forecasting and prediction, early warning and disaster assessment between TC Members; and (3) to promote management of urban flood and other typhoon-related disasters in TC area. One of the achievements of UFRM project is the publication of Guidelines on Urban Flood Risk Management in the Typhoon Committee Area.

(2) Synergized Standard Operating Procedures (SSOP) for Coastal Multi-hazard Early Warning System

With the financial support from ESCAP Trust Fund for

Tsunami, Disaster and Climate Preparedness in Indian Ocean and Southeast Asian Countries, the project of SSOP had implemented jointly with the PTC from 2012-2015. The goal is to promote community resilience to coastal multi-hazards and to improve the policy and institutional arrangements at national, district, and community level through integrated effective standard operating procedures for multi-hazards EWS. As the outcome of this project, the Manual and its Quick Reference on SSOP were published and cooperation mechanism was established between TC and PTC. To extend and implement the achievement of SSOP in the region, ESCAP provided finding support for SSOP-II with the goal to promote the capacity on establishment of the SOP at national-level to coastal multi-hazards through extending the achievement of SSOP-I in TC and PTC regions by conducting training course and workshops on the "mechanics" of preparing and implementing SSOP.

(3) Experiment on Typhoon Intensity Change in Coastal Area (EXOTICCA)

EXOTICCA, which was endorsed at 46th Session in 2014, focus on resolving the difficulties of operational typhoon forecasting and identifying the key scientific issues of tropical cyclone related disaster prevention and mitigation. The objectives of EXOTICCA are (a) to conduct demonstration research on the utilization of the synergized field observation data with the aim of deepening the understanding of the mechanism of structure and intensity changes of offshore and land-falling tropical cyclones; (b) to improve key techniques of intensity analysis and the regional tropical cyclone prediction model; to enhance the performance of tropical cyclone intensity forecasts from NWP models; (c) to develop a more reliable storm surge model for the coastal cities in the Asia Pacific region; and (d) to develop the flooding and associated risk assessment techniques and systems for the inland flood plains.

## **8. Conclusions**

ESCAP/WMO Typhoon Committee is a preeminent regional inter-Government organization who has integrated the actions and plans of the meteorological, hydrological, and disaster risk reduction (DRR) components to produce meaningful results. It is a very active and important platform with close organization structure, clear strategy and effective cooperative mechanism for regional and international cooperation on typhoon-related disaster risk reduction.

The areas to be enhanced in the region on typhoon-related disaster risk reduction and damage mitigation might focus on: (a) enhancing the typhoon-related disaster monitoring and warning by using advanced technology; (b) improving the impact-based, risk-based and community-based storm surge, urban flood, and sediment disaster (including flash flood, landslide and mudflow) monitoring, forecasting and warning; and (c) enhancing the application of internet of things (IOT), big-data, cloud compute, and mobile inter-

net in disaster monitoring, forecasting and early warning, and better response.

The proposals to enhance the Committee's regional and international collaboration mechanism on typhoon-related disaster risk reduction and damage mitigation might include: (a) to fully implement the Sendai Framework for DRR 2015-2030, taking on the targets of the global disaster reduction proposed in the Framework for the next 15 years; (b) to strengthen the technical cooperation on disaster prevention and mitigation among countries, intensifying the technical exchanges on typhoon-related DRR, project cooperation, joint research and personnel training, and sharing the experience and results of the disaster prevention and mitigation; (c) to encourage and support the developing countries to broaden the fields of cooperation on typhoon-related disaster risk prevention and mitigation under the principle of mutual respect, and equality and mutual benefit; (d) to jointly promote the capacity to cope with typhoon-related disasters, further strengthening the capacity building on typhoon-related disaster prevention

and mitigation, improving the disaster monitoring and early warning network, and reinforcing the infrastructure system, so as to comprehensively enhance the level of water-related disaster risk prevention and reduction.

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