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FOR ASIA AND THE PACIFIC  
AND  
WORLD METEOROLOGICAL ORGANIZATION

FOR PARTICIPANTS ONLY

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Typhoon Committee  
Forty-fifth Session  
29 January -01 February 2013  
Hong Kong, China

### **Report of WGH Activities in 2012**

(Item 8 of Provisional Agenda – Report activities WGs & TRCG)

(Submitted by WGH)

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#### **ACTION REQUIRED:**

This Committee is invited to:

- a) Review the activities of WGH in 2012.
- b) Approve the recommendations and AOP of WGH for 2013 and beyond

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#### **APPENDIXES:**

- I. Implementation status of WGH AOP 2012
- II. WGH AOP for 2013 and beyond

## **THE REPORT OF WGH ACTIVITY IN 2012**

In 2012, Working Group on Hydrology (WGH) conducted a series of activities very positively referring to the decision of 44<sup>th</sup> Session of the Committee which was held in Hangzhou, China from 6 to 11 February 2012. This report was drafted on the base of the outcomes of 1<sup>st</sup> WGH working meeting which was held in Seoul, Public of Korea from 7 to 10 October 2012, and the discussion of the parallel session of TC 7<sup>th</sup> Integrated Workshop (IWS) which was held in Nanjing, China from November 26 to 30, 2012.

The report briefly described the activities of WGH conducted in 2012 and summarized the status of implementation of AOPs 2012. Based on the communication among Members and the discussion at TC 7<sup>th</sup> IWS, WGH proposed the AOPs for 2013 and beyond and consequently requested the TCTF allocation for supporting WGH activities in 2013.

### **THE FIRST WORKING MEETING OF WGH**

- 1) WGH first working meeting with the theme of 'Comprehensive Counterplan for Extra-Ordinary Flood' was held in Han River Flood Control Office (HRFCO) of Korea, Seoul from 7 to 10 October 2012 at the kind invitation of the Ministry of Land, Transport, and Maritime Affairs (MLTM), Korea with generous offering of financial support.
- 2) The objectives of the WGH first working meeting were:
  - to review the implementation progresses of WGH Annual Operating Plan (AOP);
  - to review the floods happened in China, Philippines and Thailand;
  - to discuss the activity plan for WGH in 2013; and
  - to discuss the preparation of the 7<sup>th</sup> Integrated Workshop to be held in Nanjing from 26 to 30 November 2012.
- 3) The meeting was hosted by MLTM in cooperation with Korea Institute of Construction (KICT) and co-chaired by WGH chairperson Mr. Kamoto Minoru and the director of Information Center of HRFCO Dr. Sang Heon LEE. The Director General of HRFCO Dr. ByungKok JEON attended open ceremony. Totally about 25 participants from China, Japan, Korea, Laos, Malaysia, Philippines, Thailand, the United States, Vietnam and TCS took part in the meeting.
- 4) The participants recognized the working meeting is very important event for WGH to review the progresses of the AOPs and to prepare the IWS. WGH expressed its highest appreciation to Korea government for supporting WGH working meeting and expected the working meeting can be continued.

### **WGH PARALLEL SESSION OF TC 7<sup>TH</sup> IWS**

- 5) Typhoon Committee (TC) Working Group on Hydrology (WGH) had its parallel sessions during 7<sup>th</sup> TC integrated Workshop (IWS), which was held in Nanjing, China from November 26 to 30, 2012, as the proposed program of IWS.

- 6) The Sessions were convened by Chairperson of WGH Mr. Minoru KAMOTO, Chief Researcher of International Centre for Water Hazard and Risk Management(ICHARM) of Japan.
- 7) The Sessions were attended by 32 participants from 9 Members (China, DPR Korea, Japan, Laos, Malaysia, Philippines, RO Korea, Thailand, Viet Nam) and TCS.
- 8) The main contents of WGH Sessions include:
- to present Member Reports of hydrological component
  - to review the 1<sup>st</sup> working meeting of WGH
  - to review implementation status of WGH AOP2012
  - to exchange information on priorities and key areas and to propose WGH AOP for 2013 and beyond
  - to propose budget for WGH activities in 2013
  - to have Scientific lectures related proposed new AOP
  - to review TC Governance related to WGH --- TOR of WGH
  - to discuss Cross-cutting Issues – How to contribute to the ESCAP trust fund project ---- Synergized Standard Operating Procedures for Coastal Multi-Hazards Early Warning System (SSOP)
  - to discuss the ideas for TRCG Forum in the 8<sup>th</sup> IWS, 2013
  - to discuss the WGH reports with conclusions and recommendations for presentation to 45<sup>th</sup> TC Session.

#### **ACTIVITIES ON HYDROLOGICAL COMPONENT IN MEMBERS**

- 9) The representative from China, DPR Korea, Japan, Laos, Malaysia, Philippines, RO Korea, Thailand, Viet Nam presented their Member Reports related to hydrological component. The hydrological activities of Members in 2012 will be described in the Appendix of 45<sup>th</sup> Session Report.
- 10) The great efforts and progresses have been made on effective early warning of flood in some Members in 2012, such as early warning issuing platform to public in China, two publications on landslide warning in Japan, automatic flood warning sirens in Malaysia, and updated flood warning protocols in Philippines and real-time inundation warning for Hanoi in Vietnam.
- 11) It was noted that, next year (2013) will be the 40 Years of Flood Forecasting and Warning Service of the Committee. In its inaugural session in 1968, TC called attention to the need of members to embark on the development of their flood forecasting and warning capability. The Philippines was especially cited because of the destructive and extensive floods that had been affecting the country every few years. This was considered as the initial feasibility study for the pilot flood forecasting and warning system for the Pampanga River Basin which became operational in September 1973. Through the TC's initiatives and the subsequent activities to improve and enhance flood forecasting and warning service under the WGH, the Philippines through PAGASA was able to sustain its hydro-meteorological service for the past 40 years.

## THE IMPLEMENTATION STATUS OF WGH AOP 2012

12) WGH seven on-going projects in 2012 are listed in table 1. The Summary of implementation status of WGH AOP2012 is shown in Appendix 1.

Table 1 Summary of WGH AOPs in 2012

	<b>Projects</b>	<b>Driver</b>	<b>Duration</b>
AOP1	Urban Flood Risk Management in TC region	China	2008-2012
AOP2	Assessment System of Flood Control Measures on Socio-economic Impacts	Korea	2008-2012
AOP3	Hazard Mapping for Sediment-related Disasters	Japan	2009-2012
AOP4	Establishment of Flood Disaster Preparedness Indices	Japan	2009-2012
AOP5	Satellite-based Information Utilized on Reducing Water-related Disaster Risks	ESCAP	2010-2012
AOP6	Development of Comprehensive Counterplan for Extra-ordinary Flood	Korea	2012~2016
AOP7	Estimation for Socio-economic Impact of Sediment-related Disaster	Japan	2013~2015

### 13) AOP 1: Urban Flood Risk Management (UFRM) in TC region

This project was launched in 2008 and led by China. It will be closed at 45<sup>th</sup> Session held in Hong Kong, China in January 2013.

Following the decisions made at TC 44<sup>th</sup> Session which was held in Hangzhou, China in January 2012, major activities on this cross-cutting project have been done in 2012 including:

- a. **UFRM Guidelines drafting Meeting.** The meeting was held in the WMO RTC in Nanjing, China from 13 to 14 February, 2012, following the TC 44<sup>th</sup> Annual Session held in Hangzhou, China, on 6-11 February 2012. The meeting chaired by Dr. Zhiyu LIU, leader of the UFRM project and vice Chairperson of WGH, and participated by 15 delegates. The participants discussed deeply the contents and chapters of first version of Guidelines. The provisional timetable of the UFRM guidelines drafting was concurred at the meeting.
- b. **UFRM training course.** Bureau of Hydrology (BOH) under the Ministry of Water Resources (MWR) of China conducted the training course in Guangzhou, China from 24 to 26 September 2012 for the participants from five pilot cities, namely Hat Yai of Thailand, Metro Manila of Philippines, Hanoi of Vietnam, Kuala Lumpur of Malaysia and Guangzhou of China.

The objective of the training course is to enhance the capacity of urban flood forecasting and inundation mapping with contents including:

- (1) application of hydrological/hydraulic modeling (Xin'anjiang model);
- (2) urban flood inundation mapping; and
- (3) the skill of hydro-meteorological coupling modeling with QPE/QPF products application.

The participants of the training course made recommendations to WGH as:

- (1) continue providing this kind of training for professional flood forecasters of Members, and
  - (2) extending the application of Xin'anjiang model (flood forecasting model) of China in selected river basins of Members.
- c. **Workshop of UFRM funded by ESCAP.** This workshop was held in Macao, China linked with the ESCAP Workshop on Applications of Space Technology to Enhance the Activities of the Typhoon Committee from 27 February to 2 March 2012. The participants suggested that space applications for disaster monitoring and damage assessment be included in Disaster Risk Reduction (DRR) related chapters of the UFRM guidelines. In this respect, ESCAP informed that the Asia Pacific Disaster Report 2010 contained useful relevant information in a chapter devoted to that subject.
- d. **UFRM Guidelines Drafting.** The Members of UFRM Task Force made the great contribution to the UFRM Guidelines as main drafters and China made its remarkable efforts as the leading country. The second draft of Guidelines was distributed to drafters and pilot cities for comments in October 2012. Participants at the Workshop reviewed and discussed the second version of Guidelines with contents:
- Introduction
  - Framework of Urban Flood Risk Management
  - Meteorological Monitoring and Rainfall Forecasting
  - Urban Flood Monitoring, Forecasting and Warning
  - Disaster Risk Management for Urban Floods
  - Flood risk analysis and assessment
  - Decision Support System for UFRM
  - Training and research in support of UFRM
  - Conclusion and Way Forward

The final version of UFRM Guidelines was completed based on the comments from Drafters and pilot cities, and it was submitted to the 45<sup>th</sup> Session held in Hong Kong, China in January 2013 for final comments.

- e. The Guidelines will be published after the 45th Session.

#### **14) AOP 2: Assessment System of Flood Control Measures on Socio-economic Impacts (ASFCM)**

This project was launched in 2008 and led by Republic of Korea. It is proposed to be extended 2 more years up to 2014.

##### **(1) Activities in 2012**

- Development of a system to evaluate the possible flood control measures was finalized.
  - Flood inundation area considering the possible flood control measures was hydraulically simulated using HEC-RAS
  - Socio-economic effect of the flood control measures were calculated using the inundation area
  - Cost and benefit from the proposed measures were provided

- Apply the developed system in the Pampanga basin, Philippines with the arbitrary data to evaluate the inundated area along the Chao Phraya river basin.
- Two different amount of flooding discharges were applied and inundated area were compared

**(2) Plan for 2013**

- Development of technical report and user’s guide and publish the draft in the 8<sup>th</sup> Integrate Workshop;
- Technical report will include the engineering methodologies applied in the system
  - (1) Detailed features of HEC-RAS to calculate the inundation area with depth of water and velocity of flow possibly.
  - (2) Multi-dimension analysis to calculate the cost and damage of the proposed operation of flood control measures.
- User’s guide will include the explanation about the graphic user interfaces and examples applied in the selected member countries
  - (1) Detailed explain about the main screen, pop-up windows, icons, and menu bar
  - (2) Examples of the selected basins to explain the analysis steps

**15) AOP 3: Hazard Mapping for Sediment-related Disasters**

This project was launched in 2009 and led by Japan. It will be closed at 45<sup>th</sup> Session held in Hong Kong, China in January 2013.

Activities were conducted in 2012 including:

- The final report was finished and had discussion at the Workshop. The report is going to be published before the 45<sup>th</sup> Session regarding not only how to make and use hazard map but also how to establish the integrated system for residents’ evacuation based on Japanese examples, two projects result and contents of SABO Workshop.
- The main contents include:
  - Introduction
  - Establish total early warning system for Sediment-related disaster
  - How to make hazard mapping
  - Activities of “Hazard mapping for Sediment-disaster”
  - Examples of participants this project
- The final report was published before TC 45<sup>th</sup> Session in cooperation with TCS.

Japan-side expressed to continue providing technique guide and training for TC Members in need.

**16) AOP 4: Establishment of Flood Disaster Preparedness Indices (FDPI)**

This project launched in 2009 and led by ICHARM of Japan. It will be finalized at 45<sup>th</sup> Session held in Hong Kong, China in January 2013.

Activities were conducted in 2012 including:

- FDPI Methods and Analyses are completed;

- FDPI Field Survey in Hanoi city, Vietnam was completed with the cooperation of Vietnam National University and Hanoi city from August 5 to 10, 2012. In Hanoi city, 13 communities (commune) leaders or persons who are in charge of disaster management in 5 districts (Tu Liem, Ba Vi, Thanh Tri, Hoang Mai, Thuong Tin) cooperated on the survey. The results of the survey were sent to the recipients through the Vietnam National University.
- Started to complete Auto Evaluation System with Tablet Software
- Started to develop Multi-language Version. English, Thai, Vietnamese, Korean, Chinese, Malay, Lao, Tagalog, French, and Japanese version will be disclosed soon, and other languages versions will be examined;
- Started to complete Diagnoses;
- The final report was published before the 45th Session in cooperation with TCS.

All TC Members are encouraged to continue supporting and cooperating with ICHARM to establish FDPI to promote the capacity building for the local disaster preparedness. ICHARM would like to have your continuous cooperation to raise disaster preparedness levels of local Communities in TC Members.

#### **17) AOP5: Satellite-based Information Utilized on Reducing Water-related Disaster Risks**

This project is proposed by IDD of ESCAP in 2010, collaborated with ICHARM and JAXA of Japan. The project will be closed at 45<sup>th</sup> Session held in Hong Kong, China in January 2013.

The Workshop on Applications of Space Technology to Enhance the Activities of the Typhoon Committee was jointly organized by the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) and the Typhoon Committee Secretariat from 27 February to 2 March 2012 in Macao, China. The workshop was hosted by the Macao Meteorological and Geophysical Bureau (SMG) and financially supported by the Japan Aerospace Exploration Agency (JAXA).

The objectives of the workshop were to further enhance the knowledge and capacity of participating countries on space applications for disaster risk management and in particular for urban flood risk management and water-related risks.

Totally 25 participants took part in the workshop with:

- the presentations and hands-on training materials on Sentinel Asia and on remote sensing applications for disaster risk management, including optical and synthetic aperture radar that have been prepared for the workshop.
- reviewing the progress on the Urban Flood Risk Management (UFRM) project of the Typhoon Committee and discussed the outline of the UFRM guidelines.

The participants suggested that space applications for disaster monitoring and damage assessment be included in Disaster Risk Reduction (DRR) related chapters of the UFRM guidelines. In this respect, ESCAP informed that the Asia Pacific Disaster Report 2010 contained useful relevant information in a chapter devoted to that subject.

#### **18) AOP6: Development of Comprehensive Counterplan for Extra-ordinary Flood**

This project was proposed by MLTM of Korea at 44<sup>th</sup> Session held in Hangzhou, China in January 2012 and will be lasted from 2012 to 2016. The general objective of this proposal is to (a) investigate flood damage types caused by climate change, flash flood, and flood prevention capacity; and (b) cooperate for Typhoon Committee members to reduce the adverse effect from the extreme flood.

The implementation plan and expectation of this proposal includes (a) development of future counter-plan to decrease adverse effects caused by climate change, flash flood, and urban flooding; and (b) investigation of flooding history and cases which causes loss of lives and several property damage.

The title of the project was proposed by Korea to be changed to Extreme Flood Forecasting System. The Roadmap is reported as:

- **2012:** Establishment of Water resource International Cooperation Roadmap & Action Plan
- **2013:** Flood vulnerability Analysis for extreme flood
- **2014:** Comprehensive Countermeasures For Extreme Floods Using Radar and Satellite
- **2015:** Development of Platform for Extreme Floods Monitoring System on the target Member Countries in TC Members
- **2016:** Development of Extreme Flood Monitoring System for TC region

### **(1) Activities in 2012**

To understand the flood characteristics, the dam operation and flood forecasting and warning status in Members, an Expert Mission with participants from MLTM, KICT and K-water of Korea, Philippines Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) and Royal Irrigation Department (RID) Thailand was conducted from 5 to 15 June 2012 in Philippines and Thailand for historical floods and flood monitoring systems survey and investigation.

It is recognized from the Mission that, (1) the cooperation among members on extreme flood monitoring system should be enhanced; (2) the smart flood forecasting systems linked with ICT, Radar, Satellite on traditional forecasting technologies are required.

Based on the survey, Korea-side studied the comparison analysis of hydrological and Floods characteristics in the Korea, Philippines and Thailand. It is pointed out that, (1) casualties and property damages have still occurred repeatedly, although flood control projects have been continually constructed; (2) the extreme floods in selected rivers exceeded the design level due to exceptional rainfall; (3) there are the differences in the characteristics of flood among selected rivers, however, there are also similar features of drainage problems in the lower basin; (3) need to conduct more detail survey based on the result of the Mission in 2012 to understand and develop appropriate strategies for each basin; (4) to build the inclusive DB of flood characteristics, it is very important for more TC members to take part in AOP6.

The meeting was informed that Lao PDR proposed Nam Ngumriver basin of Lao PDR as a case study of this project.

### **(2) Plan for 2013**

- Conduct survey in Lao PDR
- Analysis the vulnerability of extreme flood in Members

### **19) AOP7: Project on Estimation for Socio-economic Impact of Sediment-related Disaster**

This project was initially proposed at 44<sup>th</sup> Session held in Hangzhou, China in January 2012 and to be officially launched at 45<sup>th</sup> Session held in Hong Kong, China in January 2013.

Because most of countries don't have the system to collect the record of sediment-related disaster, it is difficult to (1) establish plans and build counter measures against sediment-related disaster effectively; and (2) establish "Early warning system" (Former Japanese TC Project) and



make “Hazard Mapping” (Present Japanese TC project).

To have quick response for rehabilitation against disasters by knowing the scale of disaster damage and to appeal damage for international society, the objectives and contents of project activity were proposed as:

- To collect the record of sediment-related disaster, Project makes a format to survey
- To survey sediment-related disasters based on the format by each TC members
- Project makes a “Sediment-related Disaster Record Database” to share the records in TC members.
- To estimate the scale of disaster damage using indices based on results of survey
- To compare the scale of disaster damage within TC members.

The Roadmap is reported as:

- **2013:** (1) at 8<sup>th</sup> IWS, provide a draft format to collect the record of sediment-related disaster;  
(2) at 46<sup>th</sup> TC Session, make decision of the format to collect the record of sediment-related disaster.
- **2014:** (1) at 9<sup>th</sup> IWS, report the results of survey based on the format by each TC members (about one or two disasters);  
(2) at 47<sup>th</sup> TC Session, make a “Sediment-related Disaster Record Database” to share the records in TC members.
- **2015:** (1) at 10<sup>th</sup> IWS, report the results of survey based on the format by each TC members and “Sediment-related Disaster Record Database”, comparison of the scale of damage within TC members;  
(2) at 48<sup>th</sup> TC Session, submit the final report.

## **PROPOSAL OF WGH AOPS AND PRIORITY ACTIVITIES FOR 2013 AND BEYOND**

To respond the recommendation at the 44<sup>th</sup> Session held in Hangzhou, China in January 2012 that ‘to request WGH focus on improving the ability to forecast hydrological phenomena and provide measures for the effectiveness of the improvements’, WGH proposed four new proposals for 2013 and beyond based on the WGH 1<sup>st</sup> working meeting and discussion during the TC 7<sup>th</sup> IWS.

### **20) Proposal 1: Development of Operational System for Urban Flood Forecasting and Inundation Mapping (OSUFFIM) for TC Members**

The proposal is consequent activity of TC Cross-cutting Project of UFRM. It will be lasted from 2013 to 2016.

To promote the capacity of early warning of urban flood and emergency response, particularly urban flood forecasting and inundation mapping, Typhoon Committee Secretariat (TCS) and Macao Meteorological and Geophysical Bureau (SMG) proposed this project.

The objectives of the proposal were supposed as (1) to carry on the research on the Key technique points existed in UFRM project; and (2) to develop a real time Operational System for Urban Flood Forecasting and Inundation Mapping (OSUFFIM) for Typhoon committee.

The Science and Technology Development Fund (STDF) of Macao Government decided to provide the grant of about \$175,000 US dollar to support the development of “OSUFFIM”. Sun Yat-

Sen University of China is willing to contribute this activity for Typhoon Committee based on its existing achievement on urban flood inundation mapping. Prof. CHEN Yangbo expressed that Sun Yat-Sen University will use their own potential budget to cover the shortage of the funding for development of OSUFFIM.

- This project will be jointly driven by SMG of Macao, China and TCS.
- As cooperation partner, Sun Yat-Sen University of China will develop the OSUFFIM in one pilot city in the period of 2013 and 2014.
- The OSUFFIM will be applied in selected interesting Members gradually from 2014 to 2016.
- TMD and RID of Thailand expressed the willingness to have the strong cooperation and support to the project.
- Based on the communication with Focal Points of UFRM, Hat Yai of Thailand was selected as the pilot city for this project in 2013.
- TCS and SMG of Macao will draw up the detail implementation plan for 2013 in cooperation with Thailand and Sun Yat-Sen University.

#### **21) Proposal 2: Extension of Xin'anjiang Model Application in Selected River Basins in TC Members**

This project was proposed by China based on the recommendation from the participants of UFRM training course held in Guangzhou, China in September 2012. It will be lasted from 2013 to 2016.

The objective is to promote the capacity of real time operational flood forecasting in TC Members through extend application of flood forecasting model (Xin'anjiang model of China) in selected river basins in TC Members in next years.

- China-side will perfect the English version of the Model including calibration and forecasting modules for TC Members, and provide detail documentations of data format and user manual for Model application.
- Hohai University of China will consider providing the source code of the model to TC Members if needed.
- Hydrology Division of DID Malaysia expressed the willingness to conduct a training course of Xin'anjiang model application in Malaysia for TC Members in cooperation with BOH of China. The hydro-meteorological data of Muar river basin in Malaysia for Model's application is ready as a part of UFRM programme.
- In 2013, the model will be used in one selected Muar river basin in Malaysia. BOH of China and DID of Malaysia will jointly draw up the detail implementation plan for 2013.

#### **22) Proposal 3: Guidelines for extreme flood risk management in TC region**

This project was proposed by MLTM of Korea and will be lasted from 2013 to 2015.

The objective of the project is to develop collaborative guidelines among the TC members on the extreme floods to be aware of that the occurrence frequency of the extreme flooding event has been increased in the TC region and the coordinated response among the members is needed.

- General plan from 2013 to 2015;
  - Definition about the "extreme floods" in TC regions and causes and results of the extreme floods

- Regular based workshop to discuss and develop the consensus about the guidelines on extreme floods will be hosted
- Discussion about the collaborative response plans to the extreme floods
- To host the workshop in 2013;
  - The workshop about the guidelines can be consecutively carried with the WGH meeting to enrich the contents
- The detail implementation plan for 2013;
  - Drafting contents of the guidelines on extreme flood risk management
  - Defining the terminology “extreme floods” and meanings on TC members
  - Hosting workshop
  - Selecting the practical cities among the TC members

**23) Proposal 4: Study on Prediction of Debris flow and Shallow landslide by the Satellite Rainfall Data**

This project was proposed by ICHARM of Japan and will be lasted from 2013 to 2017.

There are many casualties caused sediment-related disaster on mountainous area every year. Installing and running the ground-based rain gauged system by rain gauge network and radar system is necessary for effective prediction on this disaster, although it is not affordable measure. Three are existing useful resources for the project already including methodology, data set and tool.

The objective of the project is to develop a system for prediction of sediment-related disaster’s risk near real time without or few ground-based rainfall gauges.

The detail implementation plan for 2013:

- 2<sup>nd</sup> quarter; kick-off meeting for discussion plan
- 3<sup>rd</sup> quarter; accept proposal as pilot basin
- 4<sup>th</sup> quarter; Study on pilot basin

24) The Participants agreed to set the Project of Synergized Standard Operating Procedures for Coastal Multi-hazard Early Warning System (SSOP), which was funded by ESCAP Trust Fund for Tsunami, Disaster and Climate Preparedness in Indian Ocean and Southeast Asian Countries as cross-cutting project of TC. The Members of WGH reaffirmed its commitment to contribute this project.

WGH agrees the Working Document submitted by TCS. WGH will give its strong support and close cooperation for the implementation of SSOP effectively and efficiently with the limited time period and the fixed budget.

25) WGH noted that, one of the innovations the WGH must pursue is the use or application of satellite based information (SBT). The previous project led by UNESCAP only introduced to the members how to access the SBT from the Sentinel Asia website. WGH should take advantage that in 2013, JAXA will be launching its satellite and the products of which will be very helpful in mitigating the impacts of water-related hazards. It so happen that ICHARM is doing this initiative and several river basins in the region have been tested using IFAS (Indonesia, Philippines, Thailand, Mekong river in Cambodia, Japan).

26) WGH also took a note that, there should be a balance on the project proposals (AOPs) of the WGH. It was emphasized that, one AOP should be dealing with addressing medium to long-term

hydrological forecasts. One of WMO's CHy and Climate and Water Programme thrust is along this line.

27) The WGH AOPs in 2013 and beyond are listed in table 2. The Summary of information of WGH AOP2013 is shown in Appendix 2.

Table 2 the summary of WGH AOPs in 2013 and beyond

	<b>Projects</b>	<b>Diver</b>	<b>Duration</b>
AOP1	Assessment System of Flood Control Measures on Socio-economic Impacts	Korea	2008-2014
AOP2	Extreme flood forecasting system	Korea	2012~2016
AOP3	Estimation for Socio-economic Impact of Sediment-related Disaster	Japan	2013~2015
AOP4	Development and Application of Operational System for Urban Flood Forecasting and Inundation Mapping (OSUFFIM) for Selected PilotCity	Macao, China /TCS	2013~2016
AOP5	Extension of Xin'anjiang Model Application in Selected River Basins in TC Members	China	2013~2016
AOP6	Guidelines for extreme flood risk management in TC region	Korea	2013-2015
AOP7	Study on Prediction of Debris flow and Shallow landslide by the Satellite Rainfall Data	Japan	2013-2017
AOP8	Project of Synergized Standard Operating Procedures for Coastal Multi-hazard Early Warning System (SSOP)	TCS	2013-2014

### **BUDGET PROPOSED FOR WGH ACTIVITIES IN 2013**

28) WGH proposed \$28,000USD TCTF totally to support WGH activities in 2013 shown in Table 3:

Table 3The summary of budget of TCTF to support WGH activities in 2013

1	Support to attend Integrated Workshop (8 <sup>th</sup> IWS) and other activities	10,000USD
2	Support to publish the Guidelines of UFRM by China	3,000USD
3	Support to publish the user manual of the project on Assessment System of Flood Control Measures on Socio-economic Impacts by Korea	2,000USD
4	Support to the investigation in selected Members for the project on Extreme Flood Forecasting System by Korea	3,000USD
5	Support to develop Operational System for Urban Flood Forecasting and Inundation Mapping (OSUFFIM) for TC Members by SMG and TCS	6,000USD
6	Support for Flood Forecasting Model Application in Selected River Basins for Promoting the Capacity of Flood Forecasting of Members	2,000USD

	by China	
7	Support to host the workshop for the project on Guidelines for extreme flood risk management in TC region by Korea	2,000USD
	Total	28,000USD

29) WGH was informed that, Dr. Yang-su KIM, the vice chairperson of WGH has moved to Yeongsan River Flood Control Office of MLTM as Director General and will not take the position of vice Chairperson after the 45<sup>th</sup> Session. The meeting delivered the gratitude to him for his remarkable work during his term. The participants concurred that, his successor Dr. Sang Heon LEE will take the position of Vice Chairperson of WGH from 45<sup>th</sup> Session.

30) WGH was informed that, Dr. Zhiyu LIU, vice Chairperson of WGH, was selected as vice president of WMO Commission for Hydrology. It is should be very helpful for enhance the linkage between TC WGH and other WMO regional bodies. Considering his new service for WMO, Dr. Liu resigned his position of vice chairperson of WGH. The Committee expressed its gratitude for his wisdom and contribution to WGH and his willing to continue his cooperation. It also was informed that Ms. Li Yan, the deputy-director of division of BOH will be his successor to serve with TC-WGH from 45<sup>th</sup> Session.

#### **CONCLUSIONS OF WGH:**

31) On the basis of the information of hydrological component provided by Members and findings of the TC 7th IWS held in Nanjing, China in November 2012, the following conclusions were reached:

- a. The working meeting of WGH is very important to push hydrological activities. The meeting should be continued.
- b. WGH will conduct activities focusing on improving the ability to forecast hydrological phenomena and provide measures for the effectiveness of the improvements.
- c. It is very important and meaningful for the Committee to successful implement the Project of Synergized Standard Operating Procedures for Coastal Multi-hazard Early Warning System (SSOP), which was funded by ESCAP Trust Fund for Tsunami, Disaster and Climate Preparedness in Indian Ocean and Southeast Asian Countries.
- d. As the subsequent activity of TC Cross-cutting project of UFRM, development and application of OSUFFIM would play very meaningful and important role for TC Members to promote the capacity on the technique of urban flood forecasting and warning. It is necessary to seek in-kind contribution for covering the shortage of funding.
- e. Technique and skill of application of QPE/QPF products in hydrology for extending the leading time and promoting the accuracy of flood forecasting and early warning is essentially requested by Members. The research and cooperation on this aspect should be enhanced among TC Members.

- f. Enhancement of the close collaboration with the AWG of WMO CHy, WMO RA II Working Group on Hydrological Forecasts and Assessments and RA V Working Group on Hydrological Services in several themes of common interest provides significant benefits to the Committee.

## RECOMMENDATIONS OF WGH

32) On the basis of the outcomes 1st WGH working meeting and the discussion of the Parallel Session, the participants concurred to make the following recommendations to the TC Session held in Hong Kong, China from 29 January to 1 February 2013:

- To re-appoint Mr. Minoru KAMOTO, ICHARM of Japan as WGH Chairperson; to appoint Dr. Sang Heon LEE, Republic of Korea as Vice Chairperson of WGH.
- To allocate US\$28,000 from TCTF in total for supporting overall WGH activities for 2013 calendar year.
- To allocate TCTF for supporting WGH participants taking part in the TRCG Forum;
- To approve the new AOP proposals:
  - Development of Operational System for Urban Flood Forecasting and Inundation Mapping (OSUFFIM) for TC Members, led by Macao, China and TCS
  - Extension of Xin'anjiang Model Application in Selected River Basins in TC Members, led by China
  - Guidelines for extreme flood risk management in TC region, led by Korea
  - Study on Prediction of Debris flow and Shallow landslide by the Satellite Rainfall Data, led by Japan
- To request Members continue providing the training and expertise on QPE/QPF application in hydrology, hydrological/hydraulic modelling, inundation mapping and flood disaster assessment for TC Members as in-kind contribution.
- To request Members of Pilot Cities exploring mobilization the self-funding support for the pilot studies of development and application of OSUFFIM and application of Xin'anjiang model in selected river basins;
- To request WGH conduct case study on real-time QPE/QPF application linked in with development and application of OSUFFIM, in cooperation with WGM;
- To request TRCG continue coordinating with WGH when planning related matters training and research.
- To request MLTM of Republic of Korea to host WGH second working meeting in appropriate time with funding support.
- To re-appoint the hydrologist of TCS Mr. Jinping LIU and the focal point of WGH, Ms. Hwi-Rin KIM, Republic of Korea as the liaison to WMO RA II and RA V WGHs for the Committee.
- To request WMO take actions to facilitate involvement of WGH in the activity of WMO water and hydrology issues.

- To request WGH take the action on the closest linkages between the two working groups of WMO RAI and the Committee which were identified at the Committee 43rd Session as:
  - UFRM and flash flood/debris flow/landslide prediction/warning under the RA II theme of Disaster Mitigation – Implementation of the WMO Flood Forecasting Initiative including Flash Flood Forecasting Capabilities; and
  - Assessment of the variability of water resources in a changing climate under the RA II theme of Water Resources Assessment, Availability and Use (surface water and ground water).
- To request WGH focus on improving the ability to forecast hydrological phenomena and provide measures for the effectiveness of the improvements.

Appendix 1. WGH AOP 2012 Implementation Status

Appendix 2. WGH AOP 2013

**Appendix 1. WORKING GROUP on HYDROLOGY (WGH) - AOP 2012 Implementation Status**

SP's KRA and SG	Objective Number	Objective	Action	Other WGs Involved	TCS Responsibility	Expected Quarter Completed	Other Organizations Involved	Success Indicators	Funding Required	Funding Sources	Completed - Yes or No
KRA 1 SG 1 KRA 2 SG 2 KRA 4 SG 4a KRA 5 SG 5b	1	Projects on Urban Flood Risk Management in TC Region	a)Initiate developing OSUFFIM in case the STDF of Macao, China approved the proposal; b)case Study on QPE/PQF Application in UFRM in cooperation with WGM; c)Continue to conductcase Study on SSWS Application in UFRM; d)Continue to conductpilot study in Pilot cities; e)Drafting UFRM Guidelines	WGM WGDRR	coordinat ion	(a) First (b) Second (c) Third (d) Fourth	ESCAP WMO	(a-1) compile the first draft and send to all drafting members ASAP, but not later than Jan. 1, 2012; (a-2)UFRM guidelines drafting meeting was proposed to be held in WMO Nanjing RTC (a-3) UFRM Workshop, funded by ESCAP (b-1)Fund application from Macao STDF (b-2)initiate developing OSUFFIM (c-1)start the case study on QPE/QPF application in UFRM, in cooperation with WGM (c-2)start the case study on SSWS application in UFRM (c-3)continue the pilot study in pilot cities (c-4)training for pilot city Members (d-1)second version of UFRM guidelines at IWS (d-2)pilot study report from related	(a) TCTF 10000USD for TF/PC activities  (b)Funding from STDF of Macao, China	potenti al ESCAP, WMO, ADB, JICA, KOICA, Macao STDF; etc	(a-1) <b>YES</b>  (a-2) <b>YES</b>  (a-3) <b>YES</b>  (b-1) <b>YES</b>  (b-2) <b>YES</b>  (c-1) <b>YES</b>  (c-2) <b>YES</b>  (c-3) <b>YES</b>  (c-4) <b>YES</b>  (d-1) <b>YES</b>  (d-2) <b>YES</b>  (d-3) <b>YES</b>



SP's KRA and SG	Objective Number	Objective	Action	Other WGs Involved	TCS Responsibility	Expected Quarter Completed	Other Organizations Involved	Success Indicators	Funding Required	Funding Sources	Completed - Yes or No
								Members (d-3)finalizing the Guidelines at 45 <sup>th</sup> Session.			
KRA 1 SG 1 KRA 2 SG 2 KRA 4 SG 4a KRA 5 SG 6b	2	Assessment of System of Flood Control Measures on Socio-economic Impacts	Apply ASFCM system in TC members who want to participate in to evaluate and enhance system capability		See above	(a) First (b) Second (c) Third (d) Fourth		(a,b,c,d)Drafting ASFCM User's manual (a,b,c,d)Apply and assess the information provided from TC members to consult the effect of the measures		MLTM	(a,b,c,d) <b>ongoing</b>

SP's KRA and SG	Objective Number	Objective	Action	Other WGs Involved	TCS Responsibility	Expected Quarter Completed	Other Organizations Involved	Success Indicators	Funding Required	Funding Sources	Completed - Yes or No
KRA 1 SG 1 KRA 2 SG 2 KRA 4 SG 4a KRA 5 SG 5b	3	Project on Hazard Mapping for sediment-related disasters	To raise local people's and local government's awareness for sediment-related disasters. To separate people and their properties from high-risk areas to reduce their damages by disasters	WGDRR	See above	(a) First (b) Second (c) Third (d) Fourth		(a,b,c,d) guide Members countries to make Hazard map. (b) Find requirement from TC Members. (d) Workshop to solve the Member's issues at next IWS (d) Drafting the guideline to reduce damage of sediment-related disaster and to spread Japanese technique in Typhoon Committee Region.	TCTF (1)2000USD for publishing the guideline;	TCTF NILIM SABO	(a,b,c,d) <b>YES</b> (b) <b>Cancelled</b> (d) <b>Cancelled</b> (d) <b>YES</b>
KRA 1 SG 1 KRA 2 SG 2 KRA 4 SG 4a KRA 5 SG 5b	4	Project on development and application of flood disaster preparedness indices		WGDRR	See above	(a) First (b) Second (c) Third (d) Fourth		(a-1) establish evaluation equation (a-2) conduct direct FDPI survey and feedback analyzed results to Marikina city(Philippines), UbonRachathani(Thailand), and Hat Yai(Thailand) (b) create multi-language FDPI and FDPI automatic self-evaluation system on the website (c) collect and compile the information for feedback to TC	TCTF 2000USD for Printing final report	ICHARM	(a-1) <b>YES</b> (a-2) <b>YES</b> (b) <b>Soon</b> (c) <b>Soon</b> (d) <b>Soon</b>

SP's KRA and SG	Objective Number	Objective	Action	Other WGs Involved	TCS Responsibility	Expected Quarter Completed	Other Organizations Involved	Success Indicators	Funding Required	Funding Sources	Completed - Yes or No
								members (d)drafting and printing the final report			
RA1, SG1 KRA2, SG2 KRA4 SG 4a, KRA5, SG 5b	5	Project on the utilization of Satellite-based information for Typhoon-related disaster management		WGM, WGDRR, TRCG	See above	(a) First (b) Second (c) Third (d) Fourth	ESCAP, JAXA, ICHARM	(a) Operational Sentinel Asia and Urban Flood Training for TC, PTC & Pacific members from 27 <sup>th</sup> Feb – 2 <sup>nd</sup> March 2012 in Macao, China.  (b-d) to conduct case study and good practice of image product of various satellites	Funds for inviting participants, lecturers and other WS organization cost	ESCAP, JAXA, ICHARM	(a) <b>YES</b>  (b-d) <b>YES</b>
KRA1 KRA 4 SG 4a SG 4b KRA5 SG 5a KRA	6	Development of comprehensive counterplan for extra-ordinary flood	Develop comprehensive counterplan for extra-ordinary flood by investigation and analysis of historical flood damage	WGDRR WGM	See above	(a)First (b) Second (c)Third (d) Fourth	RID of Thailand, PAGASA of Philippines	(a) Understand TC members' causes and effect of extra-ordinary flood damage including dam operation.  (b-1)Survey and data collection of selected TC	TCTF 4,000USD for survey and data collection	MLTM (KICT, K-water) TCTF	(a) <b>YES</b>  (b-1) <b>YES</b>  (b-2) <b>YES</b>

SP's KRA and SG	Objective Number	Objective	Action	Other WGs Involved	TCS Responsibility	Expected Quarter Completed	Other Organizations Involved	Success Indicators	Funding Required	Funding Sources	Completed - Yes or No
7 SG 7b								members (Thailand and Philippines) about external forces caused historical flood (b-2)workshop (c)Investigate selected TC members' flood control capacity considering geological and social conditions (d)Analyze selected TC members' flood control guidance and management system			(c) <b>ongoing</b>  (d) <b>ongoing</b>
KRA 1 SG 1 KRA 2 SG 2 KRA 4 SG 4a KRA 5 SG 6b	7	Project on estimation for socio-economic impact of sediment-related disaster	to improve former projects with establish common collecting format and methods of investigation for disasters to estimate estimation for socio-economic impact of sediment-related disaster and to share common technical background in TC members.	WGDRR	See above	(a)First (b)Second (c)Third (d)Fourth		(a) Submit tentative format and methods of investigation from Japan for TC members. (b) Collecting the idea to improve tentative format and make trial version.		NILIM SABO	(a) <b>YES</b>  (b) <b>YES</b>

SG1: To enhance cooperation among TC Members to reduce the number of deaths by typhoon-related disasters by half in the ten years of 2006 – 2015 (using the ten years of 1990 - 1999 as the base line).

SG2: To reduce the socio-economic impacts of typhoon-related disasters per GDP per capita by 20 per cent in the ten years of 2006- 2015 (using the ten years of 1990 - 1999 as the base line).

- SG 3a: To identify and explore the beneficial use of resources such as rainfall brought by typhoon.
- SG 3b: To study and promote the increasing use of typhoon-related beneficial effects among the Members.
- SG 4a: To provide reliable typhoon-related disaster information for effective decision making in risk management in various sectors.
- SG 4b: To strengthen capacity of the Members in typhoon-related disaster risk management in various sectors.
- SG 4c: To enhance international and regional cooperation and assistance in the field of disaster risk reduction.
- SG 5a: To promote and enhance culture of community-based disaster risk management among the Members.
- SG 5b: To promote education, training and public awareness of typhoon-related disasters among the Members.
- SG 6a: To facilitate RSMC capability to respond to the needs of the Members in forecasting and capacity building.
- SG 6b: To improve capacity of Members to provide timely and accurate user-oriented and friendly tropical cyclone products and information.
- SG 6c: To enhance capacity of Members' typhoon-related observation, monitoring, forecasting and warning.
- SG 7a: To strengthen the capacity of Typhoon Committee to effectively discharge its responsibilities and functions described in this Strategic Plan and completed its stated mission in accordance with the Typhoon Committee's Statute.
- SG 7b: To mobilize available resources and engage collaborators for the implementation of the strategic goals.

- KRA 1: Reduced Loss of Life from Typhoon-related Disasters.
- KRA 2: Minimized Typhoon-related Social and Economic Impacts.
- KRA 3: Enhanced beneficial typhoon-related effects for the betterment of quality of life.
- KRA 4: Improved Typhoon-related Disaster Risk Management in Various Sectors.
- KRA 5: Strengthened Resilience of Communities to Typhoon-related Disaster.
- KRA 6: Improved capacity to generate and provide accurate, timely and understandable information on typhoon-related threats.
- KRA 7: Enhanced Typhoon Committee's Effectiveness, Efficiency and International Collaboration.

**Appendix 2.WORKING GROUP on HYDROLOGY (WGH) - AOP 2013**

SP's KRA and SG	Objective Number	Objective	Action	Other WGs Involved	TCS Responsibility	Expected Quarter Completed	Other Organizations Involved	Success Indicators	Funding Required	Funding Sources
KRA 1 SG 1 KRA 2 SG 2 KRA 4 SG 4a KRA 5 SG 6b KRA 6 SG 6b	1	Assessment System of Flood Control Measures on Socio-economic Impacts	To develop the manual of ASFCM system and distribute to the TC members who want to apply the system		coordination	(a) First (b) Second (c) Third (d) Fourth		(a,b,c) To develop the system manual to help members' application of ASFCM in their own basins. (b,c,d) To consult the effect of the proposed flood control measures in selected basins	TCTF \$2,000 for developing the manual	MLTM TCTF
KRA1 KRA 4 SG 4a SG 4b KRA5 SG 5a KRA 6 SG 6b	2	Extreme flood forecasting system	To develop the TC homepage for WGH members and investigate flood forecasting systems in the selected members		See above	(e) First (f) Second (g) Third (h) Fourth	RID of Thailand, PAGASA of Philippines Laos	(a,b) Development of the Korean and English version of TC homepage for WGH members (a,b) Development of the member's reports and data sharing page (b,c) Investigation of the current flood forecasting systems and operation conditions in the selected	TCTF \$3,000 for the investigation	MLTM TCTF

SP's KRA and SG	Objective Number	Objective	Action	Other WGs Involved	TCS Responsibility	Expected Quarter Completed	Other Organizations Involved	Success Indicators	Funding Required	Funding Sources
								basins (b,c,d) Comparison of the flood forecasting systems of the selected members		
KRA 1 SG 1 KRA 2 SG 2 KRA 4 SG 4a KRA 6 SG 6b	3	Project on estimation for socio-economic impact of sediment-related disaster	to improve former projects with establish common collecting format and methods of investigation for disasters to estimate estimation for socio-economic impact of sediment-related disaster and to share common technical background in TC members.	WGDRR	See above	(a)First (b)Second (c)Third (d)Fourth		(a) Providing a draft format to collect the record of sediment-related disaster (b) Deciding the format to collect the record of sediment-related disaster (c) To report the results of survey based on the format by each TC members (d1) To make a "Sediment-related Disaster Record Database" to share the records in TC members (d2) To report and share the		NILIM SABO

SP's KRA and SG	Objective Number	Objective	Action	Other WGs Involved	TCS Responsibility	Expected Quarter Completed	Other Organizations Involved	Success Indicators	Funding Required	Funding Sources
								results of estimation of socio-economic impact		
KRA 1 SG 1 KRA 2 SG 2 KRA 4 SG 4a KRA 6 SG 6b	4	Development of Operational System for Urban Flood Forecasting and Inundation Mapping (OSUFFIM)	to develop a prototype real time OSUFFIM for TC Members to promote the capacity of early warning of urban flood and emergency response, particularly urban flood forecasting and inundation mapping.		diver	(a) First (b) Second (c) Third (d) Fourth	SMG, Macao; Sun Yat-Sen University of China; TMD/RID of Thailand	(a1) kick-off meeting for discussion plan (a2) Survey of Pilot City—Hat Yai; (b1) Data collection, analysis and procession of the chosen pilot cities (Hat Yai) (b-c) developing system (d) report the progress at IWS	TCTF \$6000 for supporting activities related to OSUFFIM development	STDF of Macao; SYS Univ. ; TMD/RID of Thailand; TCTF
KRA 1 SG 1 KRA 2 SG 2 KRA 4 SG 4a KRA 6 SG 6b	5	Extend application of Xin'anjiang Model in Selected River Basins in TC Members	To promote the Capacity of Flood Forecasting for TC Members; Use the Model in Pilot River basin in Malaysia in 2013		Coordination	(a) First (b) Second (c) Third (d) Fourth	BOH and Hohai University of China; DID of Malaysia	(a1) perfecting the English version of Model (China) (a2) select river basin and prepare necessary data by DID (b) Send profs/experts to Malaysia for	TCTF \$2000 to support experts for training course in Malaysia	BOH of China; DID of Malaysia



SP's KRA and SG	Objective Number	Objective	Action	Other WGs Involved	TCS Responsibility	Expected Quarter Completed	Other Organizations Involved	Success Indicators	Funding Required	Funding Sources
								training (c) Use the model on trial in flood season (d) report to TC IWS and Session		
KRA 1 SG 1 KRA 2 SG 2 KRA 4 SG 4a KRA 6 SG 6b	6	Guidelines for extreme flood risk management in TC region	To define the concept of extreme flood and host a workshop to develop the consensus about the guideline among the members		See above	(a) First (b) Second (c) Third (d) Fourth		(a) Development of the definition of extreme flood in TC region (b,c) Host a WGH meeting(works hop) for TC members to discuss about TC AOP including extreme flood risk management (b,c,d) Development of consensus about the contents in the guideline among the members	TCTF \$2,000 for hosting the WGH meeting( workshop)	MLTM TCTF

SP's KRA and SG	Objective Number	Objective	Action	Other WGs Involved	TCS Responsibility	Expected Quarter Completed	Other Organizations Involved	Success Indicators	Funding Required	Funding Sources
KRA 1 SG 1 KRA 2 SG 2 KRA 4 SG 4a KRA 5 SG 5a KRA 6 SG 6b	7	Study on Prediction of Debris flow and Shallow landslide by the Satellite Rainfall Data	To study on prediction of debris flow and shallow landslide by the satellite rainfall data	WGDRR	See above	(a) First (b) Second (c) Third (d) Fourth	accept application	(b) kick-off meeting for discussion plan (c) accept proposal as pilot basin (d) Study on pilot basin		ICHARM
KRA 1 SG 1 KRA 2 SG 2 KRA 4 SG 4a, SG 5a KRA 5 SG 5a SG 5b KRA 6 SG 6b	8	Project of Synergized Standard Operating Procedures for Coastal Multi-hazard Early Warning System (SSOP)	To develop a Manual/Handbook of Synergized Standard Operating Procedures for Coastal Multi-hazard Early Warning Systems	WGM WGDRR TRCG	Coordination Focal Point	(a) First (b) Second (c) Third (d) Fourth	PTC, ESCAP, WMO, ADRC, IOC of UNESCO	(a) Workshop of SSOP (b) Piloting in selected countries (c-d) Drafting the Manual/Handbook of SSOP		ESCAP funding

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SG 4b: To strengthen capacity of the Members in typhoon-related disaster risk management in various sectors.

SG 4c: To enhance international and regional cooperation and assistance in the field of disaster risk reduction.

SG 5a: To promote and enhance culture of community-based disaster risk management among the Members.

SG 5b: To promote education, training and public awareness of typhoon-related disasters among the Members.

SG 6a: To facilitate RSMC capability to respond to the needs of the Members in forecasting and capacity building.

SG 6b: To improve capacity of Members to provide timely and accurate user-oriented and friendly tropical cyclone products and information.

SG 6c: To enhance capacity of Members' typhoon-related observation, monitoring, forecasting and warning.

SG 7a: To strengthen the capacity of Typhoon Committee to effectively discharge its responsibilities and functions described in this Strategic Plan and

completed its stated mission in accordance with the Typhoon Committee's Statute.

SG 7b: To mobilize available resources and engage collaborators for the implementation of the strategic goals.

KRA 1: Reduced Loss of Life from Typhoon-related Disasters.

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KRA 6: Improved capacity to generate and provide accurate, timely and understandable information on typhoon-related threats.

KRA 7: Enhanced Typhoon Committee's Effectiveness, Efficiency and International Collaboration.