ESCAP/WMO
Typhoon Committee

FOR PARTICIPANTS ONLY

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Bangkok, Thailand

ENGLISH ONLY

TRAINING & RESEARCH COORDINATION GROUP (TRCG)

(submitted by TRCG Chair)

Summary and Purpose of Document**:**

This document reviews past activities, progress and future plans of TRCG.

Action Proposed

The Committee is invited to:

(a) note the major activities and development progress of TRCG as summarized in the APPENDIX;

(b) endorse the training and research priority areas as outlined in Section 5 of the APPENDIX; and

(c) endorse the future plans of TRCG as outlined in Section 6 and Annexes VI and VIII of the APPENDIX.

APPENDIX: TRCG Annual Report 2013

APPENDIX

TRAINING & RESEARCH COORDINATION GROUP (TRCG)
ANNUAL REPORT 2013

Edwin S.T. Lai (TRCG Chair)
Hong Kong, China

1. Introduction

1.1 According to the Terms of Reference, TRCG is to promote research and training activities on various aspects of tropical cyclone analysis and forecasting, including assessment of tropical cyclones' impacts on Members' socio-economic development processes, and to encourage cooperation of efforts among Members. Towards this end, TRCG is expected to assist in:

(a) identifying scientific and technical problems in the analysis and forecasting of tropical cyclones and their impacts on water resources and measures for disaster prevention and preparedness;
(b) facilitating the exchange of experience and knowledge on the latest development and techniques related to the above problems;
(c) coordinating training and research programmes, including activities in support of cross-cutting initiatives and other collaboration programmes among Members such as twinning and mentoring arrangement, aimed at improving the technical capacity and capability of Members to better serve the people in the region;
(d) evaluating the effectiveness of training and research activities undertaken by TRCG, and providing support to other working groups in performing such evaluation; and
(e) recommending to the Committee priority areas and long-term plans for cooperation in research and training in support of the various KRAs of the Committee's Strategic Plan.

2. Membership

2.1 The composition and members list of TRCG (as at December 2013) are:

Chair:	Mr. Edwin S.T. LAI (Hong Kong, China)
Vice Chair:	Mr. Roger EDSON (USA)
Members:	Mr. So Im MONICHOTH (Cambodia) Mr. QIAN Chuanhai (China) Mr. PANG Sun Nyo (DPR Korea) Dr. Naoko KITABATAKE (Japan) Mr. Bounteum SYSOUPHANTHAVONG (Lao PDR)

Mr. IAN Vai Kei, Brian (Macao, China)
Dr. Wan Azli WAN HASSAN (Malaysia)
Dr. Carina G. LAO (Philippines)
Dr. Jiyoung KIM (Republic of Korea)
Mr. Chien Wan THAM (Singapore)
Ms. Patchara PETVIROJCHAI (Thailand)
Mr. NGUYEN Dai Khanh (Viet Nam)

3. Major TRCG Activities in 2013

Roving Seminar / Visiting Lecturers Programme

3.1 As this is the year of the TRCG Forum in the 4-year plan, there is no scheduled roving seminar in the AOP.

2nd TRCG Forum

3.2 The 2nd TRCG Forum, organized in conjunction with the 8th Integrated Workshop, was successfully held on 2 – 4 December 2013 in Macao, China, generously hosted by the Macao Meteorological and Geophysical Bureau at the Macao Science Center and sponsored by the Macao Foundation and the Ministry of Land, Infrastructure and Transport of the Republic of Korea.

3.3 The theme of the Forum was "Forecasting, Warning and DRR Strategies in the Mitigation of Tropical Cyclone Impact in a Multi-hazard Environment", with 19 invited keynote speakers, including experts from Australia, Canada, China, Hong Kong, Japan, Republic of Korea and US, presenting on a range of selected topics covering the three components of the Typhoon Committee. The Forum was well attended with more than 80 participants coming from 13 out of the 14 Members of the Committee. A summary report is given in Annex II.

Forecasters' Training Attachment

3.4 Two forecasters, Mr. Monichoth So Im (from Cambodia) and Mrs. Roongrawee Onkot (from Thailand), visited JMA headquarters from 17 to 26 July 2013 to participate in the 13th Typhoon Committee Attachment Training. The contents of the training included:

1. The satellite analysis and viewer program (SATAID)
2. Tropical cyclone analysis (Dvorak technique)
3. Tropical cyclone forecasting
4. Storm surges
5. Quantitative precipitation estimation (QPE) and quantitative precipitation forecasting (QPF)
6. The Severe Weather Forecasting Demonstration Project (SWFDP)
7. The next generation meteorological satellites (Himawari-8/9)

Research Fellowship Scheme

3.5 The Research Fellowships are awarded to Members to promote joint research through the exchange of visiting scientists on a short-term basis with voluntary funding and logistic support by host Members. One of the merits of the scheme is that the visiting fellow has a chance to work closely with experienced scientists at the host centre, providing an opportunity to transfer knowledge and latest research findings to operational applications. The scheme has worked well on the basis of bilateral cooperation mutually agreed between the host and the applicant.

3.6 In 2013, fellowships were offered by Hong Kong, China and Republic of Korea. Details of the latest projects under the scheme, as well as a summary of previous fellowships awarded, can be found in Annex III. Reports or papers since published in connection with the scheme are listed in Annex IV.

3.7 Since 2011, the National Typhoon Center of the Korea Meteorological Administration (KMA) had carried out a regular fellowship programme for a number of researchers from TC Members on the use and application of the Typhoon Analysis and Prediction System (TAPS). Upon the request of Viet Nam for follow-up assistance in the effective operational implementation of TAPS, KMA helped to install data servers and computing systems, as well as set up webpage with linkage to TAPS, in Viet Nam in 2013. KMA experts on TAPS data supporting system also visited the country in November to provide technical support and advice.

UFRM

3.8 In support of the UFRM initiatives, a training component was included in the research fellowship programme offered by Hong Kong, China in 2013. Besides Dr. Sukrit Kirtsaeng from the Thai Meteorological Department who was supported by Typhoon Committee Trust Fund (TCTF) to undertake a research project on location-specific severe weather nowcasting techniques, HKO funded another fellow Mr. Mai Khanh Hung from the National Hydro-Meteorological Service of Viet Nam to join the two-week training on QPE/QPF, severe weather nowcasting algorithms, installation and operation of the SWIRLS nowcasting system. Technical support was provided to Mr. Mai to continue his research and development work on the nowcasting of severe weather using SWIRLS.

4. Resource Support for Research and Training

4.1 Resource persons or contact points on specialized research subjects provided by some Members are tabulated for reference in Annex V.

4.2 The Pacific International Training Desk (PITD), funded by the USA National Weather Service as part of the US contribution to the WMO Voluntary Cooperation Program (VCP), was re-started and expanded in scope. The PITD postponed operations for much of the past two years to allow for a broad ranging evaluation and decisions on how to improve the programme. The PITD, managed by the Telecommunications and Social Informatics (TASI) research programme at the University of Hawaii, has four components: 1) basic forecaster training, to be implemented through the use of e-learning modules that will be readily available to anyone; 2) a month-long, instructor-led on-site training programme carried out at the US Weather Forecast Office in Honolulu; 3) training on the use of

communication equipment; and 4) in-Island workshops on severe weather event topics. Subject to space availability, Typhoon Committee Members may also apply. A more formal and detailed description of the Desk will be distributed to WMO and the ESCAP/Typhoon Committee Members later in 2014.

5. Prioritization of Training and Research Areas

5.1 In view of the devastating impact of tropical cyclones that affected Members in recent years, including Super Typhoon Haiyan in the Philippines in November 2013, attention should also be given to capacity-building in the following aspects:

(1) assessment of rain-induced geological hazards such as landslides and mudflow;
(2) forecasting and warning systems for better coastal protection from hazards such as storm surge, river delta inundation and urban flooding; and
(3) effective communication of warning messages to stakeholders, DRR users and communities at risk.

5.2 As such, as discussed in the 2nd TRCG meeting on 5 December 2013 in Macao, China, the list of priority research topics is revised as follows:

(A) Meteorology

(a) rainfall forecasting: development of nowcasting and very short range forecasting techniques, and understanding of interaction between tropical cyclones and monsoon;
(b) application of Dvorak and microwave satellite image analysis techniques;
(c) application of radar-based analysis/products for landfalling tropical cyclones and monsoon depressions;
(d) application of ensembles of guidance from dynamical models, conceptual models, statistical models and systematic knowledge-based approach;
(e) use of high resolution numerical models with advanced data assimilation techniques;
(f) better understanding of TC-related issues across different spatial and time scales, from mesoscale and synoptic analysis for track prediction, to climatological impact arising from El Nino/La Nina and global warming/climate change;
(g) better understanding of wave, storm surge and marine forecasting;

(B) Meteorology and Hydrology

(h) application of meteorological and hydrological information for forecasting of river flooding and urban flash flood, including implementation of UFRM guidelines;
(i) mudslides and landslides associated with heavy rain;

(C) Meteorology and DRR

(j) development of technical procedures to quantify forecast uncertainties and to convert probabilistic information into effective warnings; and
(k) development of decision-making tools for DRR purpose, including the integration of forecast information with GIS and the use of automated information processing systems.

(l) making use of new communication technology; and
(m) community response and outreach effort for mitigation of the societal impact caused by disasters.

6. Future Directions and Strategies

6.1 After completing the first 4-year cycle of TRCG work plan, a new 4-year plan for 2014 – 2017 (Annex VI) was formulated at the 2nd TRCG meeting in Macao, China on 5 December. TRCG AOP 2013 (Annex VII) was reviewed and AOP 2014 (Annex VIII) was drawn up accordingly. The attendance list for the meeting can be found in Annex IX.

6.2 There will be changes to the way the roving seminars are organized for the 12 regular attending Members. They will be divided into three sub-regions: (1) China; DPR Korea; Hong Kong, China; Macao, China and Republic of Korea; (2) Cambodia; Philippines and Viet Nam; and (3) Lao PDR; Malaysia; Singapore and Thailand; and roving seminars will be organized by rotation in the three sub-regions. In choosing the themes for the seminars, this will allow focus and attention be given to issues most relevant to Members within that sub-region. Priority of TCTF support will also be given to local forecasters from the host Member and Members within the sub-region. This will help to minimize long travels and will provide more opportunities for local forecaster to attend.

6.3 For forecasters' attachment to RSMC Tokyo, the number of forecasters attending every year will be increased from two to three, and the target trainees will come from the six developing Members, namely Cambodia, Lao PDR, Malaysia, Philippines, Thailand and Viet Nam. This means that forecasters from these Members would be able to visit RSMC Tokyo for basic orientation training once every two years.

6.4 The meeting also proposed to explore the following training and research opportunities:

(a) in collaboration with Chairs of WGM, WGH and WGDRR, to identify opportunities for experienced scientists to visit developing Members for a period of time and to work with their researchers on specific project initiatives under the three components;
(b) to attend training courses at the TC Training Centre in Nanjing; and
(c) to facilitate Members to attend PITD at Honolulu.

6.5 TRCG will continue to support plans to have more cross-cutting training and research initiatives in consultation with the meteorology, hydrology and DRR components. Members are in turn encouraged to promote such initiatives through proactive involvement of the appropriate meteorological, hydrological and DRR personnel in their countries.

Annex I

Summary of Roving Seminars

Year	Dates	Venue	Topic	Lecturers
2003	20 – 21 Oct	Seoul	Interpretation of Typhoon Forecasts and Analyses	Dr. H-J Kwon Mr. Nobutaka Mannoji
	22 – 24 Oct	Hong Kong	Interpretation of Satellite Data and Use of Radar Data in Operational Tropical Cyclone Forecasting	Dr. Mark Lander Dr. P.W. Li Dr. B.-J. Sohn
	27 – 29 Oct	Shanghai	Interpretation of Satellite Data and Use of Radar Data in Operational Tropical Cyclone Forecasting	Dr. Mark Lander Dr. P.W. Li
2004	22 – 24 Nov	Beijing	Operational Application of Multi-model Ensemble Typhoon Forecasts	Prof. Johnny C.L. Chan Mr. Nobutaka Mannoji
	25 – 27 Nov	Kuala Lumpur	Operational Application of Multi-Model Ensemble Typhoon Forecasts	Prof. Johnny C.L. Chan Mr. Nobutaka Mannoji
2006	4 – 7 Sep	Ha Noi	Tropical Cyclone Motion and Intensity, and Principles of Dvorak Method	Prof. Johnny C.L. Chan Mr. Joe Courtney Dr. B.-J. Kim
2007	5 – 8 Sep	Manila	Satellite and Radar Analysis Techniques, and Tropical Cyclone Interaction w ith Monsoon Systems	Mr. Roger Edson Mr. Bart Hagemeyer Dr. Tetsuo Nakazawa
2009	16 – 19 Nov	Nanjing	Forecasting of High-impact Weather associated with Tropical Cyclones, and Formulation and Communication of Warning Messages	Mr. S.T. Chan Mr. Chip Guard Mr. Sam Muchemi
2010	30 Nov – 3 Dec	Ubon Ratchathani	Tropical Cyclone Genesis and Large Scale Interaction	Mr. S.M. Lee Prof. Zhang Qinghong Dr. Mark Lander
2011	20 – 23 Sep	Petaling Jaya	Heavy Rain and Flood Hazards associated with Landfalling Tropical Cyclones	Dr. Siriluk Chumchean Mr. H.Y. Yeung Prof. Chen Charng-Ning
2012	30 Oct – 1 Nov	Seoul	Tropical Cyclone Damage Assessment and Impact Forecast	DRR experts from NDMI Ms. Xu Jing Mr. W.K. Wong

Summary Report on 2nd TRCG Technical Forum
2 – 4 December 2013, Macao, China
Edwin S.T. Lai, TRCG Chair

1. The 2nd TRCG Forum, organized in conjunction with the 8th Integrated Workshop, was successfully held on 2 – 4 December 2013 in Macao, China, generously hosted by the Macao Meteorological and Geophysical Bureau at the Macao Science Center and sponsored by the Macao Foundation and the Ministry of Land, Infrastructure and Transport of the Republic of Korea.

2. The theme of the Forum was "Forecasting, Warning and DRR Strategies in the Mitigation of Tropical Cyclone Impact in a Multi-hazard Environment", with 19 invited keynote speakers, including experts from Australia, Canada, China, Hong Kong, Japan, Republic of Korea and US, presenting on a range of selected topics covering the three components of the Typhoon Committee. The Forum was well attended with more than 80 participants coming from 13 out of the 14 Members of the Committee. The forum programme is shown in Appendix A.

3. The Forum was structured in such a way that the invited experts from abroad also had the chance to appreciate the challenges Members faced within the region in terms of tropical cyclone operational forecasting and related issues. After the keynote presentations by the experts on Day 1, Members presented their annual reports under the three components of meteorology, hydrology and DRR in three separate parallel sessions on Day 2. Through such interaction and after consultation with the experts and the three working group chairs, six panel discussion topics were formulated for break-out group discussion on Day 3. A summary of the key points arising from the discussion can be found in Appendix B.

4. A survey for feedback was conducted at the end of the Forum, but the returns were unfortunately not very effectively collected: eight received from the expert speakers (nearly half), but only nine from the participants. From the available responses, the Forum was considered to be generally well run in the organizational aspects, in particular the venue facilities and the host's friendliness and helpfulness. Coverage of material in terms of objectives, scope, emphasis, length and technical level was considered adequate, although there were suggestions that reducing the number of keynote presentations would provide more time for Q&A and discussion. Responders were generally satisfied with the delivery of the technical content, although a few found the outcome not as effective as expected or had problems with the language. Nonetheless, most responders considered that benefits of the knowledge gained could be felt in their countries within a few years' time. The followings are some specific comments for reference in organizing similar events in the future:

- the possibility to engage senior managers and decision-makers in discussion;
- the possibility to involve stakeholders from private sectors;
- work on inundation modelling and information on high risk areas;
- building up capacity and datasets for climate change related studies;
- pre-Forum information gathering on expectations and interests;
- implementation of effective disaster monitoring and forecasting systems;
- work and study on storm surge;
- more effective linkage among operational, research and DRR works; and
- improvement on warning dissemination and emergency response.

2nd TRCG Forum Programme

Day 1/ December 2 (Mon)

08:30 – 09 :00	**Registration**
09:00 – 09 :30	**Opening Ceremony :** **Introductory Remark – Olavo Rasquinho, Secretary of** **TC Opening Address – Edwin Lai, Chair of TRCG, HKO** **Opening Address – Sangheon Lee, representative of HRFCO - Ministry of** **Land, Infrastructure and Transport** **Opening Address – Alf Ivar Blikberg, Representative of** **ESCAP Opening Address – Koji Kuroiwa, Representative of** **WMO Welcome Address - Fong Soi Kun, Director of SMG**
09:30 – 09:40	**Group Photo**
09 :40 – 10:10	**Tea Break**
10:10 - 12 :30	**Keynote Session 1 (Plenary) :**
10:10 - 10:30	**1. Bridging the Gap between Tropical Cyclone Research and Operation - Johnny Chan (School of Energy and Environment, City University of Hong Kong)**
10:30 – 10:50	**2. Ensemble Tropical Cyclone Activity Prediction using TIGGE Data - Munehiko Yamaguchi (ECMWF / JMA, Japan)**
10:50 – 11:10	**3. Recent Developments of JMA Operational NWP Systems and WGNE Intercomparison of Tropical Cyclone Track Forecast – Chiashi Muroi (JMA, Japan)**
11:10 – 11:30	**4. Extratropical Transition: Modern Forecasting and Communication Technique -** **Chris Fogarty (Canadian Hurricane Centre, Canada)**
11:30 – 11:50	**5. Extratropical Transition of Tropical Cyclones in the Western North Pacific Basin -** **Naoko Kitabatake (JMA, Japan)**
11:50 - 12:10	**6. Satellite-based Analyses in Tropical Cyclone Forecasting - Roger Edson (NWS, Guam, USA)**
12:10 – 12:30	**Q & A**

Day 1/ December 2 (Mon)

12:30 – 14:00	**Lunch**
14:00 – 18:00	**Keynote Session 2 (Plenary)**
14:00 – 14:20	**7. New Development on PMP Estimation in China** **- Bingzhang Lin (NUIST, China)**
14:20 – 14:40	**8. Flood Forecasting and Warning Systems -** **Yoshiharu Matsumoto (CTI Engineering, Japan)**
14:40 – 15:00	**9. The Practical Use of Flood Information for Flood Damage Mitigation** **Ji-Youn Sung (HRFCO, Republic of Korea)**
15:00 – 15:20	**10. Storm Surge Disasters by Typhoons and Information for Disaster Risk Reduction -** **Nadao Kohno (JMA, Japan)**
15:20 – 15:30	
15:30 – 16:00	**Tea Break**
16:00 – 16:20	**11. Practical Simulation of Tropical Cyclone Impacts for Forecasting, Emergency Planning and Disaster Risk Reduction-** **Bruce Harper (GHD Pty Ltd, Australia)**
16:20 – 16:40	**12. Socio-economic Impact of Tropical Cyclones making Landfall on the Korean Peninsula -** **Baek-Jo Kim (KMA, Republic of Korea)**
16:40 – 17:00	**13. Human Centric Disaster Management by a Multi-layer and Crowd Sourced GIS Mapping –** **Shim Jae Hyun (NDMI, Korea)**
17:00 – 17:20	**14. Tropical Cyclone Losses and Climate Change -** **John McAneney (Risk, Frontiers, Macquarie University, Australia)**
17:20 – 17:40	**15. Tropical Cyclone and Climate Change** **– Tom Knutson (NOAA, USA)**
17:40 – 18:00	

Day 2/ December 3 (Tue)

09:00 - 13:00	**Members Report (Parallel)**		
	Meteorology	**Hydrology**	**DRR**
09:00 **09:15** **09:30** **09:45** **10:00** **10:15** **10:30**	**Cambodia** **China** **DRP Korea** **Hong Kong, China** **Japan** **Lao PDR** **Macao, China**	**Cambodia** **China** **DRP Korea** **Hong Kong, China** **Japan** **Lao PDR** **Macao, China**	**Cambodia** **China** **DRP Korea** **Hong Kong, China** **Japan** **Lao PDR** **Macao, China**
10:45 -11:15	**Tea Break**		
11:15 **11:30** **11:45** **12:00** **12:15** **12:30** **12:45**	**Malaysia** **Philippines** **Republic of Korea Singapore** **Thailand** **USA** **Viet Nam**	**Malaysia** **Philippines** **Republic of Korea Singapore** **Thailand** **USA** **Viet Nam**	**Malaysia** **Philippines** **Republic of Korea Singapore** **Thailand** **USA** **Viet Nam**
13:00 – 14:30	**Lunch**		
14:30 – 18:00	**Keynote –Projects Session (Plenary)**		
14:30 – 14:50	**1. Typhoon Experiment on Structure and Intensity Changes in the Coastal Area (TEXSICA) – Xiaotu Lei (CMA, China)**		
14:50 – 15:20	**2. Synergized Standard Operating Procedures for Coastal Multi- Hazards Early Warning System (SSOP) - James Weyman (TC)**		
15:20 – 15:40	**3. Urban Flood Risk Management (UFRM) – Jinping Liu (TC)**		
15:40 – 16:00	**4. Severe Weather Forecast Demonstration Project (SWFDP) in SE Asia - Peter Chen (WMO)**		
16:00 – 16:30	**Tea Break**		
16:30 – 18:00	**Special Discussion Topic - Review of the impact and implications of Haiyan with highlights on the WMO and regional emergency**		
19:00	**Welcome dinner**		

Day 3/ December 4 (Wed)

09:00 – 10:30	**Topical Discussion (Parallel in 4 – 5 breakout groups)**
10:30 – 11:00	**Tea Break**
11:00 – 12:30	**Wrap-up discussion on future R&D work and capacity building - crossing-cutting projects and initiatives, resources and technical support, priority research areas, coordination and synergy (Plenary)**
12:30 – 14:00	**Lunch**
14:00 – 17:30	**Technical visit / local tour**

Acronym Used in the Programme

CMA	**China Meteorological Administration**
ECMWF	**European Centre for Medium-Range Weather Forecasts**
ESCAP	**Economic and Social Commission for Asia and the**
Pacific HRFCO	**Han River Flood Control Office**
ICHARM	**International Centre for Water Hazard and Risk Management**
IWTC	**International Workshop on Tropical Cyclones**
JMA	**Japan Meteorological Agency**
KMA	**Korea Meteorological Administration**
NOAA	**National Oceanic and Atmospheric Administration**
NDMI	**National Disaster Management Institute**
NUIST	**National University of Information Science & Technology**
PMP	**Probable Maximum Precipitation**
PWRI	**Public Works Research Institute**
SMG	**Macao Meteorological and Geophysical Bureau**
SSOP	**Synergized Standard Operating Procedures for Coastal Multi-Hazards Early Warning System**
TC	**Typhoon Committee**
TCS	**Typhoon Committee Secretariat**
TEXSICA	**Typhoon Experiment on Structure and Intensity Changes in the Coastal** **Area**
TRCG	**Training and Research Coordination Group**
WGDRR	**Working Group on Disaster Risk Reduction**
WGH	**Working Group on Hydrology**
WGM	**Working Group on Meteorology**
WGNE	**Working Group on Numerical Experimentation**
WMO	**World Meteorological Organization**

Appendix B to Annex II

Topic 1 – Interpretation and use of available NWP products, including products from ensemble and consensus models (led by Munehiko Yamaguchi)

9 participants including 3 invited speakers

- ***Training needs: to understand the basics on the product interpretation (e.g. SWFDP website) and also to use the products on a regular (e.g. daily) basis***
- ***Resource needs: new products such as spatial distribution of probability of high winds and precipitation, and point-based EPS meteograms from major NWP centres***
- ***Research needs: on top of ensemble mean and spread, studies on more useful ways to use the ensemble (e.g. clustering, EFI, selective ensemble mean techniques, percentile, calibration of the pdf)***
- ***Research needs: studies on more indicative parameters for intensity prediction (e.g. extreme of ensemble members), diagnostic tools to figure out the confidence of extreme members, regional and mesoscale EPS using higher-resolution NWP models***
- ***Research needs: cases when actual track falls outside ensemble spread***
- ***Research needs: availability of observations, including analysis fields combining different types of observations, for systematic verifications of TC intensity and structure to evaluate usefulness of EPS products***
- ***Resource needs: trend of intensities from EPS, extension of EPS products to genesis of tropical cyclones and monsoon depressions***
- ***Resource needs: new products such as spatial distribution of probability of high winds and precipitation, and point-based EPS meteograms from major NWP centres***

Topic 2 – Development of forecast products and sharing of best practices for effective communication of forecast products and warning messages (led by Chris Fogarty)

8 participants including 5 invited speakers

- ***Need to have specialist meteorologists for liaison with media, communicators, emergency planners and DRR partners***
- ***Frameworks of SOP/best practices and sharing of experiences for cross-pollination***
- ***Need to think beyond critical storm period for effective use of forecasts and warnings***
- ***Communication of low confidence but high risk scenarios***
- ***Authoritative voice amidst competing information from different sources or agencies***
- ***Videos of well-known historical events or cases to educate or activate citizens, communicators, emergency planners***
- ***Capacity-building not just for forecasters and upholding standards, but also for re-engagement purposes with stakeholders and partners***

Topic 3 – Storm surge early alert for risk assessment and emergency response (led by Bruce Harper)

10 participants including 2 invited speakers

- ***Reaffirmation on storm surge sensitivity***

- *Physical/Deterministic*
  - *Wind and pressure field/structure*
  - *Sensitivity to bathymetry/coastal landforms*
  - *Vulnerable land areas*
  - *Wave setup (especially reefs)*
- *Forecast/Probabilistic*
  - *Astronomical tide timing and interaction*
  - *Uncertainty in forecast TC parameters*
- *Risk Assessment*
  - *the above + representation of the climate*

- *In support of early warning system*
  - *Fine-mesh regional prediction to be pursued by NMHS but simple simulations also work well*
  - *Ensemble-like forecasts and probabilistic information good for emergency planning and response*
  - *Deterministic but accurate information also useful in the short range*
- *Inundation information (forecast) is desirable*
  - *Information on how much area will be inundated is easily understandable as warning*
  - *Further development of inundation forecast model for operational use*
  - *Making practical use of risk (hazard) maps*

Topic 4 – Inundation assessment in coastal region under the combined risks of heavy rain, river flooding, waves and tides, and storm surge (led by Lin Bingzhang / Minoru Kamoto)

26 participants including 4 invited speakers

- *Training needs: methodology on 1) inundation simulation modelling for different phenomena; 2) satellite data utilization; 3) damage assessment; and 4) PMP review and study with consideration of climate change impact*
- *Research needs: 1) inundation modelling; 2) risk mapping; 3) QPE/QPF products for the purpose of inundation simulation; 4) scenario building for integrated drill - storm surge modelling by WGM, inundation mapping by WGH, and interpretation of impacts or risks by WGDRR*
- *Resource needs: 1) data (high resolution DEM, meteo-hydrological data); and 2) expert ise of inundation simulation and damage assessment*
- *Collaboration opportunities: SSOP (should include modelling – storm surge, coastal inundation and interpretation of impacts or risks); OSUFFIM—focus on modelling aspects; collaboration among the 3 WGs*

Topic 5 – Disaster management and impact assessment systems, including realistic disaster scenarios based on historic plausible events (led by Shim Jae-hyun)

13 participants including 2 invited speakers

- *Training needs:*
  - *1. how to disseminate information?*

- *2. how to make information more understandable to people?*
- *3. how to engage the public in disaster mitigation activities?*

- *Research needs: social scientists to be involved for better use of terminology to make people react to impending disasters; introduction of national insurance programmes in USA, disaster impact assessment programmes in Republic of Korea, as well as environmental impact assessment system*
- *Collaboration opportunities:*
  - *annual WGDRR meeting*
  - *expert missions*
  - *Co-Win Project developed by Hong Kong Observatory*

Topic 6 – Establishment of mechanisms for building up homogeneous data sets for assessment of long term trends related to tropical cyclone patterns and activity (led by Tom Knutson)

9 participants including 1 invited speaker

- *Main issues of concern:*
  - *to narrow down the differences among warning centres on TC intensity assessment*
  - *to explore ways to bridge the differences in TC intensity assessment pre- and post-1987 periods (for climate trend analysis)*
- *Recent progress:*
  - *RSMC Tokyo working on the re-analysis of satellite assessment of CI numbers back to 1981*
  - *One of the AOPs of WGM working on the exchange of historical CI records between warning centres*
- *Idea for future study: systematic analysis of TC-induced rainfall rate and extreme rainfall using high temporal resolution rainfall (e.g. hourly) data from weather stations of Typhoon Committee Members*
- *An organization/group be set up to contribute to the building of the necessary data sets / results for future research and to conduct initial trend analysis*
- *Research issues to be addressed:*
  - *standardized data analysis methods and definitions not available and yet to be determined*
  - *differences in best track data from various warning centres*
  - *TC to ET transition (mid-latitude)*
  - *analysis of depressions after landfall (low latitude)*
- *Capacity building / training:*
  - *TC intensity assessment*
  - *TC rainfall data analysis*

Annex III

Summary of Awarded Research Fellowships

Subject	Fellow	Host	Period
Analysis of evolution of landfalling tropical cyclones with a view to developing forecast guidance for wind and rain	Mr. XUE, Jianjun (China)	Hong Kong Observatory	1 Feb – 31 Mar. 2001
TC track forecasting with use of super-ensemble	Dr. PENG, Taoyong (China)	Korea Meteorological Administration	15 Jun – 15 Nov 2001
Near real-time analysis of the wind structure of tropical cyclones	Dr. Nathaniel T. SERVANDO (Philippines)	Hong Kong Observatory	5 May – 4 Jul 2002
Numerical modelling on typhoon intensity change	Miss YU, Hui (China)	Kongju National University and Korea Meteorological Administration	15 Jul –15 Sep 2002
Tropical cyclone track forecasting method	Dr. KANG, Bom Jin Dr. KIM, Tae Jin (DPR Korea)	Shanghai Typhoon Institute	Feb – Mar 2001 Oct – Nov 2002
Analyses on the responses of extratropical transition of tropical cyclone to its environment	Dr. Vicente B. MALANO (Philippines)	Korea Meteorological Administration	Jun – Aug 2004
Effect of tropical cyclone bogussing on model analysis and forecasts	Ms. WANG, Dongliang (China)	Hong Kong Observatory	11 Oct – 10 Dec 2004
Evaluation of the model performance in typhoon prediction in the high-resolution	Ms. Sugunyanee YAVINCHAN (Thailand)	Kongju National University and Korea Meteorological Administration	1 Aug – 30 Oct 2005

global model (T426L40)			
Impact study of Moisture Data on TC forecasting in South China Sea and Western North Pacific	Dr. Vicente B. MALANO (Philippines)	Hong Kong Observatory	20 Sep – 19 Nov 2005
Using ensemble prediction system (EPS) information in tropical cyclone forecasting	Ms. CHEN, Peiyan (China)	Hong Kong Observatory	13 Oct – 12 Dec 2006
Numerical simulation of Typhoon RUSA with a very high resolution mesoscale model, and calibration of intensity of typhoon with Kalman filtering	Mr. HOA, Vo Van (Viet Nam)	Korea Meteorological Administration	Jun – Aug 2006
Use of EPS information in TC forecasting	Mr. NGUYEN, Dang Quang (Viet Nam)	Hong Kong Observatory	15 Sep – 14 Nov 2007
Seasonality of Tropical Cyclone Activities over the Western North Pacific	Ms. YING, Ming	Korea Meteorological Administration	22 Sep – 20 Dec 2008
Study of high resolution non-hydrostatic model in prediction of landfalling tropical cyclones	Mr. Santi SUMDIN (Thailand)	Hong Kong Observatory	20 Oct – 19 Dec 2008
Tropical cyclone bogus in NHM and its impact on forecast track and intensity	Mr. QU, Anxiang (China)	Hong Kong Observatory	29 Oct – 28 Dec 2009
Typhoon Vortex Initialization Scheme and typhoon Ensemble Forecast Techniques	Ms. NGUYEN Thi Minh Phuong (Viet Nam) and Mr. Chatchai CHAIYASAEN (Thailand)	National Meteorological Center, China Meteorological Administration	Early Dec 2009 – Early Feb 2010
Improvement of typhoon analysis	Mr. TRAN Quang Nang	Korea Meteorological	1 Sep – 27 Nov 2010

and forecast with KMA's TAPS	(Viet Nam)	Administration	
Study on the tropical cyclone genesis in the northwestern Pacific	Mr. Kamol Promasakha Na SAKOLNAKHON (Thailand)	Korea Meteorological Administration	1 Sep – 27 Nov 2010
Typhoon Information Processing System	Mr. NGUYEN Manh Linh (Viet Nam) and Ms. Kamolrat SARINGKARNPHASIT (Thailand)	National Meteorological Center, China Meteorological Administration	8 Oct – 8 Dec 2010
Can the extreme rainfall associated with Typhoon Morakot (0908) happen in Hong Kong?	Mr. HUANG, Yiwu (China)	Hong Kong Observatory	29 Oct – 28 Dec 2010
Improvement of typhoon analysis and forecast with KMA's TAPS	Mr. Jori J. LOIZ (Philippines)	Korea Meteorological Administration	Sep – Nov 2011
Improvement of typhoon analysis and forecast with KMA's TAPS	Mr. Chukiat THAIJARATSATIAN (Thailand)	Korea Meteorological Administration	Sep 2011
Implementation of Tropical Cyclone Intensity Forecast in the Tropical Cyclone Information Processing System (TIPS) of the Hong Kong Observatory	Mr. Nursalleh K. CHANG (Malaysia)	Hong Kong Observatory	24 Oct – 23 Dec 2011
Improvement of Prediction Method for the Rapid Intensification of Tropical Cyclones in the South China Sea	Dr. Sukrit KIRTSAENG (Thailand)	National Meteorological Center, China Meteorological Administration	2 Nov – 29 Dec 2011
Application of Numerical Ensemble Prediction in the Forecasting of Typhoon Sharp Turning Tracks	Mr. Raymond C. ORDINARIO (Philippines)	National Meteorological Center, China Meteorological Administration	14Nov 2011 – 13 Jan 2012

Typhoon Analysis and Prediction System (TAPS), genesis and dissipation of tropical cyclones, and change of typhoon characteristics due to climate change	Mr. Renito B. PACIENTE (Philippines), Ms. Plaidao KHUMCHAIYAPHUM (Thailand) and Mr. Bounteum SYSOUPHANTHAVONG (Lao PDR)	Korea Meteorological Administration	May – June 2012
Enhancement of rainfall nowcast in tropical cyclone situation	Mr. Maqrun Fadzli Mohd Fahmi (Malaysia) and Mr. Michael S. Bala (Philippines)	Hong Kong Observatory	22 Oct – 21 Dec 2012
Optimizing typhoon forecast using Typhoon Analysis and Prediction System (TAPS), and research on intensity and track forecasts using model ensemble, correction of track forecast bias according to synoptic patterns, and analysis of synoptic features and typhoon model forecast errors in anomalous typhoon tracks.	Three fellows from the Philippine Atmospheric Geophysical and Astronomical Services Administration (PAGASA), Vietnam National Center for Hydro-Meteorological Forecasting (NCHMF), and the Thailand Meteorological Department (TMD)	Korea Meteorological Administration	1 May – 30 June 2013
Development of location-specific severe weather nowcasting techniques.	Dr. Sukrit KIRTSAENG (Thailand)	Hong Kong Observatory	21 Oct – 20 Dec 2013

Annex IV

TRCG Publications / Papers

Xue, J.J., 2002: Structural and Diagnostic Analyses of Landfalling Tropical Cyclones near Hong Kong in 1999 and 2000. Typhoon Committee Annual Review 2001, pp. 153-161

Servando, N.T., P.W. Li and E.S.T. Lai, 2003: Near Real-time Analysis of the Wind Structure of Tropical Cyclones. Typhoon Committee Annual Review 2002 (in CD form)

Peng, T.-Y., H.-J. Kwon, W.-J. Lee, and J.-H. Lim, 2005: A systematic approach to tropical cyclone track. *The International Journal of Systems & Cybernetics.* **34**, 681-693.

Wang, D.L., W.K. Wong and E.S.T. Lai, 2005: A Study on Tropical Cyclone Bogussing Strategies in NWP Model Analysis and Forecast. Typhoon Committee Annual Review 2004.

Yu, Hui and H. Joe Kwon, 2005: Effect of TC–Trough Interaction on the Intensity Change of Two Typhoons. *Weather and Forecasting.* **20**, 199–211.

Malano, V.B., W.K. Wong and E.S.T. Lai 2006: Effect of Moisture Data to the Numerical Simulation of Tropical Cyclone in the Western North Pacific. Typhoon Committee Annual Review 2005, pp. 242 – 251.

Chen, P.Y. and S.T. Chan, 2009: Use of the JMA Ensemble Prediction System for Tropical Cyclone Intensity Forecasting. Typhoon Committee Annual Review 2008, pp. 276-285.

Nguyen, D.Q. and S.T. Chan, 2009: Study on Application of Ensemble Prediction System Information in Tropical Cyclone Track Forecasting. Typhoon Committee Annual Review 2008, pp. 286-291.

Wong W.K., S. Sumdin, and E.S.T Lai 2010: Development of Air-Sea Bulk Transfer Coefficients and Roughness Lengths in JMA Non-hydrostatic Model and Application in Prediction of an Intense Tropical Cyclone. Scientific Online Letters on the Atmosphere (SOLA), **6**, 65-68.

Chan, S.T. and Y. Huang, 2012: Can the Extreme Rainfall Associated with Typhoon Morakot (2009) Happen in Hong Kong? Tropical Cyclone Research and Review, **1**, 1-15.

Chang, N.K., L.S. Lee and Y.S. Li, 2012: Comparison of Performance of Various Multiple-Model Ensemble Techniques in Forecasting Intensity of Tropical Cyclone. Tropical Cyclone Research and Review, **1**, 353-360.

Annex V

List of Resource Persons

Member	Specialties	Name	E-mail	Affiliation
(A) Data Assimilation				
China	TC vortex initialization	LIANG, Xudong	Liangxd@mail.typhoon.gov.cn	Shanghai Typhoon Institute
	TC intensity estimation by radar, satellite, SSMI and QuikScat	GAO, Shuanzhu ZHOU, Bing	gaosz1129@sina.com bingz@cma.gov.cn	National Meteorological Center
	Radar data quality control and assimilation scheme	GONG, Jiandong	gongjd@cma.gov.cn	National Meteorological Center
Hong Kong, China	TC data assimilation	W.K. WONG	wkwong@hko.gov.hk	Hong Kong Observatory
Japan	Satellite data assimilation	Kazumasa AONASHI	aonashi@mri-jma.go.jp	Meteorological Research Institute
	Satellite data assimilation	Naotaka UEKIYO	n-uekiyo@mri-jma.go.jp	Meteorological Research Institute
	Data analysis related to extratropical transition	Naoko KITABATAKE	nkitabat@mri-jma.go.jp	Meteorological Research Institute
(A) Data Assimilation (cont'd)				

Member	Specialties	Name	E-mail	Affiliation
Republic of Korea	Typhoon bogussing	YOO, Hee Dong	hyoo@kma.go.kr	Korea Meteorological Administration
		KWON, H. Joe	hjkwon@kongju.ac.kr	Kongju National University
	Satellite data analysis	CHOI, Byoung-Choel	cbc123@korea.kr	Korea Meteorological Administration
	Radar data analysis	PARK, Jong Seo	jspark@kma.go.kr	Korea Meteorological Administration
USA (western North Pacific)	TC analysis, satellite interpretation, use of microwave imagery and scatterometer data	Tom LEE Peter BLACK Paul CHANG	Lee@nrlmry.navy.mil Peter.Black.ctr@nrlmry.navy.mil Paul.S.Chang@noaa.gov	NRL, Monterey, CA NRL, Monterey CA NOAA/NESDIS, Suitland MD
(B) Modelling				
China	Numerical schemes of TC model	DUAN, Yihong	duanyh@mail.typhoon.gov.cn	Shanghai Typhoon Institute
	TC model physics and bogussing schemes	MA, Suhong	mash@cma.gov.cn	National Meteorological Center
	Ensemble track forecasting	ZHOU, Xiaqiong	zhouxq@mail.typhoon.gov.cn	Shanghai Typhoon Institute
	Typhoon modelling	LIANG, Xudong	Liangxd@mail.typhoon.gov.cn	Shanghai Typhoon Institute
(B) Modelling (cont'd)				

Member	Specialties	Name	E-mail	Affiliation
Hong Kong, China	TC modelling and bogussing schemes	W.K. WONG	wkwong@hko.gov.hk	Hong Kong Observatory
Japan	Ensemble track forecasting	Munehiko YAMAGUCHI	myamagu@mri-jma.go.jp	Meteorological Research Institute
	TC-ocean interaction (incl. mixed-layer ocean and ocean surface wave modelling)	Akiyoshi WADA	awada@mri-jma.go.jp	Meteorological Research Institute
	Storm surge modelling	Nadao KOHNO	nkono@met.kishou.go.jp	Japan Meteorological Agency
Republic of Korea	Global NWP model tracks	PARK, Hoon	hoon@kma.go.kr	Korea Meteorological Administration
	Ensemble track forecasting	PARK, Hoon	hoon@kma.go.kr	Korea Meteorological Administration
	Typhoon modelling	PARK, Hoon	hoon@kma.go.kr	Korea Meteorological Administration
		KWON, H. Joe	hjkwon@kongju.ac.kr	Kongju National University
		HO, Chang Hoi	hoch@cpl.snu.ac.kr	Seoul National University
(B) Modelling (cont'd)				
USA (western North	TC Modeling Extratropical Transition TC Genesis	Jim DOYLE Pat HARR	James.Doyle@nrlmry.navy.mil paharr@nps.edu	NRL, Monterey CA Naval Postgraduate School, Monterey CA

Member	Specialties	Name	E-mail	Affiliation
Pacific)	Sub-Tropical Systems Structure	Jenni EVANS	evans@meteo.psu.edu	Pennsylvania State Univ
Viet Nam	Computational fluid dynamics and modelling	LE, Duc	leducvn@yahoo.com	National Hydro-Meteorological Service of Viet Nam
(C) Forecasting				
China	Track and intensity forecasting	LEI, Xiaotu	Leixt@mail.typhoon.gov.cn	Shanghai Typhoon Institute
	Long-range prediction of typhoon	XU, Ming	Xum@mail.typhoon.gov.cn	Shanghai Typhoon Institute
Hong Kong, China	TC climatology and best track analysis	W.H. LUI	whlui@hko.gov.hk	Hong Kong Observatory
	TC intensity, structure and landfall impact	S.T. Chan	stchan@hko.gov.hk	Hong Kong Observatory
	Long-range forecasting of TCs	S.M. LEE	smlee@hko.gov.hk	Hong Kong Observatory
	TC motion, intensity, size, modelling and seasonal prediction	Johnny C.L. CHAN	Johnny.Chan@cityu.edu.hk	City University of Hong Kong.
(C) Forecasting (cont'd)				
Republic of	Track and intensity	PARK, Hoon	hoon@kma.go.kr	Korea Meteorological Administration

Member	Specialties	Name	E-mail	Affiliation
Korea	forecasting	KWON, H. Joe	hjkwon@kongju.ac.kr	Kongju National University
		HO, Chang Hoi	hoch@cpl.snu.ac.kr	Seoul National University
		SOHN, Byung-Ju	sohn@snu.ac.kr	Seoul National University
	Long-range prediction of typhoon	KWON, H. Joe	hjkwon@kongju.ac.kr	Kongju National University
		HO, Chang Hoi	hoch@cpl.snu.ac.kr	Seoul National University
Singapore	Seasonal prediction of typhoon	LIM, Tian Kuay	LIM_Tian_Kuay@nea.gov.sg	Meteorological Services Division, National Environment Agency
USA (western North Pacific)	TC analysis and forecasting, seasonal prediction, use of microwave imagery and scatterometer data, Dvorak technique	Mark LANDER Roger EDSON	mlander@uguam.uog.edu Roger.Edson@noaa.gov	University of Guam (WERI) National Weather Service, Forecast Office Guam
	Satellite data analysis, use of microwave imagery	Jeff HAWKINS	Jeff.Hawkins@nrlmry.navy.mil	Navy Research Laboratory, Monterey
(C) Forecasting (cont'd)				
USA (western North Pacific)	Satellite data analysis, use of microwave imagery, automated Dvorak	Chris VELDEN Derrick HERNDON	chris.velden@ssec.wisc.edu dherndon@ssec.wisc.edu	CIMSS, University of Wisconsin-Madison

Member	Specialties	Name	E-mail	Affiliation
	Technique, AMSU			
	Satellite data analysis, use of microwave imagery, AMSU	John KNAFF	john.knaff@noaa.gov	NOAA/NESDIS at CIRA, Colorado State University
	Satellite-based rainfall estimates in TCs (eTRaP)	Bob KULIGOWSKI Shelden KUSSELSON	bob.kuligowski@noaa.gov sheldon.kusselson@noaa.gov	NOAA/NESDIS Suitland, Maryland
(D) Application				
Hong Kong, China	TC warning systems and operations	Edwin S.T. LAI	stlai@hko.gov.hk	Hong Kong Observatory
	TC information visualization and display systems	S.T. CHAN	stchan@hko.gov.hk	Hong Kong Observatory
USA (western North Pacific)	TC warning and disaster preparedness, seasonal prediction, Dvorak technique	Chip GUARD	chip.guard@noaa.gov	NOAA National Weather Service Guam

Annex VI

TRCG Work Plans (2014 – 2017)

Year	Quarter	Typhoon Committee Activity	Training and Research Activities (*activities organized by parties other than TRCG)	Themes (if any) / Remarks
2014	Q1	TC-46		
	Q2		Research Fellowship	
	Q3		RSMC Tokyo attachment*	To be attended by Lao PDR, Malaysia and Philippines
			Research Fellowship	
	Q4	9th Integrated Workshop	Research Fellowship	
			Roving Seminar	Proposed to be in Viet Nam with themes on "warning communication"
2015	Q1	TC-47		
	Q2		Research Fellowship	
	Q3		RSMC Tokyo attachment*	To be attended by Thailand, Viet Nam and Cambodia
			Research Fellowship	
	Q4	10th Integrated Workshop	Research Fellowship	
			Roving Seminar	Proposed to be in Lao PDR with themes on "flash flood and landslides"
2016	Q1	TC-48		
	Q2		Research Fellowship	
	Q3		RSMC Tokyo attachment*	To be attended by Lao PDR, Malaysia and Philippines
			Research Fellowship	
	Q4	11th Integrated Workshop	Research Fellowship	
			Roving Seminar	Proposed to be in Hong Kong, China with themes on "storm surge"
2017	Q1	TC-49		
	Q2		Research Fellowship	
	Q3		RSMC Tokyo attachment*	To be attended by Thailand, Viet Nam and Cambodia
			Research Fellowship	
	Q4	12th Integrated	Research Fellowship	
			3rd TRCG Forum / Meeti	Proposed to be in China (Shanghai)

		Workshop	ng	with themes to be confirmed

Annex VII

Summary and Review of TRCG AOP 2013

Objective Number	*KRA / SG*	*Objective*	*Action*	*Other WGs Involved*	*TCS Responsibility*	*Expected Quarter Completed*	*Other Organizations Involved*	*Success Indicators*	*Funding Required*	*Funding Sources*	*Review and Target Met? (Yes / No)*
1	KRA 4 / SG 4a and 4c; KRA 5 / SG 5b; KRA 6 / SG 6b and 6c	2nd TRCG Forum and Planning Meeting (in conjunction with 8th IWS)	A major technical conference with cross-cutting main theme and sub-themes on the three components	WGM, WGH and WGDRR	Provision of administrative and logistic support.	4th	ESCAP, WMO	Feedback from evaluation forms to be completed by a target audience of about 100 people.	USD 55,000	TCTF, Macao Foundation and MLIT	Yes
2	KRA 6 / SG 6b and 6c	To facilitate technology transfer (emphasis on damage assessment methodology) among TC Members through research and development initiatives.	Research Fellowship	nil	Provision of administrative and logistic support.	2nd - 4th	TC Members	Publication of research findings and development output in TCRR or other journals.	Fellowship offered by voluntary hosts.	TC Members	Yes
3	KRA 6 / SG 6b and 6c	To enhance TC Members' capacity and knowledge in operational tropical cyclone forecasting.	Attachment of two forecasters (Cambodia and Thailand) to RSMC Tokyo	nil	Provision of administrative and logistic support.	3rd	RSMC Tokyo, WMO	Assessment as given in RSMC Tokyo report.	USD 4,000	TCTF	Yes

Annex VIII

TRCG AOP 2014

1	KRA 6 / SG 6b and 6c	To: (a) implement training initiatives in the priority operational and research areas as identified in the TRCG annual report; and (b) enhance Members' capability and capacity in the assessment of damage and pre-assessment of potential impact caused by landfalling TCs	Roving Seminar [with themes on warning communications]	WGDRR	Provision of administrative and logistic support.	3rd or 4th	-	Feedback from evaluation forms to be completed by a target audience of about 30 people.	USD 14,000	TCTF
2	KRA 6 / SG 6b and 6c	To facilitate technology transfer among TC Members through research and development initiatives.	Research Fellowship	WGM, WGH and WGDRR	Provision of administrative and logistic support.	2nd - 4th	TC Members	Publication of research findings and development output in TCRR or other journals.	Fellowship offered by voluntary hosts.	TC Members
3	KRA 6 / SG 6b and 6c	To enhance TC Members' capacity and knowledge in operational tropical cyclone forecasting.	Attachment of 3 forecasters (Lao PDR, Malaysia and Philippines) to RSMC Tokyo	nil	Provision of administrative and logistic support.	3rd	RSMC Tokyo, WMO	Assessment as given in RSMC Tokyo report.	USD 6,000	TCTF

Annex IX

Attendance List for 2nd TRCG Meeting held in Macao, China on 5 December 2013

- ***Mr. YU Jun, for Mr. QIAN Chuanhai (China)***
- ***Mr. Edwin S.T. LAI (Hong Kong, China)***
- ***Dr. Naoko KITABATAKE, and Mr. Masashi KUNITSUGU as observer (Japan)***
- ***Mr. Bounteum SYSOUPHANTHAVONG (Lao PDR)***
- ***Mr. IAN Vai Kei, Brian (Macao, China)***
- ***Dr. Wan Azli WAN HASSAN (Malaysia)***
- ***Dr. Carina G. LAO (Philippines)***
- ***Ms. Patchara PETVIROJCHAI (Thailand)***
- ***Mr. Roger T. EDSON (USA)***