

SUMMARY OF MEMBERS' REPORTS 2016

(submitted by AWG Chair)

Summary and Purpose of Document:

This document presents an overall view of the progress and issues in meteorology, hydrology and DRR aspects among TC Members with respect to tropical cyclones and related hazards in 2016.

Action Proposed

The Committee is invited to:

- (a) take note of the major progress and issues in meteorology, hydrology and DRR aspects under the Key Result Areas (KRAs) of TC as reported by Members in 2016; and
- (b) review the Summary of Members' Reports 2016 in APPENDIX B with the aim of adopting a "Executive Summary" for distribution to Members' governments and other collaborating or potential sponsoring agencies for information and reference.

APPENDICES:

- 1) Appendix A – DRAFT TEXT FOR INCLUSION IN THE SESSION REPORT
- 2) Appendix B – SUMMARY OF MEMBERS' REPORTS 2016

**APPENDIX A:
DRAFT TEXT FOR INCLUSION IN THE SESSION REPORT**

6.2 SUMMARY OF MEMBERS' REPORTS

1. *The Committee took note of the Summary of Members' Reports 2016 (Appendix ??) that highlighted the key tropical cyclone impacts on Members in 2016 and the major activities undertaken by Members under the various KRAs and components during the year.*
2. *The Committee expressed its sincere appreciation to AWG Chair for preparing the Summary of Members' Reports and the observations made with respect to the trends in KRA activities under the different components.*

Recommendations of AWG

3. *AWG recommended the Committee to:*
 - (a) *Consider the key tropical cyclone impacts on Members in 2016 and review the initiatives to be pursued under the various KRAs and components for mitigating such impacts.*
 - (b) *Adopt Section 2.1 of the Summary of Members' Reports 2016 as an "Executive Summary" to be distributed to Members' governments for information and reference.*
4. *Any other text which will be included in the Session Report.*

APPENDIX B:
SUMMARY OF
MEMBERS' REPORTS 2016

Edwin S.T. Lai (AWG Chair)

The summary is based on Members' Reports as submitted by Members of the Typhoon Committee for the 11th IWS in Cebu, Philippines on 24 – 27 October 2016, details of which can be found in: <http://www.typhooncommittee.org/11IWS/Members11IWS.html>

1. Objectives

1.1 The objectives of this Summary are to extract the key aspects of tropical cyclone impact and related topical issues of regional interest in Members' countries or territories, and to consolidate the information and observations for:

- (a) the attention of Members' governments with a view to allocating the necessary resources strategically for the purposes of operational effectiveness and readiness, disaster mitigation and risk reduction, or leveraging available resources and support for technology transfer and capacity-building through regional cooperation initiatives; and
- (b) reference by sponsoring agencies with a view to coordinating and synergizing effort in the planning of relevant projects and programmes for such purposes, as well as channelling resources and aids into identified areas of gaps or needs.

2. Key Observations in 2016

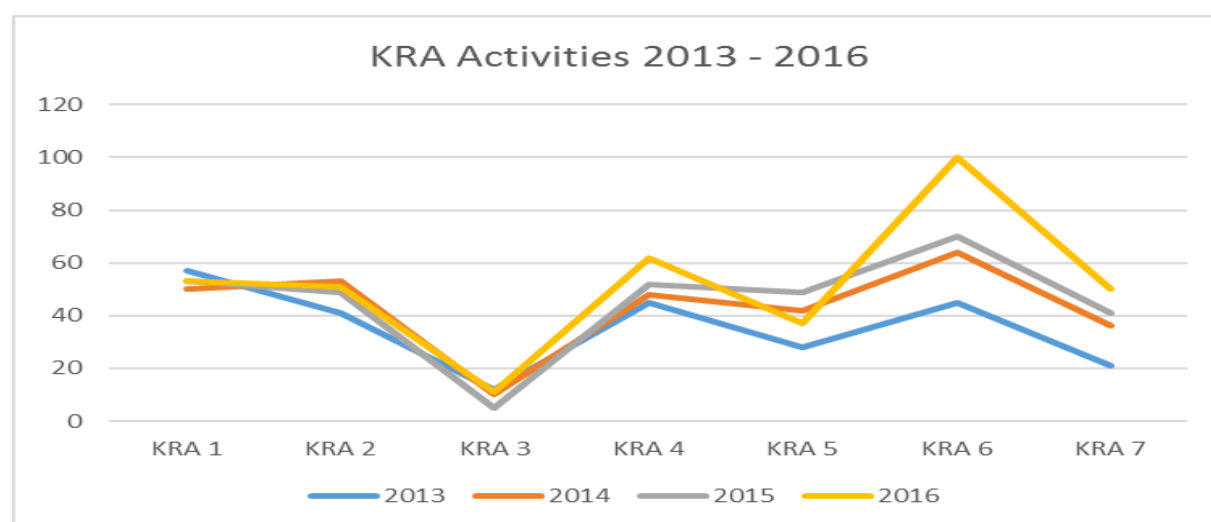
2.1 *Overview*

2.1.1 The number of JMA-numbered tropical cyclones over the western North Pacific and the South China Sea in 2016 was 26, same as the climatological normal (1981 – 2010). Against the background of a weakening El Niño event, genesis positions of tropical cyclones shifted towards the warm waters further west with development getting more active in the latter part of the year, which brought late-season cyclones in quick succession to southern China, the southern part of the Korean Peninsula and the northern part of Japan. There was also a tendency for cyclogenesis to take place at higher latitudes in 2016.

2.1.2 Initiatives pursued by Members under relevant Key Result Areas (KRAs; see Annex) against the five major activity components of the Typhoon Committee were compiled from the reports by all 14 Members as submitted for the 11th IWS at Cebu, Philippines. Cambodia, Lao PDR and Viet Nam only provided descriptive or qualitative input with no detailed breakdown, and hence their effort cannot be reflected in the following summary table. The distribution of activities among the seven KRAs in the past four years are plotted in a graph underneath the table. A general increase in activities over the years may be a reflection of increased awareness among the Members in the reporting of activities under the new format adopted since 2013.

Nevertheless, there have been significant increases in activities under KRAs 4 and 6 in 2016, while a drop in KRA 5 is noted. Among the seven KRAs, KRA 3 remains consistently the one receiving less attention.

KRA =	1	2	3	4	5	6	7
Meteorology	34	27	4	25	11	42	12
Hydrology	6	6	1	10	8	17	9
DRR	6	10	1	17	12	13	8
Training and research	3	4	5	6	3	21	14
Resource mobilization or regional collaboration	4	4	0	4	3	7	7
Total:	53	51	11	62	37	100	50



2.2 Summary of Members' Reports

2.2.1 Up to August 2016, no tropical cyclone impacted on **Cambodia**. The onset of the southwest monsoon was delayed till late May. Rainfall was very much below average in the pre-monsoon months and there was also a prolonged dry spell in August. The severe drought was attributed to the strong El Niño, resulting in a shortage of water both for human consumption and agriculture. It was estimated that 2.5 million people were affected across the country.

2.2.2 In 2016, a higher-than-average nine tropical cyclones (Nepartak, Mirinae Nida, Dianmu, Lionrock, Meranti, Megi, Sarika and Haima) affected or made landfall over **China**. Heavy rain associated with tropical cyclones was extensive and affected many provinces, especially in the cases of Dianmu in Hainan Province and Meranti in Zhejiang Province. There were more rivers exceeding the warning levels due to floods caused by tropical cyclones. Nepartak was the deadliest resulting in the most casualties, and Meranti the most destructive with significant damage. Around 16 million people in 14 provinces were affected by tropical cyclones during the year, with 169 deaths, 37 missing, more than 2.5 million people evacuated and direct economic loss exceeding 73 billion RMB.

2.2.3 Among the initiatives highlighted by **China**, they were linked to TC KRAs and activities as below:

KRA =	1	2	3	4	5	6	7
Meteorology	9	8	3	2		1	
Hydrology	1	1					
DRR	2	3		1			
Training and research	2	3	2				
Resource mobilization or regional collaboration	3	2					

2.2.4 In 2016, **DPR Korea** was affected by flooding and landslide caused by the heavy rain associated with an intense extratropical cyclone that evolved from the tropical cyclone Lionrock in late August. The number of people killed or missing amounted to several hundreds. Around 11,600 houses collapsed or were buried in a landslide, leaving nearly 70,000 people homeless. Power supply and communication were cut off for more than a week in certain parts of the country, and around 27,400 hectares of rice fields were washed out.

2.2.5 Among the initiatives highlighted by **DPR Korea**, they were linked to TC KRAs and activities as below:

KRA =	1	2	3	4	5	6	7
Meteorology	1		1			2	
Hydrology	1		1	1		1	
DRR	1			3	1	1	
Training and research			1	1		2	1
Resource mobilization or regional collaboration				1	1		1

2.2.6 **Hong Kong, China** had nine tropical cyclones (a tropical depression over the South China Sea, Mirinae, Nida, Dianmu, Meranti, Megi, Aere, Sarika and Haima) necessitating the issuance of warning signals in 2016, of which gale signals were required for Nida in early August and Haima in October. Nida brought more than 100 mm of rainfall to most parts of Hong Kong. Storm surge triggered by Nida caused minor flooding and backflow of sea water in some low lying areas. At least 12 people were injured during the passage of Nida. In a stormy October, a relatively weak system Aere hovered for days over the coastal waters of southern China at the doorstep of Hong Kong in the early part of the month, followed by the passages of Sarika and Haima within a week in mid October. While Haima brought windy conditions, Sarika brought rainstorms that broke the October hourly rainfall record. As a result of such cyclonic activity, the monthly rainfall total in October was more than six times the normal amount and the second highest on record for October.

2.2.7 Among the initiatives highlighted by **Hong Kong, China**, they were linked to TC KRAs and activities as below:

KRA =	1	2	3	4	5	6	7
Meteorology	4	3		4	2	7	3
Hydrology						3	1
DRR		1	1		2	3	
Training and research				1		5	1
Resource mobilization or regional collaboration						3	

2.2.8 In 2016, 11 tropical cyclones of tropical storm intensity or higher came within 300 km of the Japanese islands as of 7 October. **Japan** was affected by seven of them (Chanthu, Mindulle, Lionrock, Kompas, Namtheun, Malakas and Chaba), with six making landfall. The most devastating cyclone was Lionrock in August which left 22 dead, 5 missing and 11 injured in the Tohoku and Hokkaido regions. Lionrock was one of the four cyclones that brought torrential rain to the regions during the month. It was also the first time ever that Hokkaido was hit by three tropical cyclones in a year. In response to this series of tropical cyclone impact, the Japanese government held inter-ministerial meetings and dispatched a research team to Hokkaido and Iwate for discussion with local governments, including the setting up of on-site liaison office at Iwate Prefecture to support efficient collection and sharing of information as well as undertake emergency response activities. Defined as extremely severe nationwide disasters, funding was allocated for early recovery and reconstruction projects in the affected areas.

2.2.9 Among the initiatives highlighted by **Japan**, they were linked to TC KRAs and activities as below:

KRA =	1	2	3	4	5	6	7
Meteorology	4	4		4	2	5	1
Hydrology	1	1		2	1	2	
DRR				1		1	2
Training and research				1			2
Resource mobilization or regional collaboration							1

2.2.10 Up to October, **Lao PDR** was directly affected by two tropical cyclones (Dianmu and Rai) and indirectly by two others (Mirinae and Aere). There were reports of flash floods and landslides in the northern and central parts of the country triggered by heavy rain associated with Mirinae and Dianmu, while strong winds and flash floods caused by Rai were mostly confined to the central and southern parts.

2.2.11 **Macao, China** was affected by five tropical cyclones (a tropical depression over the South China Sea, Mirinae, Nida, Dianmu and Meranti) that necessitated the issuance of local warning signals. However, no significant damage was reported.

2.2.12 Among the initiatives highlighted by **Macao, China**, they were linked to TC KRAs and activities as below:

	KRA =						
	1	2	3	4	5	6	7
Meteorology	3	3		2	1	1	
Hydrology							
DRR	2	2		3	2	2	1
Training and research							
Resource mobilization or regional collaboration	1	1					

2.2.13 Up to September 2016, 18 tropical cyclones warranted the issuance of strong wind/rough sea warnings over the marine regions under the responsibility of **Malaysia**. Six of them (Nepartak, Mirinae, Nida, Dianmu, Meranti and Malakas) came relatively close, but none close enough to cause significant damage. The impact was mostly in terms of the tail effect of tropical cyclones passing by at a distance that led to enhanced rainfall, especially in the northern part of Peninsular Malaysia (such as Meranti in September) and East Malaysia (such as Mirinae in July), even though the combination of other contributing factors could also play a role in the increase of convective activity over the regions.

2.2.14 Among the initiatives highlighted by **Malaysia**, they were linked to TC KRAs and activities as below:

	KRA =						
	1	2	3	4	5	6	7
Meteorology	2	1		3	1	3	
Hydrology	1	2			2	3	1
DRR		2		3		1	
Training and research			1			1	3
Resource mobilization or regional collaboration				1			1

2.2.15 In **the Philippines**, only ten tropical cyclones (a tropical depression in June, Nepartak, Nida, Lionrock, Namtheun, Merante, Malakas, Megi, Sarika and Haima), a relatively low number compared to previous years, entered into or developed within its Area of Responsibility (AOR) up to October 2016. Nepartak, Nida, Sarika and Haima brought moderate to heavy rain to the country, while increased rainfall was also attributed to the southwest monsoon enhanced by the distant presence of Lionrock. Apart from some flooding and landslides during the passage of Nida, no significant damage was reported in the Philippines.

2.2.16 Among the initiatives highlighted by **the Philippines**, they were linked to TC KRAs and activities as below:

	KRA =						
	1	2	3	4	5	6	7
Meteorology	3	3		2	2	5	1
Hydrology						2	1
DRR		1		1	2	1	
Training and research						2	1

Resource mobilization or regional collaboration							
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2.2.17 Three tropical cyclones (Meranti, Malakas and Chaba) affected **Republic of Korea** during the year. In particular, Chaba had a direct impact on Jeju Island and the southern part of the Korean Peninsula in early October, leaving ten people dead or missing with power outage and widespread inundation. At Jeju, more than 600 mm of rain fell in the mountain regions and winds up to 50 m/s were reported. In Ulsan, heavy rain caused extensive flooding as a result of drainage problems and the lack of river overflow control. On the other hand, despite some reports of flooding, the successive passages of Meranti and Malakas in September brought much needed rain to the southern provinces of the country for water storage.

2.2.18 Among the initiatives highlighted by **Republic of Korea**, they were linked to TC KRAs and activities as below:

KRA =	1	2	3	4	5	6	7
Meteorology	4	3				7	1
Hydrology	1	1		1	1	2	
DRR					1	1	2
Training and research						4	
Resource mobilization or regional collaboration						3	2

2.2.19 Two tropical cyclones, Nepartak in early July and Nida in early August, indirectly affected **Singapore** in 2016 through the development of squall lines that brought enhanced rain and strong gusts.

2.2.20 Among the initiatives highlighted by **Singapore**, they were linked to TC KRAs and activities as below:

KRA =	1	2	3	4	5	6	7
Meteorology	3	2		2		3	
Hydrology	1						
DRR							
Training and research			1			2	
Resource mobilization or regional collaboration							

2.2.21 Up to the end of September 2016, only one tropical cyclone, namely a weakening cyclone Rai in September, had a direct impact bringing heavy rain and causing flash floods in some regions of **Thailand**, while two others Mirinae and Dianmu were indirectly linked to enhanced rainfall in the country in July and August respectively.

2.2.22 Among the initiatives highlighted by **Thailand**, they were linked to TC KRAs and activities as below:

KRA =	1	2	3	4	5	6	7
Meteorology				2		3	1
Hydrology		1		3	1	1	3
DRR							
Training and research	1	1		1	1	2	2
Resource mobilization or regional collaboration							

2.2.23 In the **USA** (western North Pacific Region), there was a classical swing in tropical cyclone activity that reflected the weakening of an intense El Niño event. There was virtually no organized convective activity in the Guam’s AOR during the first six months of 2016. In the latter half of 2016, tropical cyclone activity increased significantly. However, only four (Nepartak, Mindulle, an un-named tropical storm and Chaba) warranted the issuance of watches or warnings by Guam, and they all developed further to the west and moved out of Guam’s AOR before significant development. The first half of the year was therefore mostly dominated by drought conditions that only ended in mid July when the monsoon trough returned to the Micronesia region.

2.2.24 Among the initiatives highlighted by **USA**, they were linked to TC KRAs and activities as below:

KRA =	1	2	3	4	5	6	7
Meteorology	1			4	3	5	4
Hydrology				3	3	3	3
DRR	1	1		5	4	3	3
Training and research				2	2	3	4
Resource mobilization or regional collaboration		1		2	2	1	2

2.2.25 Up to September 2016, the number of tropical cyclones affecting **Viet Nam** was less than normal with only three (Mirinae, Dianmu and Rai) making landfall in the country. Flooding caused by the enhanced rainfall associated with Mirinae in late July, Nida in early August and Dianmu in mid August affected the northern part of the country, while Rai and its remnant brought heavy rain to the central part and the highlands in mid September.

2.2.26 Among the initiatives highlighted by **Viet Nam**, they were linked to TC KRAs and activities as below:

KRA =	1	2	3	4	5	6	7
Meteorology	x	x		x	x	x	x
Hydrology	x	x		x	x	x	x
DRR	x	x		x	x	x	x
Training and research	x	x		x			
Resource mobilization or regional collaboration							

Key Result Areas (KRAs)

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