

MEMBER REPORT

ESCAP/WMO Typhoon Committee
8th Integrated Workshop /2nd TRCG
Forum

(MALAYSIA)

Macao, China
2 – 6 December 2013

SUMMARY OF TYPHOON COMMITTEE REPORT 2013

I. Meteorology

There were 30 typhoons and tropical storms existed over the western Pacific Ocean, the South China Sea and the Philippines regions from January until early November 2013. The typhoons activities were slightly more active during this period compared to the average numbers of cyclone per year recorded from 1951 to 2012.

The impacts of the typhoons and tropical storms over Peninsular Malaysia and East Malaysia were minimal. The presence of Typhoons and tropical storms over the South China Sea and the Philippines regions generally strengthened the westerly winds and were responsible for enhancing the afternoon convections over the Malaysian region. In general, the impacts were restricted to an increase in the rainfall amount due to the tail effects of the typhoons or tropical storms which influenced also the rainfall patterns over the Peninsular Malaysia and west coast of Sarawak and Sabah. 21 out of the 30 cyclones warranted the issuance of tropical cyclone advisories while 17 of them warranted the issuance of strong wind/rough sea warnings over the marine regions under the Malaysian Meteorological Department (MMD) responsibility.

To monitor the effect of typhoon and tropical storm to weather in Malaysia, MMD had planned to have four new radar stations at Marang in Terengganu, Kuala Rompin in Pahang, Sibu in Sarawak and Tawau in Sabah. Meanwhile, the Butterworth Radar Station will be moved to a more strategic location at Kuala Gula in Perak. These projects are expected to be completed by 2015.

II. Hydrology

Prolonged heavy rainfalls during the Northeast Monsoon, from November 2012 to January 2013 have caused severe floods in low-lying area especially in the northern and eastern regions of Peninsular Malaysia and East Malaysia. The monsoon heavy rainfall was unrelated to tropical cyclone. Malaysia also faces flash floods due to heavy thunderstorms.

The Department of Irrigation and Drainage (DID) to-date has installed 489 telemetry stations. As part of the local early flood warning system, 1223 manual flood gauges, 152 flood warning boards and 419 automatic flood warning sirens were installed in flood prone areas.

Several flood forecasting models have been developed to support flood forecasting tasks in DID. All these models are currently in operation, and the reliability of each

model is currently being assessed. All models will be calibrated from time to time especially in areas that face rapid changes.

Water level and flood information are disseminated to the authorities and public via mobile phone text messages, emailing and the website <http://infobanjir.water.gov.my>. This website has been enhanced and improved in terms of IT technology, hardware, procurement and network expansion as well as its contents to meet the requirements of technical staff in monitoring the flood situation in the country. The <http://publicinfobanjir.water.gov.my> website was developed and designed to be more public-friendly.

DID also has taken up the initiative to communicate with the public on flood events at social network pages, e.g facebook at www.facebook.com/pages/PublicInfoBanjir

III. Disaster Prevention and Preparedness (DPP)

The Department of Social Welfare takes the responsibility of providing and managing relief/evacuation centres during floods. Its tasks include providing food, clothing and other essential items to victims. The Department's roles and responsibilities in disaster management have three levels, namely Preparedness Stage, Response Stage and Recovery/Restoration Stage. The officers will be on standby at district and state levels as well as at evacuation centres who can be contacted at any time during a disaster. The Department is responsible for identifying suitable evacuation centres.

Currently, the Department of Social Welfare has identified a total of 5,068 evacuation centres located in each district across the country with a capacity that can cater for up to a total of 1.3 million people nationwide. These centres are well stocked to provide victims with their basic needs. The Department of Social Welfare has five depots for the storage of food and other necessities. The depots are divided into zones such as North, South, Middle, East 1 and East 2.

At the same time, the Department of Social Welfare also establishes and coordinates a task force of volunteers. The volunteers must be registered with the Department. There are currently 2,473 registered volunteers. These volunteers are provided with basic training on carrying out tasks at evacuation centres.

CONTENTS

	Page
Summary of Typhoon Committee Report 2013	i
I Overview of tropical cyclones which have affected/impacted Member's area since the last Typhoon Committee Session	
1. Meteorological Assessment	1
2. Hydrological Assessment	15
II Summary of progress in Key Result Areas	
1. Reduced Loss of Life from Typhoon-related Disasters	
1.1 Hydrological Achievements/Results	15
Improvement of Facilities	
2. Minimized Typhoon-related Social and Economic Impacts	
2.1 Meteorological Achievements/Results	16
Weather Monitoring Area	
2.2 Tropical Depression/Tropical Storm / Typhoon Advisories / Warnings	16
3. Improved Typhoon-related Disaster Risk Management in Various Sectors	
3.1 The Role of The Department of Social Welfare	17
3.1.1 Preparedness Stage	17
3.1.2 Response Stage	18
3.2 Recovery/Restoration Stage	21
4. Strengthened Resilience of Communities to Typhoon-related Disasters	
4.1 Hydrological Achievements/Results	22
5. Improved Capacity to Generate and Provide Accurate, Timely, and understandable Information on Typhoon-related Threats	
5.1 Meteorological Achievements/Results	22

5.2	Research, Training, and Other Achievements/Results	23
	Research and Training	
5.3	Meteorological Radar	24
5.4	Information and Communication Technology (ICT)	24
III	Update of Members' Working Groups representatives	25
IV	Summary of Progress in Key Result Areas (KRAs)	
	I. Meteorology	
	Item 1: International Training Course on Nowcasting	27
	Item 2: 2013 ACTS First Workshops: Advanced Technology Of	
	Typhoon Forecasting And Its Social Implications	29
	Item 3: Radar Echo Tracking with SWIRLS Model	30
	II. Hydrology	
	Item 4: Flood Forecasting System Using Xin'Anjiang Model	31

I Overview of tropical cyclones which have affected/impacted Member's area since the last Typhoon Committee Session

1. Meteorological Assessment

Western Pacific Ocean region is the most active basin on Earth for the tropical storms and typhoons development. There were eight (8) typhoons and tropical storms developed in September 2013 and six (6) in October 2013. It is more active in both of the months as compared with the averages of 5.9 and 4.5 respectively for September and October recorded from 1951 to 2012.

From January 2013 until early November 2013, a total of 30 typhoons and tropical storms existed over the western Pacific Ocean, the Philippines and the South China Sea regions. The typhoons and tropical storms observed, together with details regarding their lifetimes, regions of formation, starting and ending dates and attained maximum wind speeds, are listed in **Table 1**. The total figure of 30 typhoons and tropical storms until early November 2013 is slightly more than the average of 26.1 recorded from 1951 to 2012.

Out of the 30 typhoons and tropical storms, 21 of them warranted the issuance of both the strong wind/rough sea warnings and tropical cyclone advisories over the marine regions by MMD. The statistics of tropical cyclone advisories and strong wind/rough sea warnings issued by MMD are listed in **Table 2**. The tracks of six typhoons or tropical storms that were relatively close and affected the Malaysian region are shown in **Figure 1**. No tropical cyclone warnings with regards to significant weather impacts were issued as none of the typhoons or tropical storms were close enough to directly cause loss of lives and properties in the country.

The satellite imageries of the rain cloud clusters over the Malaysia region associated with the tail effects of the typhoons and tropical storms are as shown in **Figure 2**. These imageries were obtained from the infrared channel of the MTSAT-1R geostationary satellite. From the satellite images it shown that the impacts of typhoons and tropical storms over the Malaysia region are only restricted to rainfall events and severe gusting due to the tail effects of the typhoons and tropical storms. These tail effects are generally responsible for enhancing the afternoon convective systems over the Malaysian region, especially in the northern Peninsular Malaysia, Sabah and coastal Sarawak. **Figure 3** shows the 850hpa wind charts from the Global Forecast System (GFS) analysis on wind pattern associated with typhoons and tropical storms that have affected Malaysian region.

The active typhoon season cause a few rainfall events indirectly affecting the weather in Malaysia. Rainfall events due to the tail effects of typhoons and tropical storms are also depicted with daily rainfall charts of selected meteorological stations in northern Peninsular Malaysia and East Malaysia. The daily rainfall charts from January to October 2013 are as shown in **Figures 4a to 4j**. Large spatial variation associated with rainfall may result in some of the selected stations not showing significant rainfall, although the satellite imageries may indicate so.

From the satellite imageries (**Figure 2**) and rainfall charts (**Figures 4a to 4j**), it was found that the rain cloud bands associated with the typhoons and tropical storms can be clearly seen over both East and West Malaysia. The month of January is relatively drier for Peninsular Malaysia as shown in **Figure 4a**. However, during the earlier occurrence of Tropical Storm Sonamu on 3 January, most stations recorded significant rainfall. There are stations that recorded more than 80mm rainfall, especially in the east coast of Peninsular Malaysia. In East Malaysia, most of the stations also recorded rainfall during early January with Sandakan recorded the highest amount of rainfall.

The rainfall charts for September 2013 (**Figures 4g and 4h**) clearly shown that much more significant accumulated rainfall amounts for Sabah and Sarawak as compared to Peninsular Malaysia. While in October 2013, the rainfall charts (**Figure 4i and 4j**) shown that there are more significant accumulated rainfall amounts over Peninsular Malaysia as compared with Sabah and Sarawak.

In other months, whether rainfalls are caused by typhoon is difficult to determine. There were cases where rainfall occurred during typhoon events, but may not be associated to the presence of typhoon.

Table 1: Typhoons and Tropical Storms from January 2013 to November 2013

No.	Tropical Cyclone	JTWC Classification	Date		Max Wind (knots)
			Birth	Death	
1	SONAMU#	Tropical Storm	3/1/2013	8/1/2013	50
2	SHANSHAN@	Tropical Storm	21/2/2013	22/2/2013	35
3	YAGI#	Tropical Storm	8/6/2013	12/6/2013	45
4	LEEPI#	Tropical Storm	18/6/2013	21/6/2013	40
5	BEBINCA@	Tropical Storm	21/6/2013	24/6/2013	40
6	RUMBIA#	Tropical Storm	28/6/2013	2/7/2013	50
7	SOULIK*	Typhoon	8/7/2013	14/7/2013	100
8	CIMARON#	Tropical Storm	17/7/2013	18/7/2013	40
9	JEBI@	Tropical Storm	31/7/2013	3/8/2013	55
10	MANGKHUT@	Tropical Storm	6/8/2013	8/8/2013	40
11	UTOR#	Typhoon	9/8/2013	15/8/2013	105
12	TRAMI*	Tropical Storm	18/8/2013	22/8/2013	60
13	PEWA!	Tropical Storm	18/8/2013	25/8/2013	55
14	UNALA!	Tropical Storm	19/8/2013	19/8/2013	35
15	KONG-REY#	Tropical Storm	26/8/2013	30/8/2013	55
16	YUTU*	Tropical Storm	1/9/2013	4/9/2013	35
17	TORAJI*	Tropical Storm	1/9/2013	4/9/2013	50
18	MAN-YI*	Tropical Storm	12/9/2013	16/9/2013	60
19	USAGI#	Typhoon	16/9/2013	23/9/2013	110
20	PABUK*	Tropical Storm	21/9/2013	27/9/2013	60
21	WUTIP@	Typhoon	27/9/2013	30/9/2013	70
22	SEPAT*	Tropical Storm	30/9/2013	2/10/2013	40
23	FITOW#	Typhoon	30/9/2013	7/10/2013	75
24	DANAS*	Typhoon	4/10/2013	9/10/2013	100
25	NARI#	Typhoon	9/10/2013	15/10/2013	75
26	WIPHA*	Typhoon	10/10/2013	16/10/2013	90
27	FRANCISCO*	Typhoon	16/10/2013	26/10/2013	105
28	LEKIMA*	Typhoon	20/10/2013	26/10/2013	115
29	KROSA#	Typhoon	29/10/2013	4/11/2013	80
30	HAIYAN*	Typhoon	4/11/2013	11/11/2013	125

Remarks:

1. Numbers of tropical cyclones originated from:-

- * Western Pacific Ocean region : 12
- ! Central Pacific region : 2
- # Philippines region : 11
- @ South China Sea region : 5

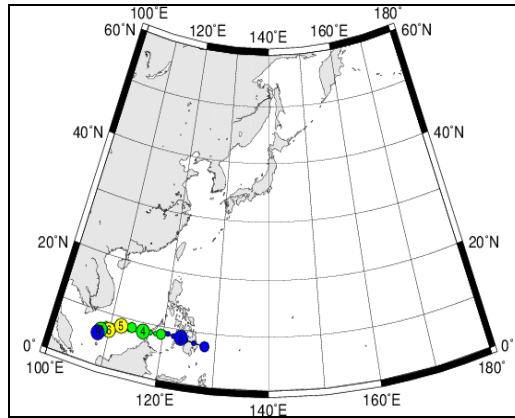
2. JTWC: Joint Typhoon Warning Centre

Table 2: Tropical Cyclone Advisories and Warnings Issued by MMD in 2013

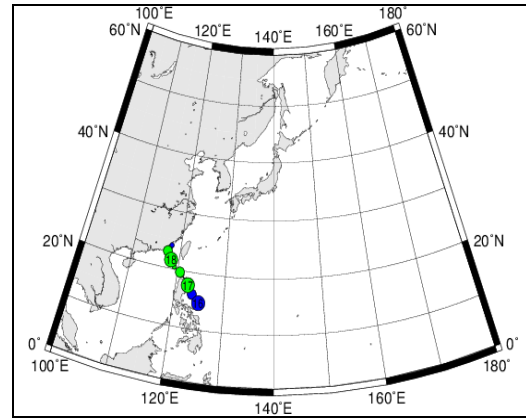
No.	Name	Category	Date		Total No. of Advisories	Total No. of Strong Wind/Rough Seas Warnings due to Tropical Cyclones (area affected)
			Start	End		
1.	SONAMU	STORM	3/1/2013	7/1/2013	33	31 (Kelantan, Terengganu, Samui, Condore, Reef North, Reef South, Layang-Layang, Palawan, Pahang, East Johore, Sarawak, FT Labuan, Sabah, Phuket, Tioman, Sarawak, Sabah, Bunguran & Sulu)
2.	SHANSHAN	STORM	22/2/2013	23/2/2013	10	11 (Kelantan, Terengganu, Pahang, Johor Timur, Condore, Reef North, Reef South, Layang-Layang Palawan, Sarawak, WP Labuan & Sabah)
3.	YAGI	STORM	8/6/2013	9/6/2013	3	NIL
4.	LEEPI	STORM	18/6/2013	20/5/2013	21	NIL
5.	BEBINCA	STORM	21/6/2013	24/6/2013	24	18 (Langkawi, Perlis, Kedah, Penang, North Straits of Malacca, Sabah, North Samui, Condore, Reef North, Layang-Layang & Palawan)
6.	RUMBIA	STORM	28/6/2013	2/7/2013	33	8 (Kedah, Pulau Pinang, Perak, Selangor, Negeri Sembilan, Malacca, West Johore, Kelantan, Sarawak, Labuan FT, Samui, Reef North, Sabah, Palawan & Sulu)
7.	SOULIK	TYPHOON	11/7/2013	13/7/2013	15	NIL
		STORM	13/7/2013	13/7/2013	8	
8.	CIMARON	STORM	17/7/2013	18/7/2013	16	6 (Perlis, Kedah, Perak, Selangor, N.Sembilan, Malacca, Terengganu, Pahang, east Johore, Penang, Sarawak, FT Labuan, Sabah, Tioman, Bunguran, Reef South, Phuket, Condore, Reef North, North of Samui, Reef South, Sulawesi, Sulu, Layang-layang & Palawan)

No.	Name	Category	Date		Total No. of Advisories	Total No. of Strong Wind/Rough Seas Warnings due to Tropical Cyclones (area affected)
			Start	End		
9.	JEBI	STORM	31/7/2013	3/8/2013	29	24 (North Straits of Malacca, Langkawi, Perlis, Kedah, Penang, Perak, Johore, Pahang, Terengganu, FT Labuan, Sarawak, Sabah, Phuket, Tioman, Bunguran, Condore, Reef North, Layang-Layang, Palawan & Sulu)
10.	MANGKHUT	STORM	6/8/2013	8/8/2013	12	4(Terengganu, Pahang, REEF North, Phuket, Layang-Layang & Palawan)
11.	UTOR	STORM	10/8/2013	10/8/2013	1	36 (Perak, Selangor, Johore, Pahang, FT Labuan, Sabah, Phuket, Condore, Reef North, Reef South, Palawan, Layang-layang, Sulu & Sarawak)
		TYPHOON	10/8/2013	14/8/2013	34	
		STORM	14/8/2013	15/8/2013	8	
12.	TRAMI	STORM	18/8/2013	22/8/2013	38	37 (N.Sembilan, Malacca, Pahang, Sarawak, Labuan FT, Sabah, Strait of Malacca, Phuket, Condore, Reef North, Reef South Layang-Layang, Palawan, & Sulawesi)
13.	KONG-REY	STORM	26/8/2013	30/8/2013	32	1 (Langkawi, Perlis, Terengganu, Condore, Bunguran & Reef North)
14.	TORAJI	STORM	2/9/2013	3/9/2013	14	NIL
15.	USAGI	STORM	17/9/2013	18/9/2013	14	44 (Selangor, N.Sembilan, Malacca, South of Straits of Malacca, Sarawak, Labuan FT, Sabah, Phuket, Condore, Reef North, Reef South, Layang-Layang, Palawan & Sulu)
		TYPHOON	18/9/2013	22/8/2013	35	
		STORM	23/8/2013	23/8/2013	4	
16.	WUTIP	STORM	27/9/2013	28/9/2013	10	30 (Sarawak, Labuan FT, Sabah, Langkawi, Perlis, Kedah, Penang, Perak, Selangor, Kelantan, Terengganu, Pahang, East Johore, Palawan, Layang-Layang, Condore, Reef North & Phuket)
		TYPHOON	28/9/2013	30/9/2013	17	
		STORM	30/10/2013	1/10/2013	4	

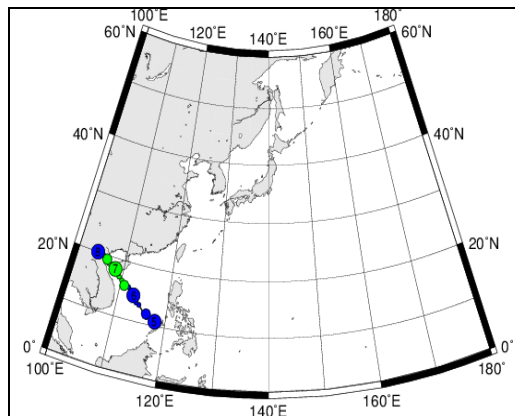
No.	Name	Category	Date		Total No. of Advisories	Total No. of Strong Wind/Rough Seas Warnings due to Tropical Cyclones (area affected)
			Start	End		
17.	FITOW	STORM	2/10/2013	4/10/2013	19	36 (Langkawi, Perlis, Kedah, Penang, Selangor, N. Sembilan, Malacca, West Johore, Pahang, Kelantan, Terengganu, Sarawak, Labuan FT & Sabah, Phuket, Samui, Condore, Reef North, Reef South, Layang-Layang, Palawan & Sulu)
		TYPHOON	4/10/2013	7/10/2013	19	
		STORM	7/10/2013	7/10/2013	2	
18.	DANAS	TYPHOON	7/10/2013	8/10/2013	12	11 (Langkawi, Perlis, Penang, Northern Perak, Kelantan, Terengganu, Pahang, Sarawak, Labuan FT, Sabah, North Straits of Malacca, Phuket, Samui, Tioman, Condore, Reef North, Layang-Layang, Palawan, Reef South, Sulawesi & Sulu)
19.	NARI	STORM	9/10/2013	11/10/2013	10	46 (Kedah, Penang, Perak, Selangor, Negeri Sembilan, Johore, Kelantan, Terengganu, Pahang, Johore, Sarawak, FT Labuan, Sabah, Northern Straits of Malacca, Condore, Phuket, Samui, Tioman, Bunguran, Reef North, Reef South, Layang-Layang & Palawan)
		TYPHOON	11/10/2013	15/10/2013	35	
		STORM	15/10/2013	15/10/2013	4	
20.	KROSA	STORM	30/10/2013	31/10/2013	9	11 (Kelantan, Terengganu, Pahang, East Johore, Kedah, Penang, Perak, Selangor, Negeri Sembilan, Malacca, Labuan FT & Sabah, Sarawak, Samui, Tioman, Bunguran, Condore, Reef South, Reef North, Layang-Layang, Palawan & Sulu)
		TYPHOON	31/10/2013	3/11/2013	22	
		STORM	3/11/2013	4/11/2013	11	
21.	HAIYAN	TYPHOON	7/11/2013	10/11/2013	28	32 (Sabah, Labuan FT, Sarawak, Kelantan, Terengganu, Pahang, East Johore, Selangor, N. Sembilan, Malacca, West Johore, Condore, Reef North, Reef South, Palawan, Layang-Layang, Samui, Tioman, Bunguran, Sulu & Sulawesi)
		STORM	10/11/2013	11/12/2013	6	



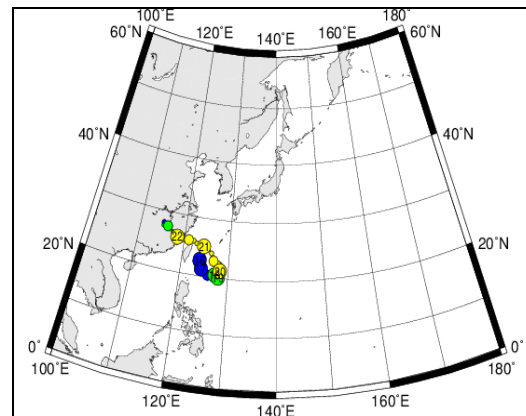
SONAMU



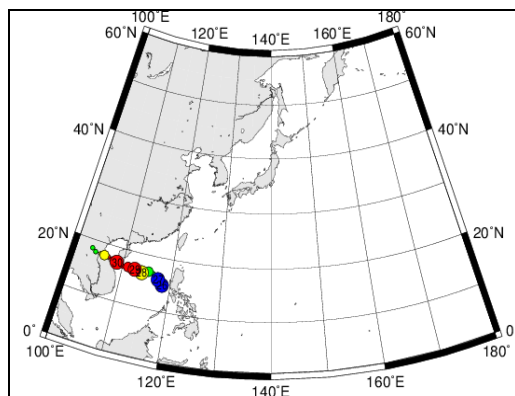
CIMARON



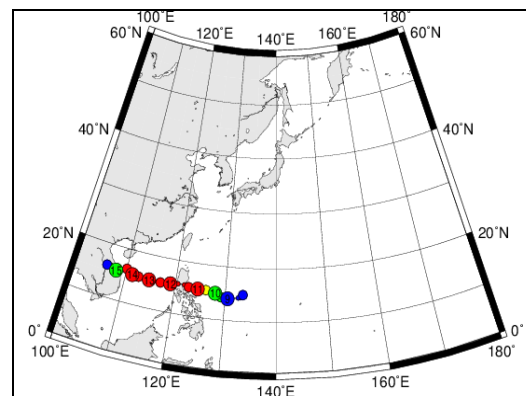
MANGKHUT



TRAMI

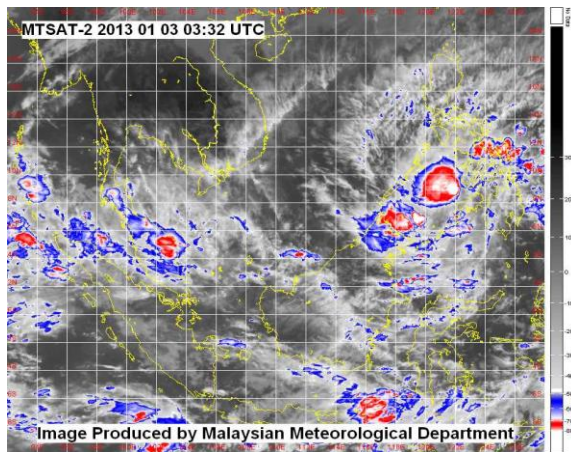


WUTIP

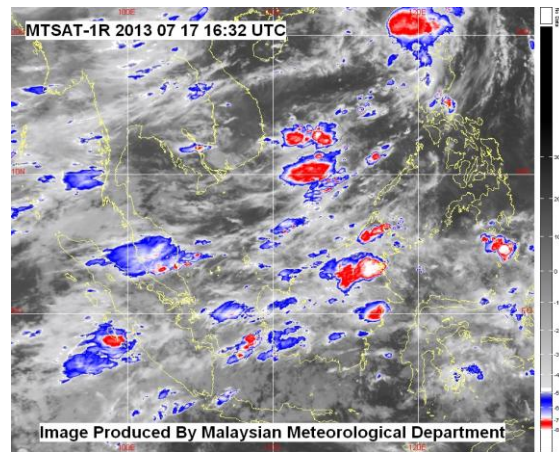


NARI

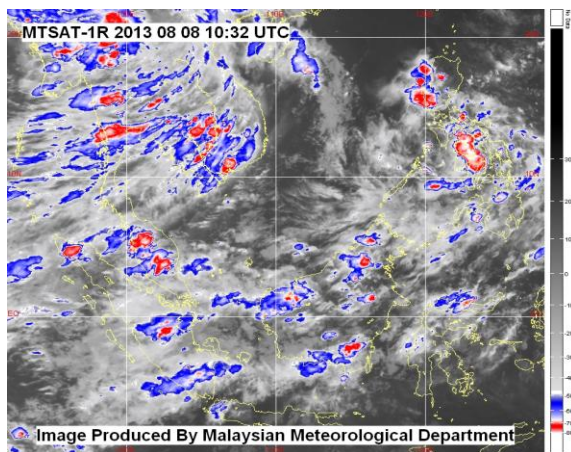
Figure 1: Tracks of six (6) tropical storms and typhoons closest to Malaysia from January 2013 until October 2013. The number in the circle represents the date of occurrence of the tropical storms and typhoons. (Source: National Institute of Informatics (NII), Research Organization of Information and Systems (ROIS), Japan <http://agora.ex.nii.ac.jp/digital-typhoon/latest/track>)



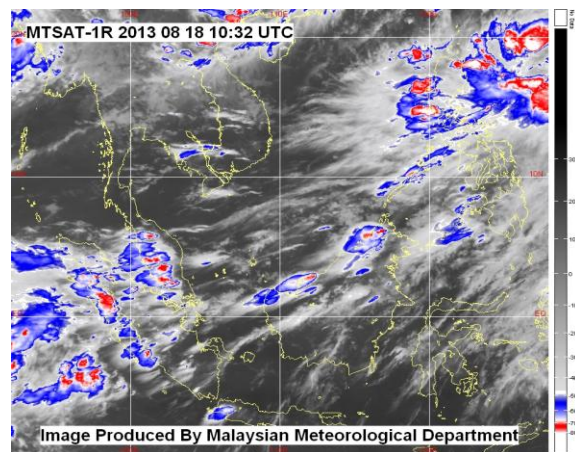
SONAMU



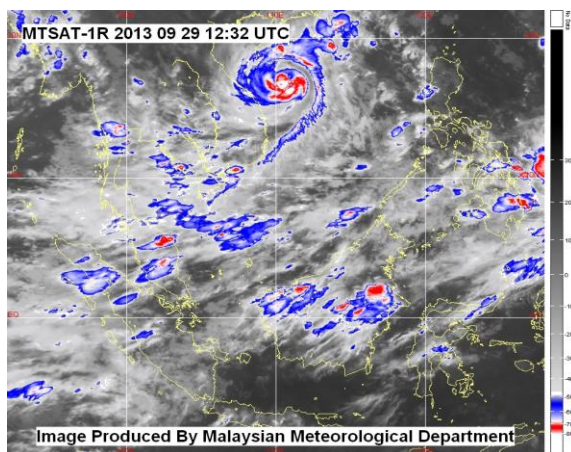
CIMARON



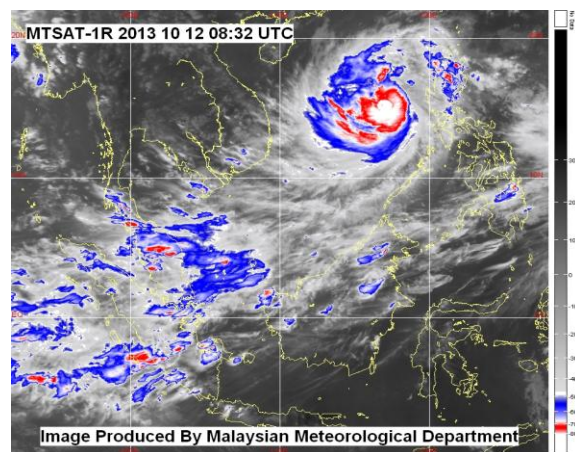
MANGKHUT



TRAMI

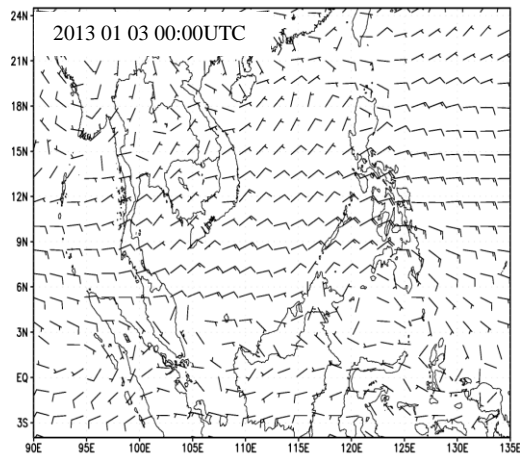


WUTIP

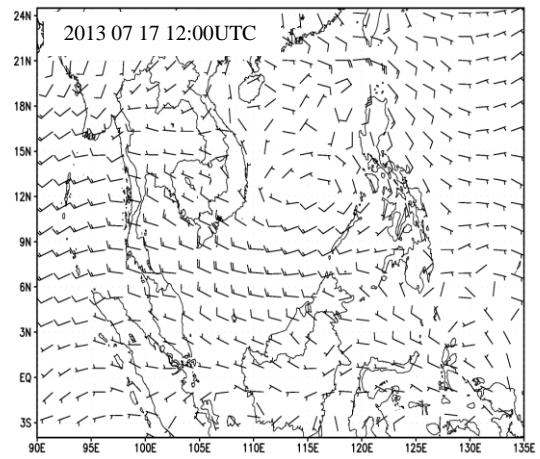


NARI

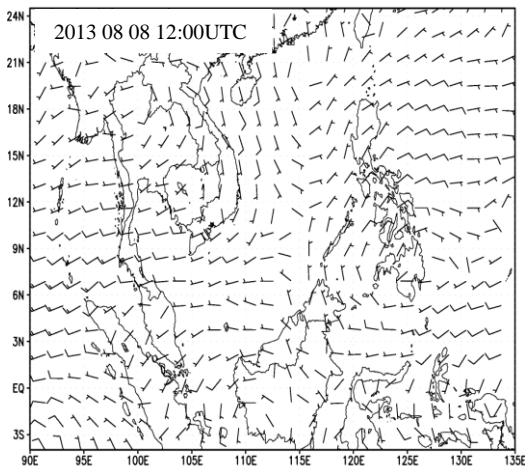
Figure 2: MTSAT-1R satellite imageries showing the rain cloud clusters associated with some of the selected tropical storms and cyclones over the Malaysia region from 1st January 2013 to 31st October 2013.



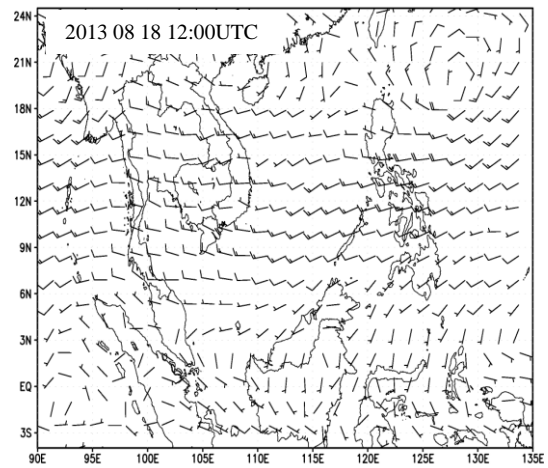
SONAMU



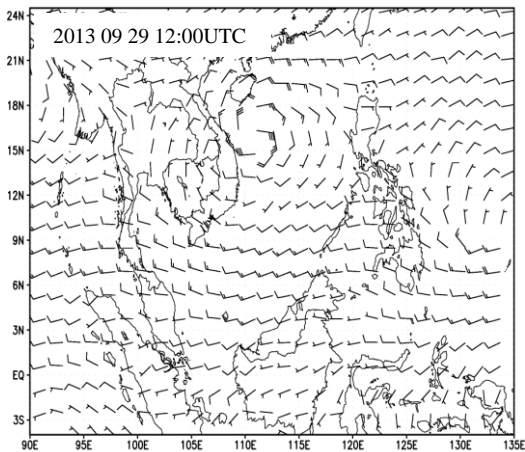
CIMARON



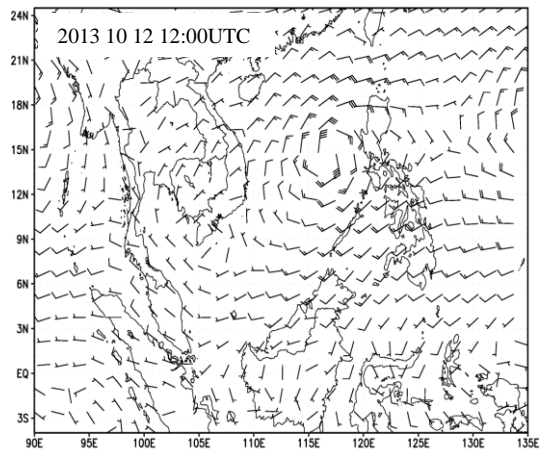
MANGKHUT



TIRAMI



WUTIP



NARI

Figure 3: 850 hPa wind charts from Global Forecast System (GFS) analysis showing wind pattern during the passage of the tropical storms Sonamu, Cimaron, Mangkhut, Trami, typhoons Wutip and Nari.

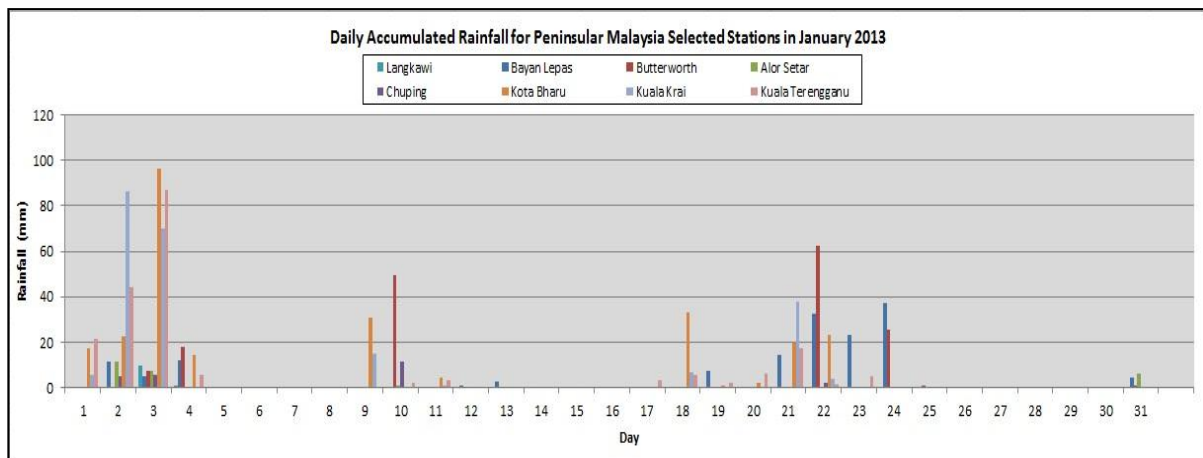


Figure 4a Daily rainfall chart of selected meteorological stations in Peninsular Malaysia for January 2013: Tropical Storm SONAMU (3/1/2013 – 8/1/2013)

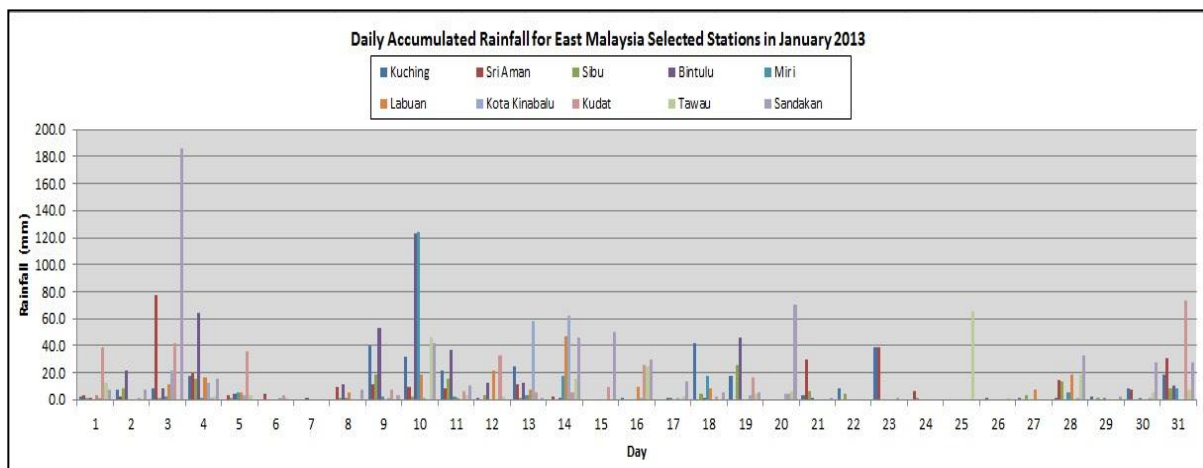


Figure 4b Daily rainfall chart of selected meteorological stations in East Malaysia for January 2013: Tropical Storm SONAMU (3/1/2013 – 8/1/2013)

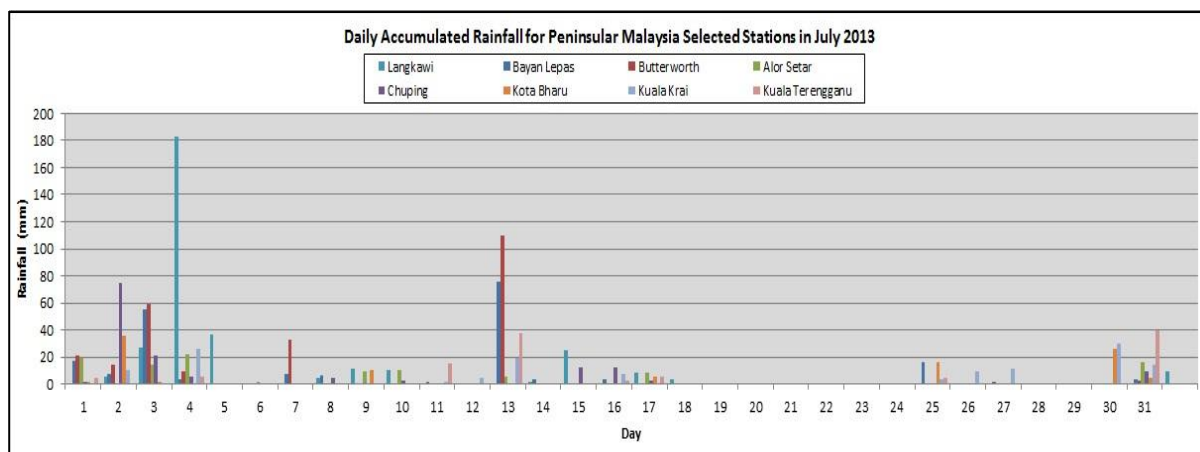


Figure 4c Daily rainfall chart of selected meteorological stations in Peninsular Malaysia for July 2013: Tropical Storm CIMARON (17/7/2013 – 18/7/2013)

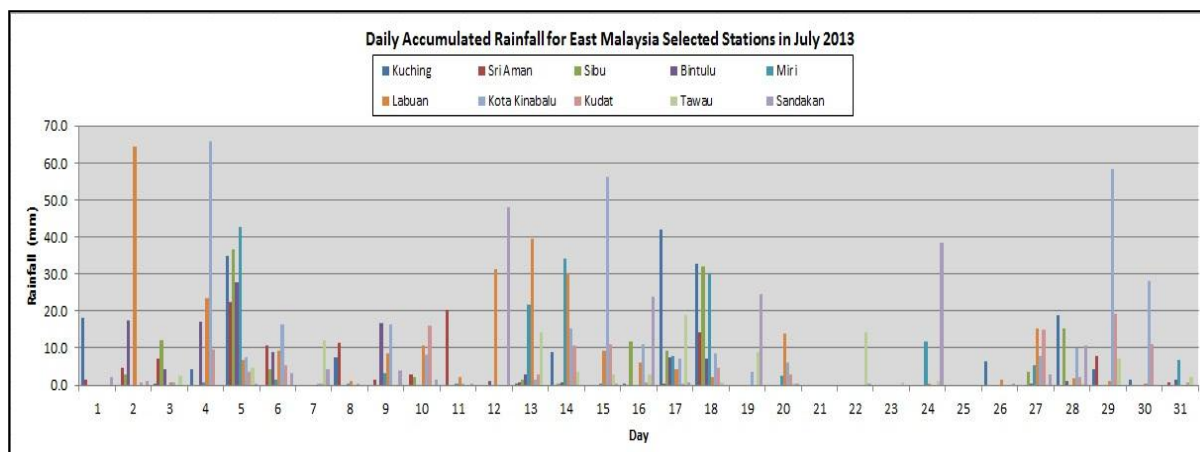


Figure 4d Daily rainfall chart of selected meteorological stations in East Malaysia for July 2013: Tropical Storm CIMARON (17/7/2013 – 18/7/2013)

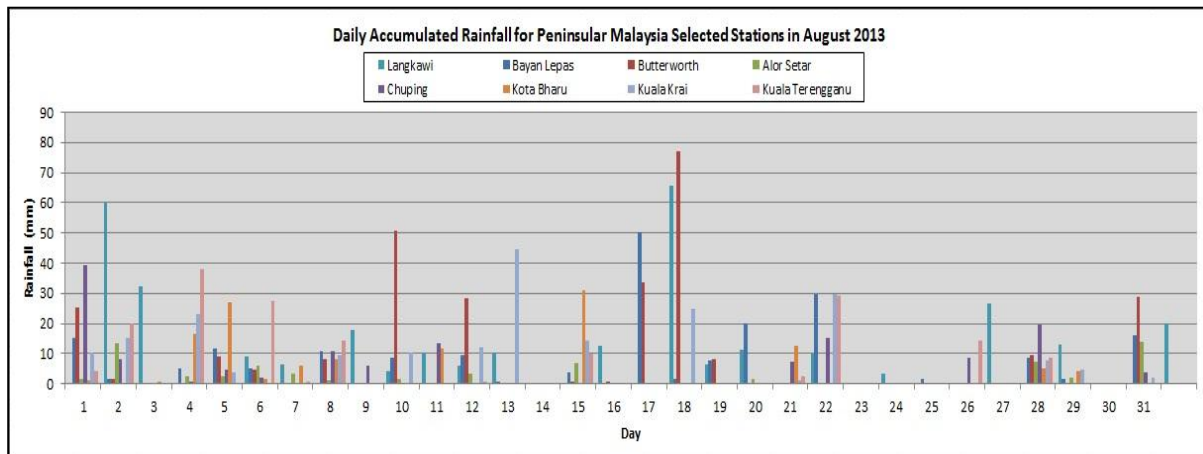


Figure 4e Daily rainfall chart of selected meteorological stations in Peninsular Malaysia for August 2013: Typhoon MANGKHUT (6/8/2013 – 8/8/2013) and Tropical Storm TRAMI (18/8/2013 – 22/8/2013)

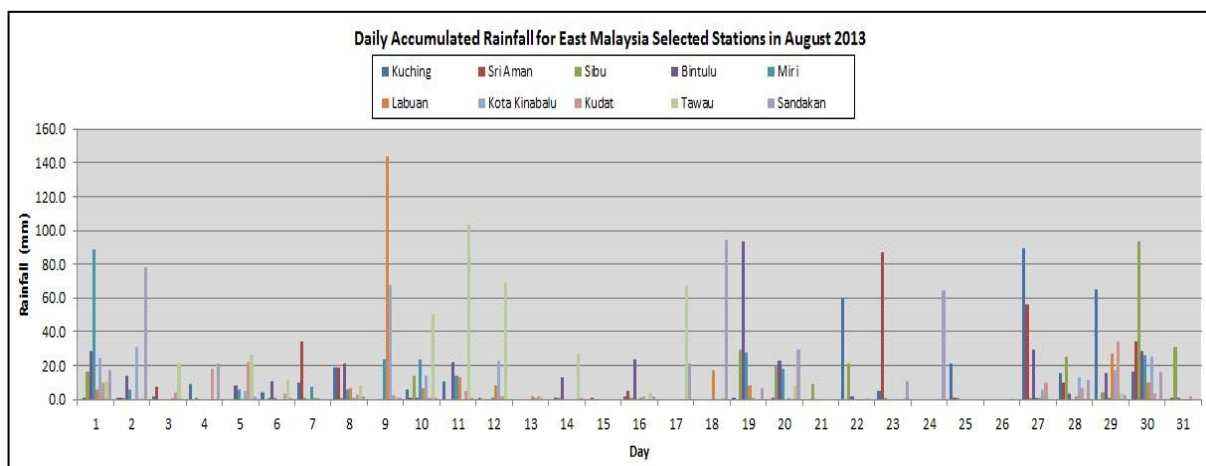


Figure 4f Daily rainfall chart of selected meteorological stations in East Malaysia for August 2013: Typhoon MANGKHUT (6/8/2013 – 8/8/2013) and Tropical Storm TRAMI (18/8/2013 – 22/8/2013)

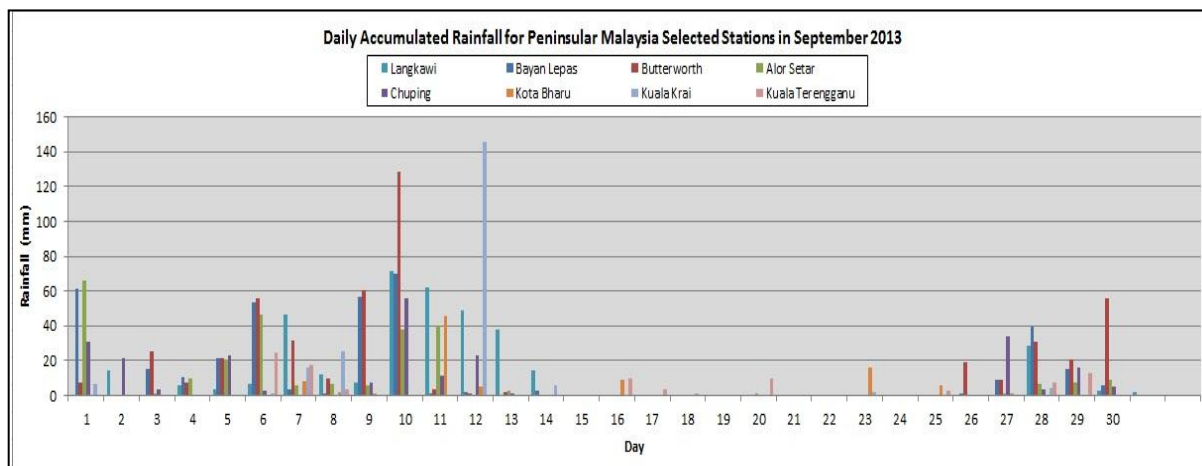


Figure 4g Daily rainfall chart of selected meteorological stations in Peninsular Malaysia for September 2013: Tropical Storm YUTU & TOTAJI (1/9/2013 – 4/9/2013), Tropical Storm MAN-YI (12/9/2013 – 16/9/2013), Typhoon USAGI (16-9/2013 – 23/9/2013), Tropical Storm PABUK (21/9/2013 – 27/9/2013), Typhoon WUTIP (27/9/2013 – 30/9/2013) and Tropical Storm SEPAT (30/9/2013-2/10/2013), Tropical Storm FITOW (30/9/2013 – 7/10/2013)

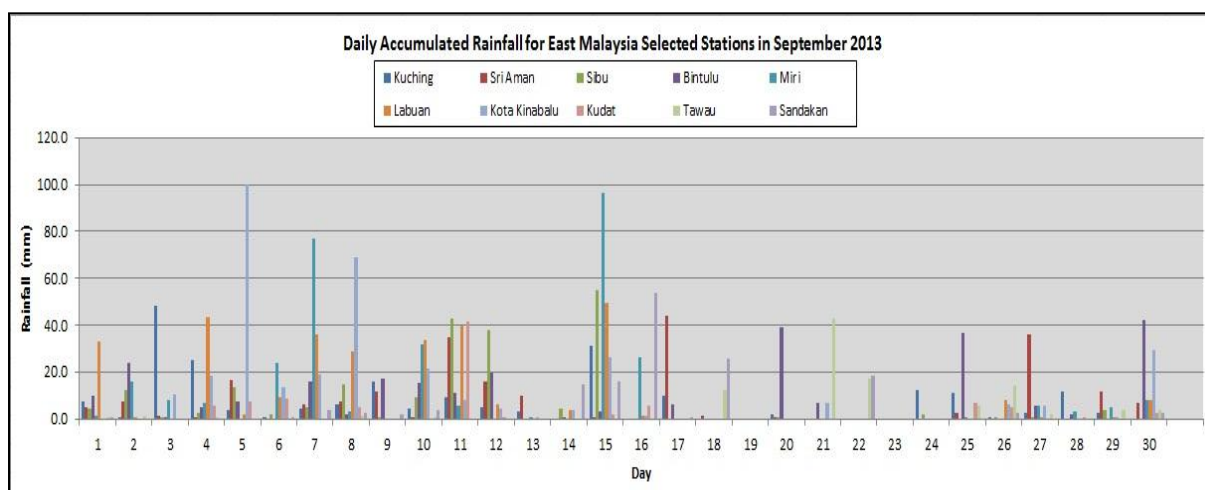


Figure 4h Daily rainfall chart of selected meteorological stations in East Malaysia for September 2013: Tropical Storm YUTU & TOTAJI (1/9/2013 – 4/9/2013), Tropical Storm MAN-YI (12/9/2013 – 16/9/2013), Typhoon USAGI (16-9/2013 – 23/9/2013), Tropical Storm PABUK (21/9/2013 – 27/9/2013), Typhoon WUTIP (27/9/2013 – 30/9/2013) and Tropical Storm SEPAT (30/9/2013-2/10/2013), Tropical Storm FITOW (30/9/2013 – 7/10/2013)

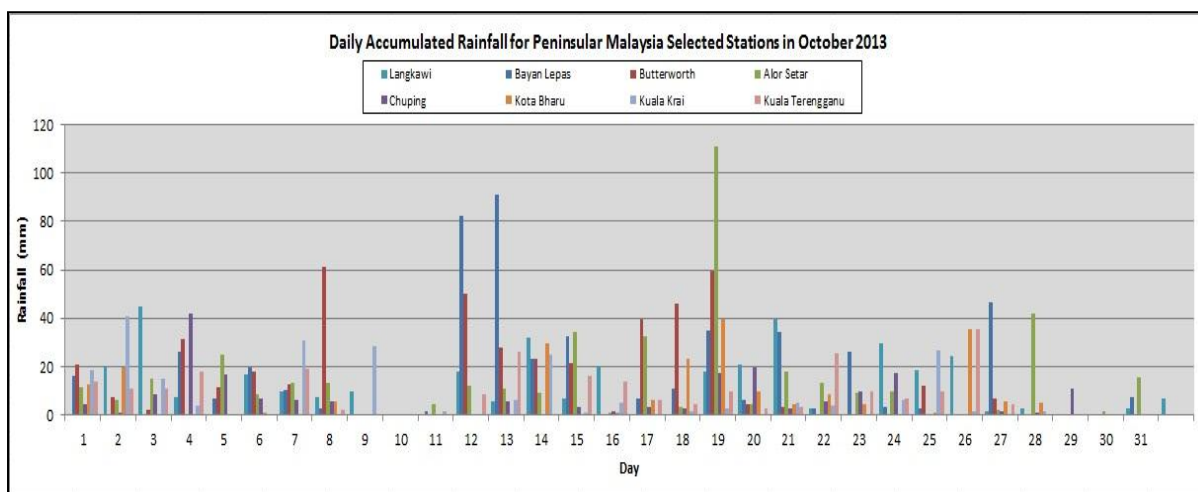


Figure 4i Daily rainfall chart of selected meteorological stations in Peninsular Malaysia for October 2013: Typhoon DANAS (4/10/2013 – 9/10/2013), Typhoon NARI (9/10/2013 – 15/10/2013), Typhoon WIPHA (10/10/2013 – 16/10/2013), Typhoon FRANCISCO (16/10/2013 – 26/10/2013), Typhoon LEKIMA (20/10/2013 – 26/10/2013), Typhoon KROSA (29/10/2013 – 4/11/2013)

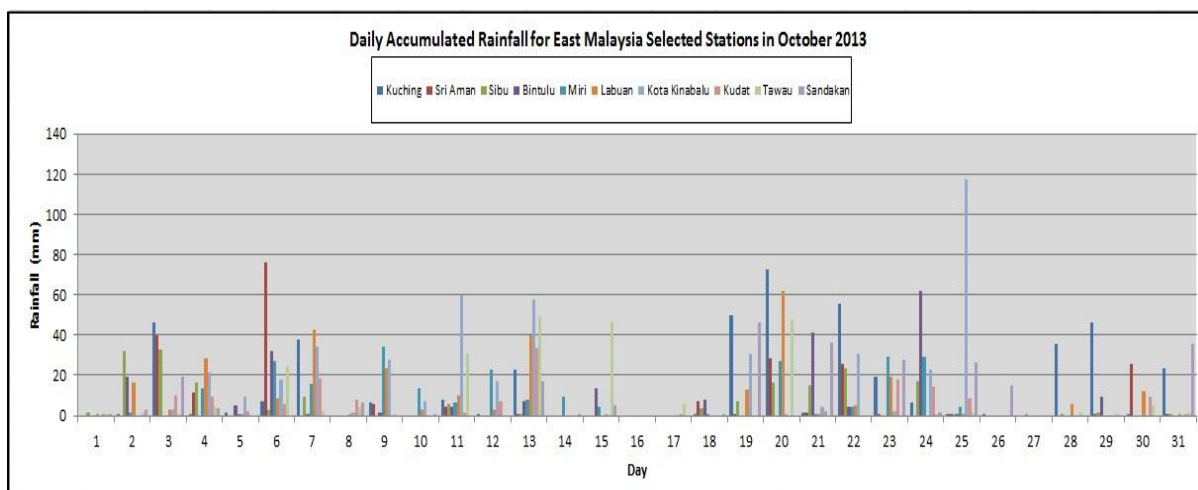


Figure 4j Daily rainfall chart of selected meteorological stations in East Malaysia for October 2013: Typhoon DANAS (4/10/2013 – 9/10/2013), Typhoon NARI (9/10/2013 – 15/10/2013), Typhoon WIPHA (10/10/2013 – 16/10/2013), Typhoon FRANCISCO (16/10/2013 – 26/10/2013), Typhoon LEKIMA (20/10/2013 – 26/10/2013), Typhoon KROSA (29/10/2013 – 4/11/2013)

2. Hydrological Assessment

Prolonged heavy rainfalls during the Northeast Monsoon, from November 2012 to January 2013 have caused severe floods in low-lying area especially in the northern and eastern regions of Peninsular Malaysia and East Malaysia. The monsoon heavy rainfall is unrelated to tropical cyclone. Malaysia also faces flash floods due to heavy thunderstorms.

II Summary of progress in Key Result Areas

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

1.1 Hydrological Achievements/Results

Improvement of Facilities

The Department of Irrigation and Drainage (DID) to-date has installed 489 telemetry stations. As part of the local early flood warning system, 1223 manual flood gauges, 152 flood warning boards and 419 automatic flood warning sirens were installed in flood prone areas.

Several flood forecasting models have been developed to support flood forecasting tasks in DID, namely:-

1. Integrated Flood Forecasting and River Monitoring System (iFFRM) for Klang Valley
2. Atmospheric Model Based Rainfall & Flood Forecasting System (AMRFF) for Pahang, Kelantan and Johor rivers
3. Integrated Flood Forecasting and Warning System for Muda river basin
4. Integrated Atmospheric and Radar-Satellite Model-Based Rainfall and Flood Forecasting for Sarawak river basin
5. Integrated Flood Forecasting and Warning System Based on Real Time Radar Rainfall for Padas river basin
6. Integrated Flood Forecasting and Warning (IFFW) System for Dungun river basin

All these models are currently in operation, and the reliability of each model is currently being assessed. All models will be calibrated from time to time especially in areas that face rapid changes e.g. Klang Valley as changes in the areas may alter the hydrodynamic behaviour of the river.

Continuous efforts are taken in providing flood forecast in Malaysia. In 2013, DID continue to develop a flood forecasting system for Kerian river basin, with a catchment area of 1,418 km². The Kerian river basin spreads into three states, namely Perak, Kedah and Seberang Prai, Pulau Pinang. The system is expected to be completed and ready for forecasting by end of 2014.

2. Minimized Typhoon-related Social and Economic Impacts.

2.1 Meteorological Achievements/Results

Weather Monitoring Area

The Malaysian Meteorological Department (MMD) performs continuous monitoring of the weather and sea conditions especially in the Malaysian Exclusive Economic Zone (EEZ) covering the Straits of Malacca, South China Sea, Sulu Sea and Celebes Sea. In addition, monitoring of weather and sea conditions outside the EEZ is also conducted to identify meteorological and oceanographic phenomena which may affect waters in the EEZ in the next few days.

2.2 TROPICAL DEPRESSION/TROPICAL STORM / TYPHOON ADVISORIES / WARNINGS

A tropical depression/tropical storm/typhoon advisory/warning is issued based on analysis of satellite imageries, wind charts, Numerical Weather Prediction (NWP) products and information from tropical cyclone monitoring centres such as Regional Specialized Meteorological Center (RSMC) Tokyo-Typhoon Center, Joint Typhoon Warning Center (JTWC) and RSMC Tropical Cyclones New Delhi. The advisory/warning is issued for tropical depression/tropical storm/typhoon in the Malaysian EEZ, Straits of Malacca, Indian Ocean, South China Sea, Sulu Sea and the western North Pacific Ocean. Special attention will be given to tropical depression/tropical storm/typhoon which have impacts on the weather and sea condition in the Malaysian EEZ.

As of 23 October 2013, the MMD issued 659 tropical depression/tropical storm/typhoon advisories based on information from RSMC Tokyo-Typhoon Center. A total of 324 advisories/warnings on strong winds and rough seas due to the effect of these tropical depression/tropical storm/typhoon were issued.

Towards the end of 2012, the MMD sent two of its officers to attend a two-month training attachment at the Hong Kong Observatory (HKO). One of the officers was awarded a fellowship under The Typhoon Committee Trust Fund while the MMD provided funding for the other officer to participate in the training to gain invaluable experience and exposure. One of the main objectives of the attachment was to learn about the HKO's nowcasting system called Short-range Warning of Intense Rainstorms in Localized Systems (SWIRLS) and further explore the possibility of adopting the system for use in MMD. Upon the completion of the training, the SWIRLS was installed successfully and is still undergoing further tests to determine its suitability for operational use.

3. Improved Typhoon-related Disaster Risk Management in Various Sectors

3.1 The Role of The Department of Social Welfare

The Department of Social Welfare takes the responsibility of providing and managing relief / evacuation centres during floods. Its tasks include providing food, clothing and other essential items to victims. The Department's roles and responsibilities in disaster management have three levels, namely:-

- i. Preparedness Stage
- ii. Response Stage; and
- iii. Recovery/Restoration Stage

3.1.1 Preparedness Stage

The Department of Social Welfare prepares a list of officers who will be on standby at district and state levels as well as at evacuation centres who can be contacted at any time during a disaster. The Department is responsible for identifying suitable evacuation centres. The criteria and guidelines for the selection of evacuation centres are as follows:

- i. The building has enough space and is safe to use in terms of structure;
- ii. Location of building is safe from potential disaster area; and

- iii. Facilities and basic amenities such as water supply, electricity and etc. are available.

Currently, the Department of Social Welfare has identified a total of 5,068 evacuation centres located in each district across the country with a capacity that can cater for up to a total of 1.3 million people nationwide. These centres are well stocked to provide victims with their basic needs. The Department of Social Welfare has five depots for the storage of food and other necessities. The depots are divided into zones such as North, South, Middle, East 1 and East 2.

At the same time, the Department of Social Welfare also establishes and coordinates a task force of volunteers. The volunteers must be registered with the Department. There are currently 2,473 registered volunteers. These volunteers are provided basic training on carrying out tasks at evacuation centres. Such training prepares volunteers to assist flood victims.

3.1.2 Response Stage

Upon getting instructions to open disaster evacuation centres from the Chairman of District Disaster or Disaster Operations Commander, the Department of Social Welfare is responsible for organising disaster evacuation centres to perform the following tasks:

- i. Registration of disaster victims;
- ii. Distribution of food, clothing, blankets, mats and other necessities;
- iii. Coordinate and mobilise a task force of volunteers to assist in the registration of victims, cooking, food distribution etc;
- iv. Organise suitable activities in the evacuation centres such as indoor games, religious activities, motivational talk, story-telling for children etc; and
- v. Provide advice, guidance and post-trauma counselling services to victims suffering from trauma, depression etc.

Evacuation centres are managed by a committee which is made up of local leaders, volunteers, community members,

government agencies, private companies. The centres are headed by local leaders. To facilitate the operations of the disaster evacuation centres, several subcommittees have been formed, namely:

- a) Subcommittee on Registration of Disaster Victims;
- b) Subcommittee on Needs and Food Supply;
- c) Subcommittee on Cleanliness;
- d) Subcommittee on Safety and Health; and
- e) Subcommittee on Activities.

The roles of each subcommittee are as follows:

a) Subcommittee on Registration of Disaster Victims

- Open registration counters which are divided into three categories, namely:
 - i. registration counter for disaster victims;
 - ii. registration counter for Persons with Disabilities and older persons; and
 - iii. information counters.

b) Subcommittee on Needs and Food Supplies

- Division of duties is as follows:
 - i. preparation of four meals a day;
 - ii. scheduling of cooking tasks;
 - iii. ensuring that the quantity of raw materials is sufficient at the evacuation centres; and
 - iv. distribution of supplies to disaster victims.
- Work closely with the Subcommittee on Registration of Disaster Victims to coordinate supplies and food for victims.
- Ensure balanced meals for victims and ensure that the supply of food at evacuation centres is sufficient.
- Ensure that each victim is given proper attention in terms of food supply especially to:

- i. infants and children;
 - ii. pregnant women and postnatal mothers;
 - iii. older persons; and
 - iv. chronically ill victims.
- Monitor the process of food preparation and food quality at evacuation centres through collaboration with the Ministry of Health Malaysia.
- Coordinate volunteers from the Malaysian Red Crescent Society and other volunteers in food preparation areas such as:
 - i. distribution of food to disaster victims; and
 - ii. cleanliness of food preparation areas

c) Subcommittee on Cleanliness

- Maintain cleanliness at evacuation centres.
- To ensure adequate signages and specific prohibitions are displayed at evacuation centres.

d) Subcommittee on Safety and Health

- To create a perimeter for evacuation centres.
- Schedule security patrol at evacuation centres.
- Control and secure the movement of victims and personnel in and out of the evacuation centres.
- Traffic Control and Road Safety Control.
- Ensure that first-aid kits are always available and sufficient.

e) Subcommittee on Activities

- Ensure various programs are held to provide activities for the victims whilst at the evacuation centres to reduce depression and effects of a trauma.

- Among the activities are handicraft making, watching videos or television, religious activities, motivational talks etc.

3.2 Recovery/Restoration Stage

During Recovery/Restoration Stage, the Department of Social Welfare is responsible:

- to evaluate the damages involved, including damages to houses, crops and livestock;
- to propose and draw up appropriate rehabilitation programmes or plans; and
- to provide short-term or long-term relief / aid from the existing financial aid schemes.

Short Term Assistance Plan

Food supplies of 3 to 7 days will be provided to family members returning to their homes. They are also given family hygiene kits and cleaning items.

Long Term Assistance Plan

Long term assistance for victims includes financial assistance to help alleviate their hardship. Currently, 6 types of recovery financial aid are available:

Type of Assistance	Financial Aid
Schooling	Stationery - RM50 (USD 15.367) per person Uniforms - RM70 (USD 21.93) per person
Clothing	RM70 (USD21.93) per person
Family expenses	RM40 (USD12.54) per person
Essential needs for home / kitchen	RM100 (USD31.33) per family
Repair of houses	Maximum RM2,500 (USD 782.21)
Recovery of small scale businesses	Maximum RM3,000 (USD 939.61) per person

Note: Every family is given a maximum of RM5,000 (USD1,567.67)

The success and effectiveness of disaster prevention and preparedness depends on the cooperation, understanding and capabilities of all the relevant agencies in fulfilling their responsibilities. Disaster prevention and preparedness of a sustainable disaster management programme involves an outreach approach and inter-agency collaboration as well as support from the private sector, non-governmental organisations and the community. Well-coordinated measures will ensure victims of natural disasters such as floods find some relief and comfort to help them overcome their sense of loss.

4. Strengthened Resilience of Communities to Typhoon-related Disasters.

4.1 Hydrological Achievements/Results

Water level and flood information are disseminated to the authorities and public via mobile phone text messages, emailing and the website <http://infobanjir.water.gov.my>. This website has been enhanced and improved in terms of IT technology, hardware, procurement and network expansion as well as its contents to meet the requirements of technical staff in monitoring the flood situation in the country. The <http://publicinfobanjir.water.gov.my> website was developed and designed to be more public-friendly. Besides these, DID also has taken up the initiative to communicate with the public on flood events at social network pages, e.g facebook at www.facebook.com/pages/PublicInfoBanjir

5. Improved Capacity to Generate and Provide Accurate, Timely, and understandable Information on Typhoon-related Threats.

5.1 Meteorological Achievements/Results

The Malaysian Meteorological Department (MMD) is responsible in providing meteorological and oceanographic information and services which include forecast up to seven days on weather and sea condition over its Exclusive Economic Zone (EEZ) covering the Straits of Malacca, South China Sea, Sulu Sea and Celebes Sea. In supporting increasing activities over its territorial waters and the adjacent seas, the MMD continuously monitors the weather and seas state and issuing of advisories and warnings if required.

From January to September 2013, a total of 10 advisories and 74 warnings on strong winds and rough seas were issued. These

warnings include 39 first category, 27 second category and eight on third category warnings which are categorized as below:

Warning Stages	Criteria
First Category	Strong wind with speed from 40-50 kmph and rough sea with wave rough up to 3.5 meter. or Tropical Depression / Tropical Storm detected over the rough seas (more than 400 km or 200 nautical miles from the coast bringing strong winds and rough seas are described above.
Second Category	Strong wind with speed from 50-60 kmph and rough sea with wave height up to 4 – 5 meter. or Tropical Depression / Tropical Storm detected in the high seas of the EEZ Malaysia and increasing in intensity
Third Category	Strong wind with speed from 60 kmph and rough sea with wave height more than 4.5 meter. or Tropical storm / typhoon heading towards the coastal areas of Malaysia.

During the same period, the MMD monitored the development of 16 tropical depressions (TD) of which 12 developed into tropical storm (TS) and four reached typhoon (TY) intensity. Among the typhoons are Soulik, Utor, Usagi and Wutip while the tropical storms in the list are Sonamu, Shanshan, Yagi, Leepi, Bebinca, Rumbia, Cimaron, Jebi, Mangkhut, Trami, Kong-Rey and Toraji.

5.2 Research, Training, and Other Achievements/Results

Research and Training

For capacity building, six officers from MMD had respectively attended the following symposium, seminar and workshops:

- i. 45th Typhoon Committee Session, 29 Jan – 1 Feb 2013, Hong Kong, China
- ii. International Training Course on Nowcasting, 7-17 May 2013, Beijing, China
- iii. Workshop on Synergized Standard Operating Procedures (SSOP) for Coastal Multi-Hazards Early Warning System, 8-9 May 2013, Bangkok, Thailand

- iv. 2013 ACTS First Workshop: Advanced Technology On Typhoon Forecasting And Its Social Implications, 6-7 June 2013, Taipei, Taiwan
- v. 2013 APEC Typhoon Symposium (ACTS), 21-23 Oct 2013, Taipei, Taiwan
- vi. Typhoon Committee Research Fellowship Scheme for 2012: Enhancement of Rainfall Nowcast in Tropical Cyclone Situations, Hong Kong Observatory, 22 Oct – 22 Dec 2012, Hong Kong

5.3 Meteorological Radar

To enhance radar coverage and the severe weather monitoring activities, MMD plan to have four new radar stations at Marang in Terengganu, Kuala Rompin in Pahang, Sibul in Sarawak and Tawau in Sabah respectively. The Butterworth Radar Station will move to Kuala Gula in Perak. These projects have been approved by the government and expected to be completed by 2015.

5.4 Information and Communication Technology (ICT)

To ensure the sustainability of services through the department's web portal, the ICT Division has established backup system for the MMD's web portal at the Disaster Recovery Centre which is located in the KLIA Meteorological Office, Sepang, Selangor. The backup system then will be maintained according to schedule to make sure thT it is ready anytime in case of emergency.

III Update of Members' Working Groups representatives

i. Working Group on Meteorology

Mr. Alui bin Bahari
Deputy Director
Malaysian Meteorological Department
Jalan Sultan
46667 Petaling Jaya
Selangor
Malaysia
Email: alui@met.gov.my

ii. Working Group on Hydrology

Mdm. Hajjah Paridah Anun bt Tahir
Deputy Director
Hydrology and Water Resources Division
Department of Irrigation & Drainage
Km. 7, Jalan Ampang
68000 Ampang
Kuala Lumpur
Malaysia
Email: paridah_a@water.gov.my

iii. Working Group on Disaster Prevention and Preparedness

Mr. Mohd Ariff bin Baharom
Under Secretary
Disaster and Crisis Management Division
National Security Council
Aras G, Blok Barat
Bangunan Perdana Putra
62502 Putrajaya
Malaysia
Email: ariff@mkn.gov.my

iv. Training and Research Coordinating Group

Dr. Wan Azli Wan Hassan
Director
Technical Development Division
Malaysian Meteorological Department
Jalan Sultan
46667 Petaling Jaya
Selangor
Malaysia
Email: wanazli@met.gov.my

v. Resource Mobilization Group

Ms. Rosmahwati Ishak
Director
Socioeconomic Development and Financial Assistance Division
Department of Social Welfare Malaysia
Aras 9, No. 55, Persiaran Perdana
Presint 4
62100 Putrajaya
Malaysia
Email: rosmahwati@jkm.gov.my

SUMMARY OF PROGRESS IN KEY RESULT AREAS (KRAs)

I. Meteorology

Item 1: International Training Course on Nowcasting

The International Training Course on Nowcasting was organized by WMO Regional Meteorological Training Center, Beijing, China, from 7 May 2013 to 17 May 2013. The course was aimed to enhance the capabilities of participants in the application and interpretation of weather radar forecast products, and to enhance the nowcasting and the short-term and strong convective weather forecasting ability in developing countries. The content of the lectures included radar signature, interactive mode between forecasters and AutoNowcaster (ANC) windstorm, rainstorm and hailstorm nowcast, introduction of VIPS, and lab practices.

Mr. James Wilson and Mrs. Rita Roberts, well-known radar meteorology experts from NCAR were invited to give lectures for the training course. Professor Xiaoding Yu from the China Meteorological Administration Training Center (CMATC) also joined in the team of the instructors. Prof Dr. Ding Xiao Yu, who is a trainer of the CMATC in Beijing, China, also delivered lectures related to the theories of convective weather.

The benefit from this course is enhancement of the forecaster's nowcasting skills that have been practiced by all the forecasters to monitor weather conditions especially at the airport by using all available information such as METAR, SPECI, Tephigram, Wind Charts, Radar & Satellite Images and all available prediction models.

The WMO Regional Training Center (RTC) needs to conduct more related meteorological courses to fulfill the future human resources development needs.

Summary Table of KRAs and components for Item 1:

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

Member:	Malaysia	Name of contact for this item:	Mr. Delan Lah
Telephone:	+6082-617736	Email:	lahdelan@met.gov.my

Item 2: 2013 ACTS First Workshop: Advanced Technology Of Typhoon Forecasting And Its Social Implications

The Workshop organized by Asia-Pacific Economic Cooperation (APEC) Research Centre for Typhoon and Society (ACTS) was held in National Taiwan University (NTU), Taipei, Taiwan (APEC), from 6 - 7 June 2013. The workshop objectives were to offer participants from APEC member economies with a thorough introductory course in ensemble forecasting and its applications, demonstrate recent advancements in tropical cyclone ensemble forecast applications/products in Chinese Taipei and/or other member economies, facilitate exchange of information among APEC member economies in applying ensemble forecasting for typhoon/flood forecasts, and to advance development and utilization of ensemble forecasts.

This workshop was conducted by experts from Development Manager Hurricane Forecast, National Oceanic and Atmospheric Administration (NOAA), Disaster Prevention Research Institute, Kyoto University, Chilean Weather Service, Thai Meteorology Department (TMD), and Taiwan Typhoon Flood Research Institute (TTFRI). They were invited to give lectures that were related to ensemble forecast models and weather disaster risk management in supporting decision making.

In general, Malaysia is located out of typhoon track area. However the threat of heavy rains and strong wind due to typhoon exists. By using the ensemble forecast model, a better prediction for a desired area can be provided and thus disaster management can be done in more effective and systematic way.

Summary Table of KRAs and components for Item 2:

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

Member:	Malaysia	Name of contact for this item:	1. Mr. Nashriq Ab Rahman 2. Ms. Arnizah Jaafar
Telephone:	1.+6088-413690 2.+603-87872391	Email:	1. nashriq@met.gov.my 2. arnizah@met.gov.my

Item 3: Radar Echo Tracking with SWIRLS Model

The research project cum training attachment “Enhancement of Rainfall Nowcast in Tropical Cyclone Situations” was performed under the aegis of the Typhoon Research Committee Fellowship 2012, and hosted by the Hong Kong Observatory (HKO). This project adopted a hands-on approach in transferring knowledge, technique and skill in data processing, computer scripting and programming in C and Linux, and also presenting high quality graphical output relevant to the field of radar and of typhoon tracking. The training was performed via lectures. Then the participants were asked to test-run the HKO nowcasting system for selected case studies of tropical cyclones that affect Hong Kong.

Mr. Linus Yeung, Mr. Woo Wang-chun and Mr. Vincent Cheng, experts in the field of meteorological nowcasting provided guidance throughout the attachment period from 22 October until 21 December 2013. The lectures covered the topics of radar data analysis, heavy rainfall nowcasting, as well as HKO standard operating procedures in cases of severe weather.

This course provides participants with good exposure in rain-gauge and radar data analysis techniques for research purposes, as well as preparation in running nowcasting models.

It is imperative for future consideration that training in the HKO nowcasting system (SWIRLS) be expanded to include more Malaysia raingauge, radar, as well as numerical weather prediction data in order to further enhance extreme rainfall nowcasting in the tropics.

Summary Table of KRAs and components for Item 3:

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

Member:	Malaysia	Name of contact :	Mr. Yip Weng Sang
Telephone:	+603-87872181	Email:	yipws@met.gov.my

II. Hydrology

Item 4: Flood Forecasting System Using Xin'Anjiang Model

Following the Typhoon Committee 45th session Meeting held in January 2013 in Hong Kong, a knowledge transfer session in developing flood forecasting system using Xin'Anjiang model is conducted in Kuala Lumpur, Malaysia from 21 to 25 October 2013. Two experts from China, Dr Hou AiZhong (Bureau of Hydrology, Ministry of Water Resources, China) and Mr AnDong (PhD student from HoHai University) were invited to share their expertise. This session involves young engineers of Department of Irrigation and Drainage Malaysia (DID) Malaysia, university and local consultants (± 30 participants) who are the main drivers in developing flood forecasting system in Malaysia.

Succeeding knowledge transfer session held in Kuala Lumpur, flood forecasting using Xin'Anjiang model was carried out for Segamat river basin. DID has identified the needs to continue this program in 2014, expanding the model to include the possibility to automate the forecasting task and linking to DID's telemetry station. Looking at this plan, a further collaboration with China is deemed necessary.

Summary Table of KRAs and components for Item 4:

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

Member:	Malaysia	Name of contact for this item:	Noor Aishah Zaharin
Telephone:	+6012-2250025	Email:	aishah@water.gov.my