MEMBER REPORT

ESCAP/WMO Typhoon Committee
44th Session

6 – 11 February 2012
Hangzhou, China

(MALAYSIA)

SUMMARY OF TYPHOON COMMITTEE REPORT 2011

I. Meteorology

There were 21 typhoons and tropical storms developed over the western Pacific Ocean, South China Sea and the Philippines regions in 2011. This figure is about 20% lower than the average number of 26.2 cyclones per year recorded from 1951 to 2010.

The presence of typhoons and tropical storms in the South China Sea and Philippines regions caused the strengthening of the southwesterly winds over the Malaysia region. The impacts were generally restricted to increase in rainfall and wind gust events due to the tail effects of the cyclones which influenced the rainfall patterns mostly over the northern Peninsular Malaysia and west coast of Sarawak and Sabah. Nock-Ten, Nesat, Nalgae and Washi had caused an increase in wind gust events in 2011. The only cyclone that had an impact of increase in rainfall was tropical storm Nock-Ten. Even then, the impact was minimal and insignificant. Thirteen out of the 21 cyclones warranted the issuance of tropical cyclone advisories while nine of them warranted the issuance of strong wind/rough sea warnings over the marine regions under the Malaysian Meteorological Department (MMD) responsibility.

Additional hardware and software improvements and upgrades were done to the existing Radar System Network when MMD installed a new Gematronik METEOR 600S radar system in Subang which was fully integrated into the network and became fully operational in October 2011. This has given better supports and services to MMD's clients as a result of enhanced radar coverage in the country. The MMD-JMA Storm Surge Model was enhanced by ingesting output data from the MMD-MM5 Typhoon Bogussing Scheme as inputs and became fully operational in June 2011 for prediction of storm surge due to strong winds caused by typhoons and tropical storms in the neighbouring waters.

For capacity building, the Typhoon Committee Roving Seminar 2011 (TCRS 2011) was organised by the ESCAP/WMO Typhoon Committee and hosted by MMD from 20-23 September 2011. The theme for TCRS 2011 was *Heavy Rain and Flood Hazards Associated with Landfalling Tropical Cyclones*. Participants were introduced to the Quantitative Precipitation Estimates/Forecasts (QPE/QPF) techniques and their applications during the seminar. In addition, three meteorological officers from MMD were sent separately in 2011 to attend the ACTS-WG Meeting and APEC Typhoon Symposium in Taiwan, First Asia-Pacific Economic Cooperation (APEC) Research Center for Typhoon and Society (ACTS) Workshop in the Philippines and the UNESCAP/WMO Typhoon Committee Integrated Workshop in Vietnam. Three research papers directly

related to tropical cyclone impacts in Malaysia were completed and presented in international conferences by the Research Division in MMD in 2011.

II. Hydrology

The northern and eastern regions of the Peninsular Malaysia experienced severe floods due to prolonged heavy rainfall events during the 2010-2011 Northeast Monsoon. These events were mainly caused by monsoon disturbances between November 2010 and January 2011 which were unrelated to tropical cyclone.

The Department of Irrigation and Drainage (DID) to-date has installed and operates about 418 telemetry stations in 38 river basins. Besides, 1694 manual flood gauges and 93 flood warning boards had been set up in flood prone areas so as to provide additional information during the flood seasons. As part of the local early flood warning system, DID operates about 423 automatic flood warning sirens installed in flood prone areas. In addition, 12 new servers were procured in 2010 to replace old terminal servers at the state level for the operational and maintenance of SCADA telemetry systems.

An Integrated Flood Forecasting and River Monitoring System (iFFRM) for the Klang Valley was recalibrated and completed by the end of December 2011. For this system, 87 new telemetric stations and infrastructure networks were installed together with a flood modelling system that include both hydrometeorology and hydrodynamic. The Atmospheric Model-Based Rainfall and Flood Forecasting (AMRFF) System had been developed for Pahang, Kelantan and Johor river basins in Peninsular Malaysia, The objective of AMRFF was to provide flood flow forecasting and their corresponding flood stages every 6 hours. Subsequently, radar rainfall analyzer and integrator for Malaysia (RAIM) had been developed in order to derive gridded areal rainfall distribution and the rainfall forecast magnitude. An Integrated Flood Forecasting and Warning System for Muda River Basin had also been developed. This model provides flood forecasting every 6 hours, with a 2-day lead time.

The Infobanjir website http://infobanjir.water.gov.my continues to be 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. Recently, a new website which was an enhancement of the Infobanjir website had been developed and designed to give relevant flood information to the general public. It is now available at http://publicinfobanjir.water.gov.my.

Nine courses and conferences were organised throughout the country by DID in 2011. Critical areas such as storm water management, flood forecasting and warning and flood mitigation were covered during these courses and conferences.

III. Disaster Prevention and Preparedness (DPP)

The National Security Council (NSC) played a vital role in coordinating the usage of meteorological and hydrological information available for relieve efforts to mitigate the impacts of massive flooding by coordinating flood preparation and evacuation procedures. The National Security Council Directive No. 20: *The Policy and Mechanism on National Disaster and Relief Management* was established on 11 May 1997 for this purpose. Due to the high intensity, complexity and occurrences of disaster, measures were taken to review and upgrade Directive No. 20 to ensure that it remained relevant and up to date in meeting these challenges. After an extensive discussion with related agencies, the reviewed Directive No. 20 is now waiting for approval by the Prime Minister.

The Emergency Command Centre (ECC) had been approved during the Mid-Term Review of the Ninth Malaysia Five-year Plan. The Government of Malaysia through the National Security Council had agreed to start the development of the centre early by 2011. When completed by the 3rd quarter of 2012, ECC will be the main centre at national level in coordinating disaster management activities. Ensuring effective communication between NSC, collaborating agencies and the affected population for any given disaster is pivotal for any Search and Rescue (SAR) and evacuation operation to proceed as effective as possible. Hence, continuous supports through ECC, Malaysian Emergency Response System (MERS 999), Government Integrated Radio Network (GIRN) and Fixed Line Alert System (FLAS) were crucial efforts undertaken to ensure effective communication in the face of any impending disaster.

The Department of Social Welfare is responsible for providing the necessities of disaster victims throughout their wait at the relieve centres until the danger has subsided. These necessities include food, clothing, guidance and counselling. The Department of Social Welfare had established good networking with food suppliers at strategic places. On top of that, the depots for food and other storage necessities at the zone level such as north, south, east and central of Peninsular Malaysia had also been established. For 2011, the department had identified 5,143 relief centres which can accommodate 1.5 millions disaster victims at a time.

The occurrences of earthquake happening in areas surrounding Malaysia had increased as neighbouring countries such as Indonesia and the Philippines sit on

active tectonic plates. This also increased the chances for tsunami to inflict Malaysia at any time. Therefore, there was a need for clear and concerted actions from various government departments and agencies as well as non-governmental bodies, the private sector and the public to be mobilized effectively during disasters due to earthquake and tsunami.

As such, the Standard Operating Procedure (SOP) in Handling Earthquake and Tsunami Disaster was prepared in accordance with the National Security Council Directive No. 20. This was to ensure that the mechanisms to manage such disasters were in line and proper with the overarching mechanism. The SOP covers the management and handling of earthquakes and tsunami from the stage of prevention to post disaster recovery. The SOP is expected to be released in the first quarter of 2012.

In an effort to strengthen the resilience of victims affected by natural disasters, the government had established the National Disaster Relief Trust Fund (NDRF) to alleviate the financial burden of the victims to a certain extent. For the year 2011, Malaysia had contributed more than USD 15 million in terms of cash money to more than 90,000 families in Malaysia which were affected by disasters mostly floods.

To enhance understanding, knowledge and capacity of government agencies, non-government organisations (NGOs), community leaders and the public in order to face the impacts of earthquake and tsunami, NSC had organised Community-Based Disaster Management (CBDM) programmes throughout the country aligned with the official slogan: “Community Resilience through Disaster Awareness”. In 2011, CBDM programmes were conducted at various risk prone areas around Malaysia involving around 854 participants.

To instil disaster risk awareness among the public, the 2011 National Disaster Awareness Day was held in Malacca on 18-19 February 2011. The main objective for the year’s event was to integrate the strength and effort of the government agencies at the national, state and district levels to come together and be seriously involved in disaster management especially in preparing for and mitigating the impacts of disaster in accordance with the priorities of the Hyogo Framework for Action (HFA). To further solidify Malaysia’s commitment towards achieving the strategic goals and priorities of the HFA, the 2011 National Disaster Awareness Day was culminated with the Malacca Declaration on Disaster Risk Reduction. Disaster Awareness Day 2011 also saw the launching of the UNISDR World Disaster Reduction Campaigns namely the “1,000,000 Safe Schools and Hospitals Campaign” and “Resilient Cities: My City is Getting Ready”.

As a regional cooperation, Malaysia participated in the Third Session of the Global Platform for Disaster Risk Reduction (GPDRR) in Geneva, Switzerland on 8-13 May 2011. In conjunction with the World Reconstruction Conference, it aimed at building on existing commitments and set priorities and actions that would help to strengthen resilience to disaster at the local level. The theme for the Third Session was “Invest Today for a Safer Tomorrow – Increased Investment in Local Action”. The main objective was to encourage stronger political commitment to local action. Additionally, the role of the private sector, especially in the local setting was a key feature at the Global Platform 2011.

CONTENTS

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

1. Meteorological Assessment

There were all together nine typhoons and 12 tropical storms developed in the western Pacific Ocean, Philippines and South China Sea regions in 2011. The number of typhoons is only slightly more than half the number of around 17 normally occurring in these regions. Among them, eight formed in the western Pacific Ocean region and the remaining one formed in the Philippines region. The total number of 21 typhoons and tropical storms in 2011 was about 20% lower than the yearly average of 26.2 recorded from 1951 to 2010. The 2011 season was more active than 2010 as there were two more typhoons and five more tropical storms in 2011 than those in 2010. The typhoons and tropical storms observed in 2011, together with details regarding their lifetimes, regions of formation, starting and ending dates and attained maximum wind speeds, are listed in **Table 1.** The only tropical storm that had caused the most impacts on the Malaysian weather especially strong wind events was Nock-Ten which occurred from 26th to 31st July 2011.

Among the 21 typhoons and tropical storms in 2011, there were respectively 9 and 13 of them warranted the issuance of strong wind/rough sea warnings over the marine regions under the Malaysian Meteorological Department (MMD) responsibility and tropical cyclone advisories. The numbers of tropical cyclone advisories and strong wind/rough sea warnings issued by MMD are listed in **Table 2**. The marine regions under MMD responsibility for issuing sea state conditions are shown in **Figure 1**. Tracks of six typhoons or tropical storms that were relatively close to the Malaysia region are shown in **Figure 2**. No tropical cyclone warning in regard to significant weather impacts was issued as none of the typhoon or tropical storm occurrence was close enough to directly caused significant loss of lives and properties in the country.

Generally, Malaysia region only experiences the tail effects of the tropical storms and typhoons which usually enhance the southwesterly winds and convective activities, especially over the northern Peninsular Malaysia, Sabah and coastal Sarawak. Satellite imagery on 30th July 2011 obtained from the infrared channel of the MTSAT-2 geostationary satellite showing the rain cloud clusters over the Malaysia region associated with the tail effects of tropical storm Nock-Ten is shown in **Figure 3.** The rain cloud bands were generally more intense in the northeast region of Peninsular Malaysia. **Figure 4** shows the daily rainfall chart of selected meteorological stations in the northern Peninsular Malaysia for July 2010 during tropical

storm Nock-Ten (26-31 July 2011). Large spatial variations in rainfall may result in most of the selected stations not showing any significant amount of rainfall. Based upon satellite imagery in **Figure 3** and rainfall data in **Figure 4**, tropical storm Nock-Ten had very little impact in term of weather in Malaysia.

Table 1: Typhoons and Tropical Storms in 2011

No.	Tropical Cyclone	JTWC Classification	Date		Max Wind (knots)
			Birth	Death	
1	Aere[#]	Tropical Storm	07/05/11	11/05/11	45
2	Songda[*]	Typhoon	21/05/11	29/05/11	105
3	Sarika[@]	Tropical Storm	09/06/11	11/06/11	40
4	Haima[#]	Tropical Storm	21/06/11	25/06/11	40
5	Meari[#]	Tropical Storm	22/06/11	27/06/11	60
6	Ma-On[*]	Typhoon	12/07/11	24/07/11	95
7	Tokage[*]	Tropical Storm	15/07/11	16/07/11	35
8	Nock-Ten[#]	Tropical Storm	26/07/11	31/07/11	50
9	Muifa[*]	Typhoon	28/07/11	09/08/11	95
10	Merbok[*]	Tropical Storm	03/08/11	09/08/11	55
11	Nanmadol[#]	Typhoon	23/08/11	31/08/11	105
12	Talas[*]	Typhoon	25/08/11	05/09/11	65
13	Noru[*]	Tropical Storm	04/09/11	06/09/11	40
14	Kulap[*]	Tropical Storm	07/09/11	10/09/11	35
15	Roke[*]	Typhoon	13/09/11	22/09/11	95
16	Sonca[*]	Typhoon	15/09/11	20/09/11	70
17	Nesat[*]	Typhoon	24/09/11	30/09/11	80
18	Haitang[@]	Tropical Storm	25/09/11	27/09/11	35
19	Nalgae[*]	Typhoon	27/09/11	05/10/11	95
20	Banyan[#]	Tropical Storm	11/10/11	12/10/11	35
21	Washi*	Tropical Storm	15/12/11	19/12/11	40

Remarks

1. Region of tropical cyclones formation:
   - * Western Pacific Ocean region : 13 cases
   - # Philippines region : 6 cases
   - @ South China Sea region : 2 cases
2. JTWC: Joint Typhoon Warning Centre

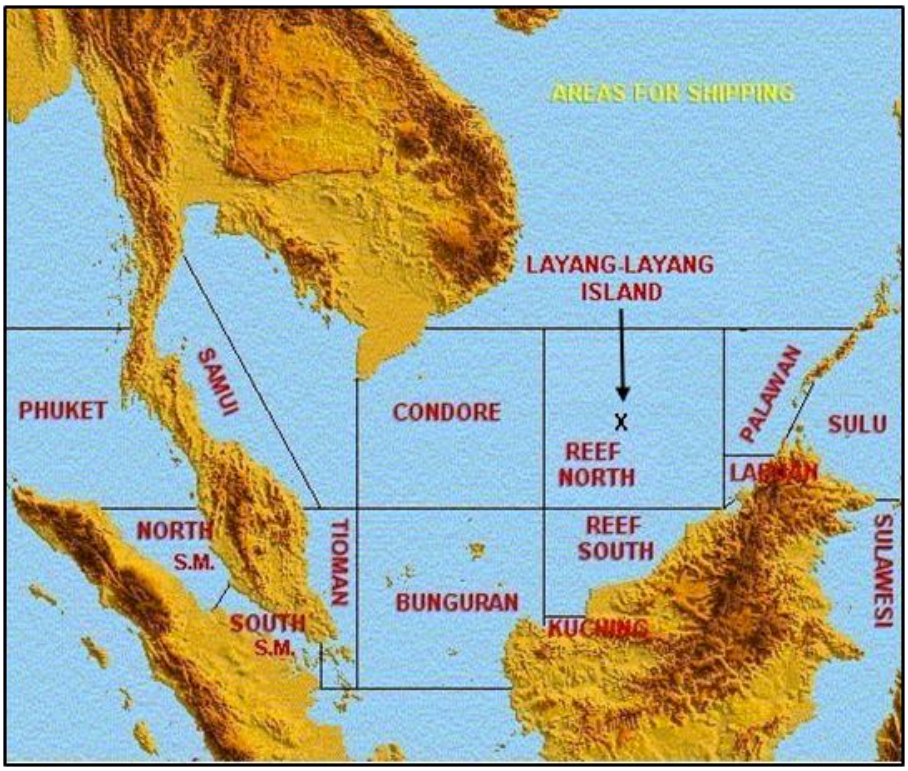
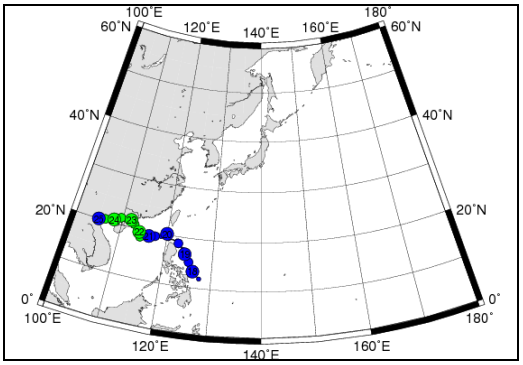


Figure 1: Marine Regions under MMD Responsibility for Issuing Sea State Conditions

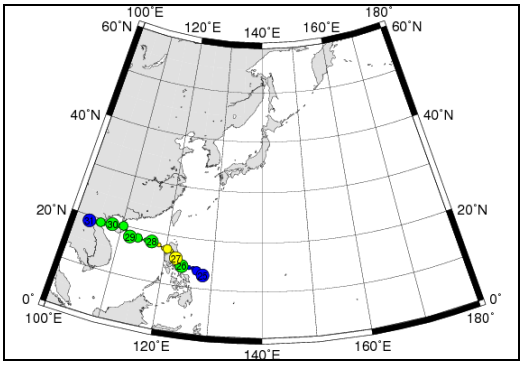
Table 2: Number of Tropical Cyclone Advisories and Warnings Issued by MMD in 2011

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	Aere	Tropical Storm	07/05/11	11/05/11	16	28 (Phuket, Perlis, Kedah and Penang Waters)
2	Songda	Tropical Storm	24/05/11	25/05/11	5	22 (Sabah, Phuket, Condore, Reef North, Layang-layang, Palawan and Sulu waters)
		Typhoon	25/05/11	28/05/11	14	
3	Sarika	Tropical Storm	10/06/11	11/06/11	5	Nil
4	Haima	Tropical Storm	21/06/11	25/06/11	22	17 (Langkawi, Perlis, Kedah, Labuan, Condore, Sabah, Phuket, Reef North, Pulau Layang-Layang, Sulu and Palawan waters)

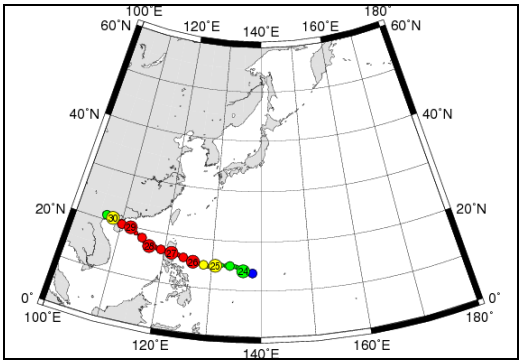
No.	Name	Category	Date		Total No. of Advisories	Total No. of Strong Wind/Rough Seas Warnings due to Tropical Cyclones (area affected)
			Start	End		
5	Meari	Tropical Storm	22/06/11	26/06/11	24	18 (Langkawi, Perlis, Kedah, Labuan, Condore, Sabah, Phuket, Reef North, Pulau Layang-Layang, Sulu and Palawan waters)
6	Nock-Ten	Tropical Storm	26/07/11	31/07/11	39	20 (Langkawi, Perlis, Kedah, Labuan, Condore, Sabah, Phuket, Reef North, Pulau Layang-Layang, Sulu and Palawan waters)
7	Muifa	Typhoon	04/08/11	06/08/11	17	34 (Phuket, Sabah, Condore, Reef North, Layang-Layang and Palawan waters)
8	Nanmadol	Tropical Storm	23/08/11	25/08/11	8	51 (Phuket, Sabah, Labuan, Condore, Reef North, Layang-Layang and Palawan)
		Typhoon	25/08/11	28/08/11	25	
		Tropical Storm	28/08/11	31/08/11	18	
9	Nesat	Tropical Storm	25/09/11	26/09/11	7	37 (Samui, Kelantan, Terengganu, Pahang, East Johore, Sarawak, Labuan, Sabah, Bunguran, Reef South, Condore, Reef North, Layang-Layang and Palawan)
		Typhoon	26/09/11	30/09/11	28	
		Tropical Storm	30/09/11	01/10/11	9	
10	Haitang	Tropical Storm	25/09/11	27/09/11	12	Nil
11	Nalgae	Typhoon	30/09/11	02/10/11	19	48 (Phuket,Langkawi, Perlis, Kedah, Penang, Samui, Kelantan, Terengganu, Pahang, East Johore, Sarawak, Labuan, Sabah, Bunguran, Reef South, Condore, Reef North, Layang-Layang and Palawan)
		Tropical Storm	02/10/11	05/10/11	24	
12	Banyan	Tropical Storm	11/10/11	12/10/11	9	Nil
13	Washi	Tropical Storm	15/12/11	19/12/11	26	Nil



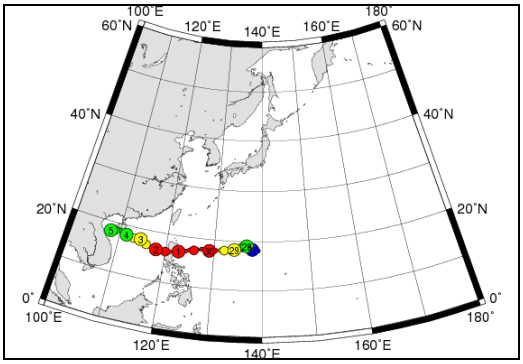
HAIMA (21-25/06/11)



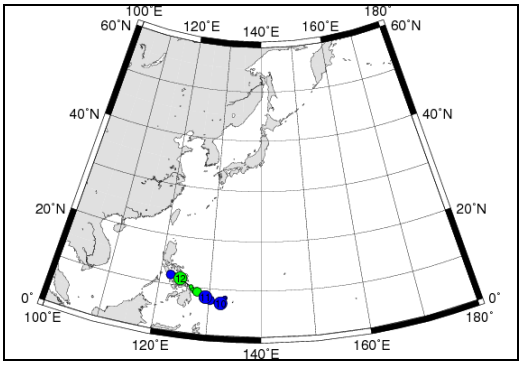
NOCK-TEN (26-31/07/11)



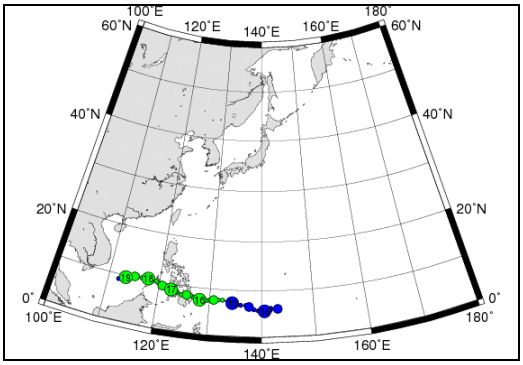
NESAT (24-30/09/11)



NALGAE (27/09-05/10/11)



BANYAN (11-12/10/11)



WASHI (15-19/12/11)

Figure 2: Tracks of six (6) tropical storms and typhoons closest to Malaysia in 2011. 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)

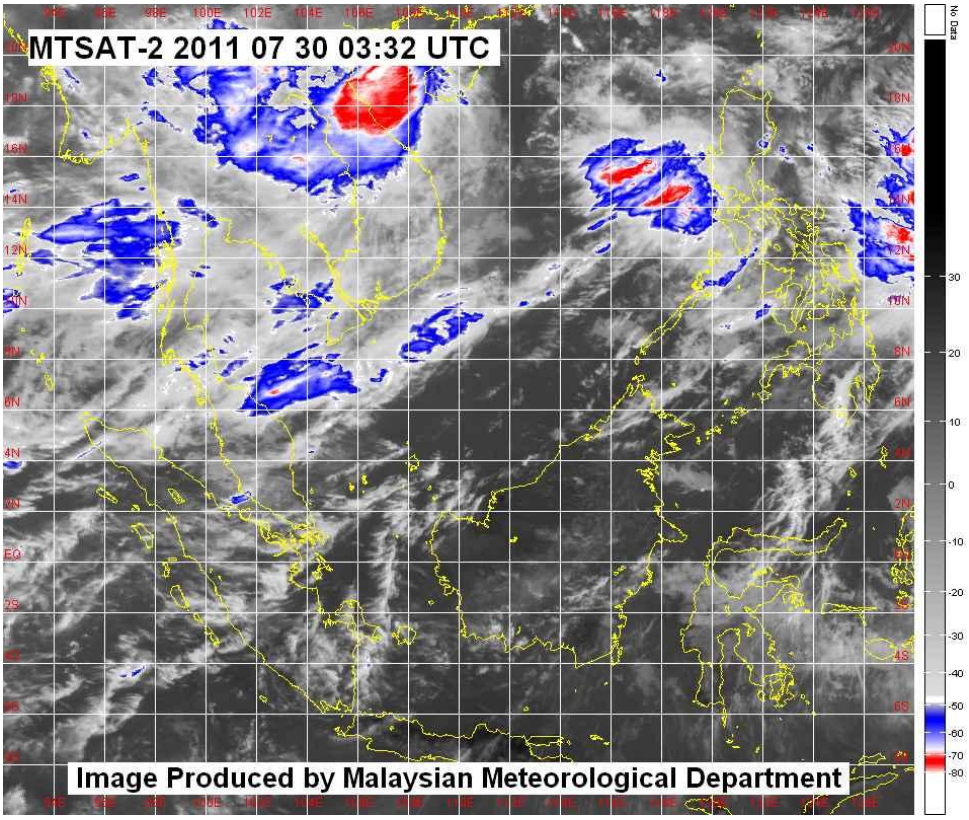


Figure 3: MTSAT-2 satellite imagery showing the rain cloud clusters over the Malaysia region associated with tropical storm Nock-Ten on 30th July 2011

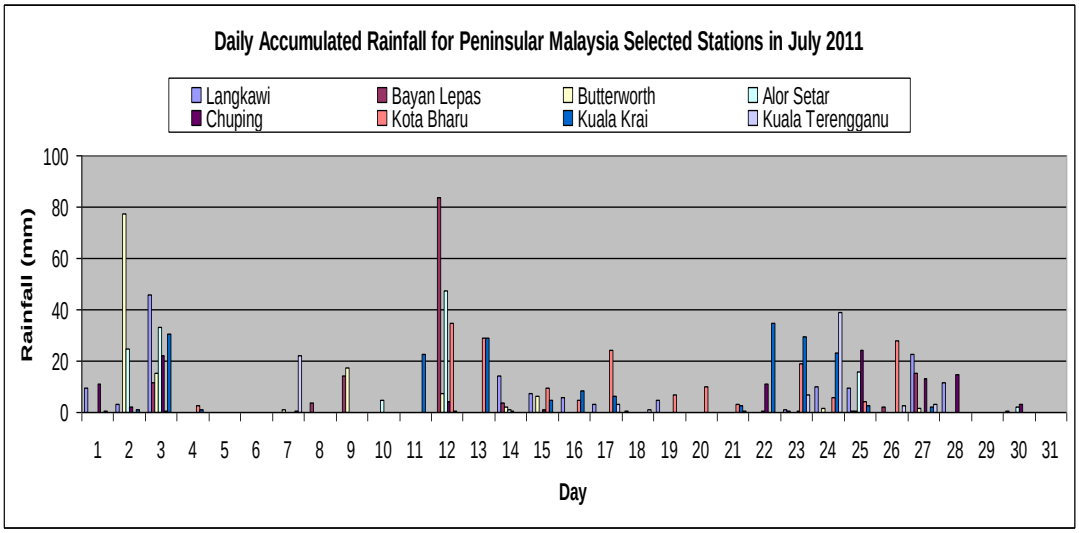
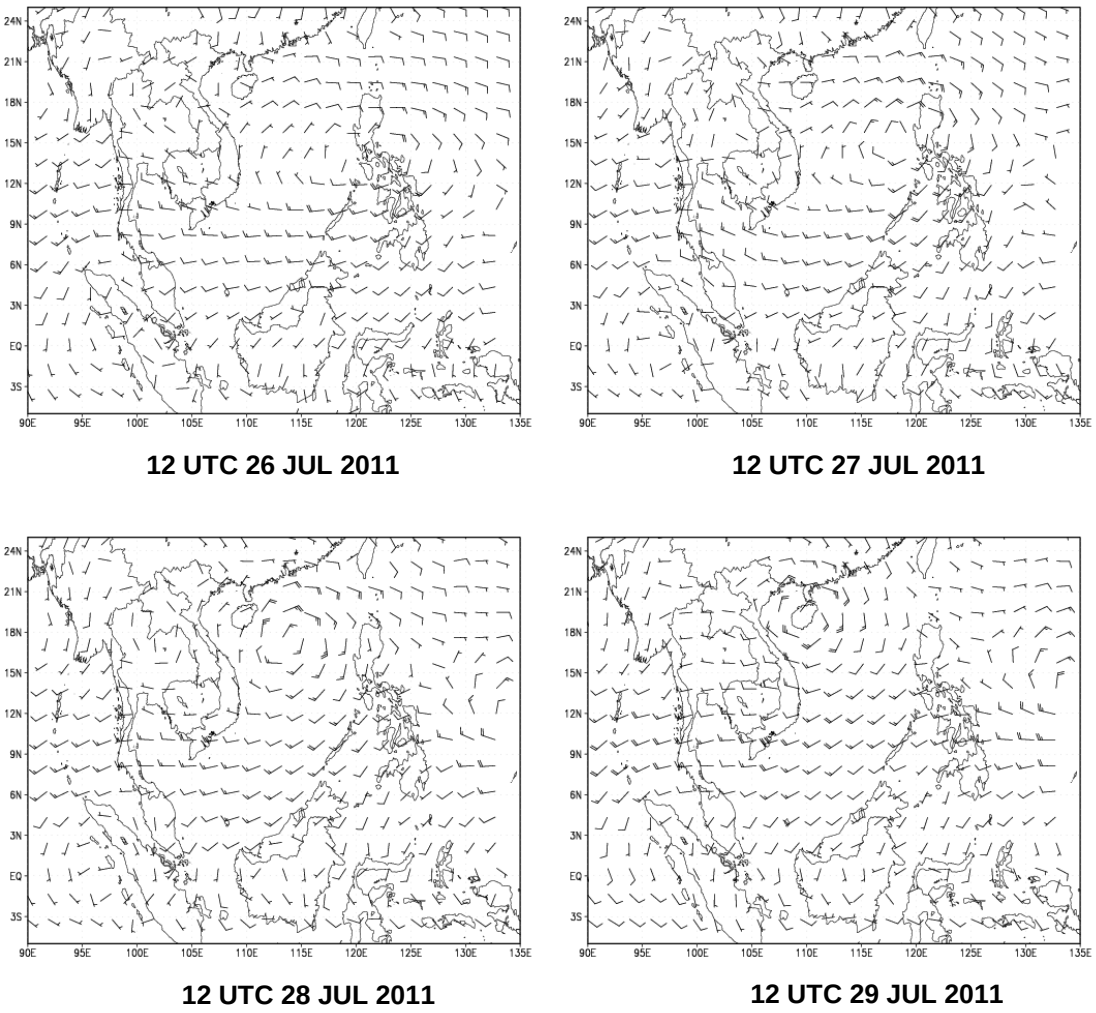


Figure 4: Daily rainfall chart of selected meteorological stations in the northern Peninsular Malaysia for July 2011 during tropical storm Nock-Ten (26-31 July 2011)

The passage of tropical storm Nock-Ten across the South China Sea from the Philippines to the Hainan Island had led to a change in wind pattern over the Malaysian region as shown in **Figure 5**. Near westerly winds on the 26th July 2010 became southwesterly winds on the 28th July 2010 at the 850 hPa level with slight strengthening of wind speed especially over the coastal waters of Sarawak.



12 UTC 26 JUL 2011 **12 UTC 27 JUL 2011**

12 UTC 28 JUL 2011 **12 UTC 29 JUL 2011**

Figure 5: 850 hPa wind charts from GFS analysis showing wind patterns during the passage of tropical storm Nock-Ten

2. Hydrological Assessment

Generally, during the 2010 Northeast Monsoon, the northern and eastern regions of the Peninsular Malaysia namely Kedah, Penang, Perlis, Perak, Kelantan, Terengganu and Pahang experienced severe floods due to prolonged heavy rainfall events, mainly between the months of November 2010 and January 2011.

The States of Kelantan and Terengganu received three periods of heavy rainfall, specifically during the last week of December 2010, first and second week of January 2011. Meanwhile, the State of Johor was worst hit by the monsoon from 30th January - 1st February 2011 which flooded most of its districts and inundated for nine days.

The estimated total cost of flood damages for the Department of Irrigation and Drainage (DID) infrastructure was RM173.19 million. Approximately 114,246 people were evacuated and given shelter in flood relief centres. The death toll during this monsoon season was three persons. The summary of flood events from October 2010 to February 2011 is shown in **Table 3**.

Table 3: Summary of Flood Events from October 2010 to February 2011

State	Period	Highest Recorded Daily Rainfall (mm)	No. of Victims Evacuated
Perlis	30 Oct - 2 Nov 2010	196	14,000
Kedah	31 Oct - 2 Nov 2010	144	-
Kelantan	i. 1 - 6 Nov 2010 ii. 30 Dec 2010 - 4 Jan 2011 iii. 6 - 11 Jan 2011	200	4,393
Pahang	i. 30 - 31 Dec 2010 ii. 6 - 9 Jan 2011	131	3,065
Terengganu	i. 19 - 20 Dec 2010 ii. 29 - 31 Dec 2010 iii. 5 - 9 Jan 2011	292	15,000
Johor	30 Jan - 1 Feb 2011	493	77,788

II Summary of progress in Key Result Areas

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

1.1 Meteorological Achievements/Results

Radar System Upgrade

In 2011, the Radar Division in the Malaysian Meteorological Department (MMD) had installed a new radar system in Subang. The installation works of the Gematronik METEOR 600S radar system together with the IRIS software were completed in May 2011. This radar system was integrated into the Radar System Network in the department and became fully operational in October 2011. The integration of the radar system in Subang into the Radar System Network, which was completely upgraded on 31 August 2010, had enhanced the radar coverage in the country. This had given better supports and services to MMD's clients.

1.2 Hydrological Achievements/Results

Improvement of Facilities

The DID to-date had installed and operates about 418 telemetry stations in 38 river basins. In addition, 1694 manual flood gauges and 93 flood warning boards had been set up in flood prone areas so as to provide additional information during the flood seasons. As part of the local early flood warning system, DID operates about 423 automatic flood warning sirens installed in flood prone areas. In addition, 12 new servers were procured in 2010 to replace old terminal servers at the state level for the operational and maintenance of SCADA telemetry systems.

Development of Operational Flood Forecasting and Warning Systems

Development of a number of flood forecasting and warning systems was initiated in early 2011 and the systems are now being tested for the coming flood season. The performances of these systems would be assessed after the flood season and any shortcomings would be resolved before the next flood season. The flood forecasting systems which had been developed are as follows:

a) Integrated Flood Forecasting and River Monitoring System (iFFRM)

An Integrated Flood Forecasting and River Monitoring System (iFFRM) for the Klang Valley was recalibrated and completed by the end of December 2011. For this system, 87 new telemetric stations and infrastructure networks were installed together with a flood modelling system that include both hydrometeorology and hydrodynamic. To-date, infrastructure networks had been completed, while the progress for flood forecasting modelling had reached 95% completion.

b) Atmospheric Model-Based Rainfall & Flood Forecasting System (AMRFF)

The Atmospheric Model-Based Rainfall and Flood Forecasting (AMRFF) System had been developed for three river basins in Peninsular Malaysia, namely Pahang, Kelantan and Johor. The objective of AMRFF was to provide flood flow forecasting and their corresponding flood stages every 6 hours, separately for Pahang, Kelantan and Johor watersheds, with a 3-day lead time, at hourly time increments. Subsequently, radar rainfall analyzer and integrator for Malaysia (RAIM) had been developed in order to derive gridded areal rainfall distribution and the rainfall forecast magnitude in the vicinity of Pahang, Kelantan and Johor River Basins.

c) Integrated Flood Forecasting and Warning System for Muda River Basin

An Integrated Flood Forecasting and Warning System for Muda River Basin had been developed. The objectives were to develop a radar rainfall analyzer and integrator for Muda River and a real time flood forecasting system. This model provided flood forecasts every 6 hours, with a 2-day lead time.

1.3 Research, Training, and Other Achievements/Results

As there were still a number of river basins which were yet to be equipped with efficient Flood Forecasting and Warning Systems (FFWS), development of operational FFWS had been extended to the following river basins:

a) Integrated Flood Forecasting and Warning (IFFW) System for Dungun River Basin

An Integrated Flood Forecasting and Warning System for Dungun River Basin was being developed. The objective was to develop a real time flood forecasting system which would provide real time flood warning and emergency responses in a convenient lead time to Dungun River Basin.

b) Integrated Flood Forecasting and Warning System Based on Real Time Radar Rainfall for Padas River Basin in Sabah and Sarawak River Basin in Sarawak

The real time flood forecasting model called Atmospheric Model-based Rainfall and Flood forecasting (AMRFF) System was being developed for Padas River Basin and Sarawak River Basin respectively to provide real time flood warning and emergency responses in a convenient lead time to these river basins.

2. Minimized Typhoon-related Social and Economic Impacts.

2.1 Meteorological Achievements/Results

Maintenance Upgrade of Automatic Weather System and Weather Cam Monitoring System

In MMD, the Weather Cam Monitoring System and Automatic Weather System were upgraded in 2009 and 2010 respectively. Since then, the maintenance works of both systems were carried out by contractors. In 2011, these maintenance works were slowly taken over by MMD staff. This was to ensure higher system performance efficiency in terms of reduced system downtime and sustained optimal system operation. It was important as enhanced efficient ensured more reliable and up-to-date meteorological information were channelled to the forecasters on-duty for them to delivery weather forecast services to MMD's clients more precisely.

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

3.1 Disaster Prevention and Preparedness Achievements/Results

Malaysia is geographically located just outside the "Pacific Rim of Fire" and is generally free from severe natural disasters such as earthquake, volcanic eruption and typhoon. Although Malaysia was

spared from the threats of severe natural disasters and calamities, it was nonetheless not spared from other disasters such as flood, man-made disaster, landslide and severe haze.

The worst experience was when the tsunami struck on 26th December 2004. The 9.3 Richter scale magnitude of earthquake that occurred 680 km from Kuala Lumpur caused an unprecedented tsunami that killed hundred of thousands of people and massive destruction of properties in several countries bordering the Indian Ocean including Malaysia. A total of 74 persons were killed or lost and many properties were destroyed along the northwest coastal areas in Peninsular Malaysia. Relief efforts were deployed by various government agencies such as the Royal Malaysian Police, Malaysian Fire and Rescue Department, Malaysian Armed Forces, Social Welfare Department as well as Non-Governmental Organizations (NGOs), among others.

In the past few years, Malaysia had experienced several extreme weather and climatic events, ranging from freak thunderstorms to monsoonal floods which had caused havoc in the country. The country experienced monsoonal floods annually which vary in terms of severity, place and time of occurrences. The flood which happened in December 2006 and lasted until February 2007 was among the worst floods ever experienced by the country. The worst affected state was Johor in southern Peninsular Malaysia where more than 65,000 families were evacuated to evacuation centres. The total economic loss was estimated at RM1.2 billion. Nineteen casualties were reported and four of them were foreigners. The financial burden on the government was enormous.

Severe haze happens almost every year during the southwest monsoon (May-September) season. The haze that struck Peninsular Malaysia in 2005 was one of the worst after the incident that happened to the country in 1997. Forest fires in peat soil forests in the states of Selangor and Pahang since early August 2005 caused the Air Pollution Index (API) to deteriorate to dangerous level. A state of emergency was declared at Port Kelang and Kuala Selangor in Selangor from 11 to 13 of August when the Air Pollution Index (API) increased to 500. The API was frequently publicized by the government through the mass media to inform people on the level of air quality. To overcome the problem, cloud seeding worth RM900,000 were done to instigate rain. The inhaling of these thick hazy smokes posed health hazard to the community living in the haze

affected area. In addition, the deterioration of health caused economic losses especially in the industrial sector.

Other than flooding, the country also from time to time, experienced some man-made disasters, which caused considerable damage to properties and loss of lives.

3.2 Progress in Member's Regional Cooperation, Important, High-Priority Goals and Objectives

3.2.1 Hardware and/or Software Progress

Emergency Command Centre (ECC)

The Emergency Command Centre (ECC) had been approved during the Mid-Term Review of the Ninth Malaysia Five-year Plan. The Government of Malaysia through the National Security Council had agreed to start the development of the centre in early 2011.

When completed by the 3rd quarter of 2012, ECC would be the main centre at national level in coordinating disaster management activities. During the calm period (no disaster), the centre would monitor the mitigation and preparedness activities such as flood mitigation construction, awareness campaigns, drills etc. Meanwhile, at the time of disaster occurrence, representatives of related agencies involved with the disaster would be located at the centre as a liaison to collaborate with other agencies in gathering appropriate information and monitoring the current situation, at the same time would aid in reporting and decision making.

The development of ECC's system would take into consideration the four (4) major stages of disaster management process namely Mitigation (prevention), Preparedness, Response (relief) and Rehabilitation (recovery). In order to ensure the successful implementation of ECC, relevant data and information were critical. Therefore, cooperation and collaboration with related agencies would be sought to provide relevant and meaningful data to ECC. Hence, secured communication link (leased line) would be build to connect the centres with those agencies.

Malaysian Emergency Response System (MERS 999)

The establishment of a single emergency number “999” for the entire nation would make it easier for the public to contact emergency service providers, namely the police, ambulance, fire station and civil defence rescue units. With the new system, specially-trained service professionals from the 999 Emergency Call Service Centre would handle all emergency calls and reroute them to respective emergency service providers, complete with digital data on the type of emergency and location.

The emergency number 999 was a free service and any emergency call would be answered and vetted within 10 seconds. All 999 call centres were connected to the agencies through a virtual private network. The telephone number and location of callers would be identified through automatic number identification and automatic location identification with the help and sharing of information between telecommunication service providers.

Government Integrated Radio Network (GIRN)

A Government Integrated Radio Network (GIRN) project was recently introduced to provide secure digital trunk radio system between the various government agencies in Malaysia as a study had shown that there were currently more than 12 radio networks used by the various agencies.

The current radio networks had several limitations:

a) Limited radio network coverage over the country;
b) Ineffective radio network coverage resulting in limitation for facilities sharing;
c) Networks were using various type of technology and did not adhere to any standard;
d) Lacks of capability due to outdated technology; and
e) Frequencies used were not as recommended in “Standard Radio System Plan” by the Malaysia Communication and Multimedia Commission (MCMC).

The introduction of the GIRN project preserved the autonomy and freedom of the various agencies while providing a unified network of shared infrastructures.

The benefits of the GIRN approach are:

a) Shared infrastructure created “economies of scale” and the effort to cover the whole country could be reached in a reasonable cost;
b) Digital technology enabled sophisticated and integrated audio and data services;
c) The technology used was standardized and the level of “interoperability” increased without interrupting the autonomy;
d) The level of security increased in radio and data communication;
e) Frequencies used as recommended in Standard Radio System Plan by MCMC and communication services in the government could be restructured.

GIRN will certify that every agency’s network would be physically and virtually separated. Every agency would manage the equipments and assets on its own. It could utilise and manage the network using its own and unique command and control policy. The network was virtually separated by using different System Number for each agency.

GIRN was targeted to cover 95% of Malaysia’s populated land and areas extending 10 nautical miles from the shoreline.

Fixed Line Alert System (FLAS)

Fixed line alert system (FLAS) or disaster alert system (DAS) would enable the government (National Security Council and Malaysian Meteorological Department) to disseminate early warning messages to selected communities who subscribed to fixed line telephones when disasters occur. Currently, FLAS was being tested to be incorporated for early tsunami warning dissemination.

The advantages of using the FLAS were short and precise message dissemination, quick, 24 hours operations, pre-recorded message or real-time message and specific area for dissemination. Currently, the system could simultaneously

broadcast 5,280 calls at any one time. The system would be able to generate statistics and reports for successful, unanswered and failed calls. The potential of FLAS was huge and if proven would be utilised for other disaster management.

3.2.2 Implications on Operational Progress

Disaster Management and Relief Committee

For the year 2011, minister at the Prime Minister's Department had chaired the National Disaster Management and Relief Committee meeting to look into the preparedness among disaster management agencies in emergency response, recovery and rehabilitation for flood victims.

State and District Disaster Management and Relief Committee meetings were also been held at the respective state and district levels. The committees were responsible to evaluate the situation and to determine the level and scope of disaster; to formulate plan of action; to determine capability in handling disaster and the need to request for assistance whether from within or outside the country.

In 2011, several states in Malaysia including Kelantan, Terengganu, Pahang, Perak, Selangor, Malacca, Johore, Sarawak and Sabah were affected by floods in November and December. About 26,059 people were affected and received assistances provided by various government agencies and NGOs at the relief centres or their relatives' houses.

The Department of Social Welfare, which was in charge of preparing relief centres, food supply and registration of disaster victims, would identify suitable potential relief centres in the whole country. At the same time, the department also has to establish good networking with food suppliers at strategic places. On top of that, the depots for food and other storage necessities at the zone level such as north, south, east and central of Peninsular Malaysia had also been established. For 2011, the department had identified 5,143 relief centres which could accommodate 1.5 millions disaster victims at a time.

Reviewing the Directive No. 20 of the National Security Council (NSC)

To facilitate the management of disasters, NSC was tasked to coordinate efforts among the various agencies involved in disaster management. The National Security Council Directive No. 20: *The Policy and Mechanism on National Disaster and Relief Management* was established on 11th May 1997 to provide inter-agency coordination in disaster management.

Due to the high intensity, complexity and occurrences of disaster, measures were taken to review and upgrade Directive No. 20 to ensure that it remained relevant and up to date in meeting these challenges. After an extensive discussion with related agencies, the reviewed Directive No. 20 is now waiting for approval by the Prime Minister.

Standard Operating Procedure in Handling Earthquake

In light of the increasing occurrences of earthquake happening in areas surrounding Malaysia, there was a need for clear and concerted actions from various government departments and agencies as well as non-governmental bodies, the private sector and the public to be mobilized on earthquake disaster.

As such, the Standard Operating Procedure (SOP) in Handling Earthquake Disaster was prepared in accordance with the National Security Council Directive No. 20. This was to ensure that the mechanisms to manage earthquakes were in line and proper with the overarching mechanism. The SOP covered the management and handling of earthquakes from the stage of prevention to post disaster recovery. The SOP in handling earthquake is expected to be released in the first quarter of 2012.

Standard Operating Procedure in Handling Tsunami

The only tsunami incident that affected Malaysia was the 26th December 2004 Indian Ocean Tsunami. The tsunami incident was a testimony that Malaysia was not immune to major disasters. Bordering with countries that sit on active tectonic plates like Indonesia and the Philippines increased the chances for this type of disaster to inflict Malaysia at any time.

In this light, cooperation and concerted actions from various government departments and agencies as well as non-governmental bodies, the private sector and the public need to be mobilized during tsunami disasters.

As such, the Standard Operating Procedure (SOP) in Handling Tsunami Disaster was prepared in tune with the National Security Council Directive No. 20. This was to ensure that the mechanisms to manage tsunami disasters were in line and proper. The SOP in handling tsunami was expected to be released in the first quarter of 2012.

Standard Operating Procedure in Handling Drought

Malaysia in general rarely experienced prolonged droughts. However, the El-Nino episodes in 1982-1983 and 1997-1998 caused droughts to happen in certain areas in Malaysia and shortage of water in almost all states especially in Sabah and Sarawak. It was expected that with the onslaught of global warming, extreme weather patterns as well as the El-Nino phenomenon would occur more frequently.

The Standard Operating Procedure in Handling Drought was prepared as a guide to enhance the efficiency of government departments and agencies involved in the management of drought in executing their duties. The SOP in handling drought was also expected to be distributed in the first quarter of 2012.

National Disaster Relief Trust Fund (NDRF)

National Disaster Relief Trust Fund was changed from a normal fund to a trust fund in 2005 which enabled the general public and the private sector to contribute in assisting disaster victims. Financial sources for the fund comprise of both annual budget allocation from the government and contribution from public and private sectors. The types of financial assistance provided were for the following eventualities:

i) loss of income;
ii) damaged/demolished house;
iii) agricultural damage;
iv) livestock and aquaculture damage; and
v) burial cost for fatalities due to disasters

The trust fund was administered in accordance with a letter of trust which was subjected to Section 10 of the Financial Procedure Act 1957. The letter allowed the usage of the trust fund for extending financial aids and relief supplies to foreign countries affected by disasters.

For the year 2011, Malaysia had contributed more than USD 15 million in terms of cash money to more than 90,000 families in Malaysia which were affected by disasters mostly floods.

Central Store

During the National Disaster Management and Relief Committee Meeting No. 1/2006 on 5 January 2006, the Prime Minister of Malaysia, as chairman of the committee highlighted the need to relocate and deploy search and rescue (SAR) assets in a strategic location / storage facility.

At the National Disaster Management and Relief Committee meeting No. 1/2007, the Prime Minister requested that a centralised store for SAR utilities and equipments should be established. This storage facility was to be managed together by the National Security Council, the Armed Forces, the Welfare Department and the Royal Malaysia Police.

The establishment of this facility at the Defence Supplies Depot in Sungai Buloh allows centralised procurement of much needed assets and equipments for disaster relief operations such as rescue boats, mobile toilets and heavy trucks as required at the local level across Malaysia. These assets are managed by state offices of the National Security Council and coordinated in their deployment via the role of the NSC as secretariat for the Disaster Management and Relief Committee at the district and state levels respectively.

3.3 Interaction with users, other Members, and/or other components

Enhancement of Public Education and Awareness

As the lead agency in disaster management, the National Security Council (NSC) had organised Community-Based Disaster Management programmes throughout the country in collaboration with other agencies such as the Malaysian

Meteorological Department (MMD), Department of Town and Country Planning Peninsular Malaysia, Ministry of Health, Department of Irrigation and Drainage and Department of Social Welfare. The programmes were aligned with the official slogan: "Community Resilience through Disaster Awareness". As a continuation of the 8 series of Community-Based Disaster Management (CBDM) programmes which were conducted in 2010, the programmes were further conducted in 2011 at various risk prone areas around Malaysia involving around 854 participants as shown in **Table 4** and are expected to continue throughout the year 2012.

The CBDM was a two-pronged programme whereby not only did it serve as a platform to convey information on disasters to communities at risk prone areas, but also to build communities that were resilient and able to act to save themselves, their families, neighbours and community members when disasters strike.

The objectives of this program were to enhance understanding, knowledge and capacity of the government agencies, non-government organisations (NGOs), community leaders and public to face the impacts of earthquake and tsunami.

Besides that, this program was designed to introduce the Malaysian Tsunami Early Warning System, its functions and locations to targeted groups. This module was combined with the public education program on disaster prevention for people living in flood prone areas in order to protect human lives and properties as well as minimize or avoid social disruption and economic losses.

Table 4: Community-Based Disaster Management Programme in 2011

State (District)	Date	Location	Community Participation
Kelantan (Pasir Mas)	16th July 2011	MARA Advanced Vocational College	362
Terengganu (Kuala Berang)	23rd July 2011	Tengkawang Primary School	210
Negeri Sembilan (Jempol)	30th July 2011	Pekan Rompin Primary School	282
		TOTAL	**854**

To enhance the level of awareness among the masses, Disaster Awareness Day was celebrated annually since 2005 in commemoration of tropical storm Greg and the great Indian Ocean Tsunami which struck the nation on 26 December in 1997 and 2004 respectively. This event was organized by the NSC with the main objective to inform the public on the government's efforts in disaster management as well as to create awareness and strengthen national resilience to disasters. The 2011 National Disaster Awareness Day was held in Malacca on 18-19 February 2011. The main objective for the year's event was to integrate the strength and effort of the government agencies at the national, state and district levels to come together and be seriously involved in disaster management especially in preparing for and mitigating the impacts of disaster in accordance with the priorities of the Hyogo Framework for Action (HFA).

To further solidify Malaysia's commitment towards achieving the strategic goals and priorities of the HFA, the 2011 National Disaster Awareness Day was culminated with the Malacca Declaration on Disaster Risk Reduction. This declaration would be a further action plan guided by the HFA Implementation Regional Action Plan (HIRAP) and the previous Asian Ministerial Conference on Disaster Risk Reduction (AMCDRR) declarations including the Kuala Lumpur Declaration of 2007. In addition to identifying Malaysia's own national priorities and strategies to ensure the timely implementation of HFA, the action plan would act as general guideline to establishing a National Platform for Disaster Risk Reduction in Malaysia. The declaration would also pave way for enhanced partnership with the private sector and civil society for DRR through public-private-partnership initiatives such as corporate social responsibility (CSR), philanthropy and voluntarism in different phases of disaster management.

Disaster Awareness Day 2011 also saw the launching of the UNISDR World Disaster Reduction Campaigns namely the "1,000,000 Safe Schools and Hospitals Campaign" and "Resilient Cities: My City is Getting Ready" with a high level launching ceremony officiated by the Deputy Prime Minister, Minister of Health, Chief Minister of Malacca and Miss Helena Molin Valdes from UNISDR. As a start, Kuala Lumpur, Malacca and Putrajaya were declared as Role Model Cities for the campaign. ASEAN also took part in the occasion by organizing

the ASEAN Lesson-Learning Workshop on Best Practices in Establishing Safe Schools with participants from all ASEAN member countries. The workshop was officiated by Dato' Misran Karmain, the Deputy Secretary General of ASEAN.

Regional Cooperation

At the regional level, Malaysia was an active member of the Association of South East Asia Nations (ASEAN) and is a member of the ASEAN Committee on Disaster Management (ACDM). In ensuring cooperation among Member States, the ASEAN Agreement on Disaster Management and Emergency Response (AADMER) was signed on 26 July 2005. The agreement had entered into force on 24 December 2009.

In line with the Agreement, States were called upon to designate National Focal Point and competent authorities to coordinate regional Humanitarian Assistance and Disaster Relief Operations (HADR); to support the establishment of ASEAN Coordinating Centre for Humanitarian Assistance on Disaster Management (AHA Centre) as well the ASEAN Standby Arrangements for Disaster Relief and Emergency Response (SASOP). The standby arrangements required Malaysia to earmark assets on voluntary basis to be shared with other Member States in need of assistance.

The Third Session of the Global Platform for Disaster Risk Reduction (GPDRR)

Malaysia participated in the Third Session of the Global Platform for Disaster Risk Reduction (GPDRR) which took place at Geneva, Switzerland on 8-13 May 2011. The Third Session, convened in conjunction with the World Reconstruction Conference aimed at building on existing commitments and set priorities and actions that would help to strengthen resilience to disaster at the local level. The Third Session also reflected on the outcomes of the Mid-term Review of the Hyogo Framework for Action and start setting priorities and processes for meeting the recommendations.

The theme for the Third Session was "Invest Today for a Safer Tomorrow – Increased Investment in Local Action". The local level was where the impact of disaster was most felt and where risk reduction impact and results must be realized. More

effective support was required to empower local communities. Local authorities (including mayors, city administrators and other civic leaders) play an essential role in ensuring their cities were made more resilient to disasters. The main objective for the Third Session was to encourage stronger political commitment to local action. Additionally, the role of the private sector, especially in the local setting was a key feature at the Global Platform 2011.

Several other topics that had also been given attention at the Third Session include infrastructure and reconstruction; the economics of disaster risk reduction; and building alliances and partnerships in climate change adaptation.

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

4.1 Hydrological Achievements/Results

Technical Advancement

The Infobanjir website http://infobanjir.water.gov.my continued to be 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.

Recently, a new website which was an enhancement of the Infobanjir website had been developed and designed to give relevant flood information to the general public. It is now available at http://publicinfobanjir.water.gov.my. This new website had incorporated new interface which was more user friendly to the public. It had also incorporated social media networking facility for wider flood information sharing amongst online community of internet users.

4.2 Research, Training, and Other Achievements/Results

Enhancement of Public Education and Awareness

For many years, MMD had carried out various initiatives to instil disaster risk reduction awareness among students, government staff and the general publics. These initiatives include exhibitions and public awareness campaigns on disasters due to earthquakes, tsunami and extreme weathers. These initiatives were mostly conducted in schools, colleges, hospitals and government agencies.

In 2011, regional offices of MMD throughout the country had organized a total of 96 exhibitions for the general publics. In collaboration with the Ministry of Education, 17 exhibitions were organized for students. In addition, nine other exhibitions were carried out for government staff. Four large scale exhibitions at national level were also hosted by MMD in collaboration with the Ministry of Science, Technology and Innovation. Furthermore, four public awareness campaigns were organized in different states of the country. A total of 730 participants took parts in these campaigns.

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

5.1 Meteorological Achievements/Results

MMD operated the following wave and storm surge models on a 24x7 basis:

i) Global MMD-WAM Model: Coverage 80^{o}S-80^{o}N, 180^{o}E-180^{o}W, resolution $1^{o}x1^{o}$, output up to 192 hours of wave height and period

ii) Regional MMD-WAM Model: Coverage 10^{o}S-15^{o}N, 95^{o}E-120^{o}E, resolution $0.25^{o}x0.25^{o}$, output up to 384 hours of wave height and period

iii) Regional MMD-JMA Storm Surge Model: Coverage 0^{o}-20^{o}N, 93^{o}E-123^{o}E, resolution 1'x1', output up to 192 hours of sea level rise

The outputs of the models were used as guidance in the issuance of forecasts, advisories and warnings for the surrounding seas especially in the Malaysian Exclusive Economic Zone (EEZ) covering the Straits of Malacca, South China Sea, Sulu Sea and Celebes Sea.

In 2011, a total of 109 advisories and warnings on strong winds and rough seas were issued for the Malaysian EEZ and the adjacent seas. The advisories and warnings were disseminated to the public and disaster management agencies through various communication channels such as the Internet, short message system (SMS), facsimile, live media broadcast and print media.

MMD also monitored the development of 36 low pressure systems mainly in the western North Pacific region, most of which became tropical storms and typhoons. Even though only tropical storm Washi

entered the Malaysian EEZ, few others brought about strong winds and rough seas in the Malaysian territorial waters and the adjacent seas. Among the tropical storms and typhoons that caused these severe marine weather conditions were tropical storm Nock-Ten (26-31 July 2011), typhoon Nesat (24-30 September 2011), typhoon Nalgae (27 September-5 October 2011) and tropical storm Washi (15-19 December 2011).

In early 2011, MMD started a series of test on using outputs (up to 72 hours) of the MMD-MM5 Typhoon Bogussing Scheme as inputs into the MMD-JMA Storm Surge Model to predict sea level rise (storm surge) due to strong winds and low pressure caused by tropical storms/typhoons in the neighbouring waters. The results of the test were very promising and the MMD-JMA Storm Surge Model with inputs from Typhoon Bogussing Scheme was fully put into operation in June 2011.

5.2 Research, Training, and Other Achievements/Results

Research and Training

For capacity building, three officers from MMD had respectively attended the following symposium and workshops in 2011:

i. ACTS-WG Meeting and APEC Typhoon Symposium, 9-14 April 2011, Taipei, Taiwan

ii. First Asia-Pacific Economic Cooperation (APEC) Research Center for Typhoon and Society (ACTS) Workshop, 25-27 May 2011, Cebu, Philippines

iii. UNESCAP/WMO Typhoon Committee Integrated Workshop: Damage Assessment Methodology and Pre-Assessment of Typhoon Landfall Impact, 7-11 November 2011, Nha Thrang, Vietnam

The Typhoon Committee Roving Seminar 2011 (TCRS 2011) was organised by the ESCAP/WMO Typhoon Committee and hosted by MMD from 20-23 September 2011. The theme for TCRS 2011 was *Heavy Rain and Flood Hazards Associated with Landfalling Tropical Cyclones*. The Seminar was attended by 39 participants: China (6), Philippines (5), Hong Kong (1), Cambodia (1), Laos (2), Macau (1), Singapore (1), Thailand (3), Vietnam (2) and Malaysia (13), three resource persons: Hong Kong (1), Singapore (1) and Thailand (1), and one representing the Typhoon Committee Secretariat.

The participants were introduced to the Quantitative Precipitation Estimates/Forecasts (QPE/QPF) techniques and their applications during the seminar. The cause, assessment and management of flood hazards associated with landfalling tropical cyclones and heavy rain were also discussed. The participants had an opportunity to improve their knowledge and enhance their skills in forecasting heavy rains and floods that were due to landfalling tropical storms. They were also given a chance to learn the "Short-range Warning of Intense Rainstorms in Localized Systems (SWIRLS)" nowcasting system. Group photo for the participants, lecturers and organising officials is shown in **Figure 6**.

Figure 6: Organising officials, lecturers and participants of the Typhoon Committee Roving Seminar 2011 (TCRS 2011), Kuala Lumpur, 20-23 September 2011

In 2011, MMD Research Section had completed and presented in international conferences the following three papers which are directly related to tropical cyclones.

i. Comparison of the Pressure-Wind Relationship for Tropical Cyclones in the Major Ocean Basins and Data from Two Different Data Centres.

ii. The Combined Influence of El-Nino and Western North Pacific Tropical Cyclone Activity on the Rainfall over Monsoon Asia during Active Tropical Cyclone Season of July to October.

iii. Impact of Tropical Cyclones in the Western North Pacific and South China Sea on the Asian Monsoon Rainfall during the Pre-Monsoon, Monsoon and Post-Monsoon Seasons.

The first two papers were presented in the IUGG 2011 General Assembly - Earth on the Edge: Science for a Sustainable Planet, 28 June – 7 July 2011, Melbourne, Australia. The last paper was presented in the WCRP Open Science Conference - Climate Research in Service to Society, 24 – 28 October 2011, Denver, USA.

Capacity Building in Hydrology

A number of courses, seminars and conferences related to flood and hydrology organized by DID during 2011 are as follows:

i) Technical Talk No.1/2011 – Role of MSMA in Promoting Sustainable Urban Drainage System in Malaysia and Planning Water Management, 28 January 2011

ii) Onsite Training on Telemetry System at 7 Dams in Malaysia, 16 February 2011

iii) World Water Day Colloquium 2011, 11 March 2011

iv) Technical Talk No.3/2011 – Hydrological Data Screening and Climate Change Detection, 23 March 2011

v) National Young Leaders Camp 2011 on Water Concern, 24-26 March 2011

vi) Course on Flood Forecasting and Warning System, 26-28 April 2011

vii) Hydraulic Characteristics and Flow Estimation in Flooding Rivers, 29 April 2011

viii) Course on Equipment Operations and Maintenance of Hydrology Equipment for the State of Terengganu and Kelantan, 9-12 May 2011

ix) Course on Equipment Operations and Maintenance of Hydrology Equipment , 14-16 June 2011

5.3 Information and Communication Technology (ICT)

MMD started using the new integrated forecasting tools namely Malaysian Integrated Forecasting System (MIFS) at the beginning of 2011. This system comprised of product generation and internal web. All the generated products including products from the other systems such as satellite, radar, lightning and Numerical Weather Prediction (NWP) could be viewed through this internal web. Some of the products could be viewed as composites of various products using the layering method. This would help our meteorologists to better visualize and analyze the atmospheric and weather conditions around our country and adjacent regions. This internal web not only helped the meteorologists to gather real time and near real time weather information and NWP products but also could be used to issue weather forecasts and warnings.

MMD also started using the new climate database system based on web technology at the beginning of 2011 to replace the old climate database system which was based on client-server architecture. The new system could be accessed through any computer that has internet browser compared to the old system that has limited access. This would help meteorologists at regional forecast offices to access climate database for their own purposes such as generating climate reports and carrying out research studies.

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