MEMBER REPORT MALAYSIA

ESCAP/WMO Typhoon Committee
13th Integrated Workshop
Chiang Mai, Thailand
5-9 November 2018

CONTENTS

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

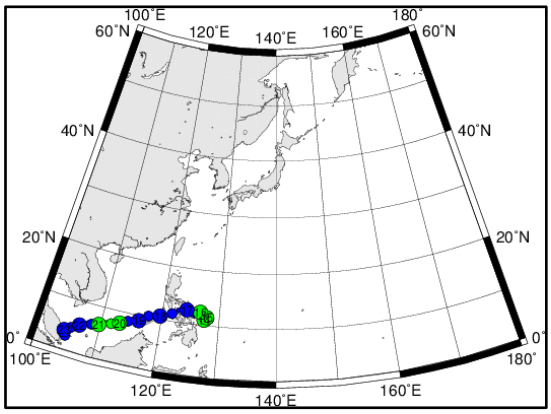
1. Meteorological Assessment (highlighting forecasting issues/impacts)

For the period of 1st November 2017 until 6th October 2018, thirty tropical cyclones were formed over the Western Pacific Ocean, the Philippines region, and the South China Sea. Out of these thirty TCs, only three entered into the area of responsibility of Malaysia Meteorological Department (MMD) as shown in **Figure 1** below. They are Tropical Storm Kai-Tak (1726) on 14-21 December 2017, Typhoon Tembin (201727) on 20-25 December 2017 and Tropical Storm Sanba (201802) on 11-13 February 2018 as shown in **Figure 2**.

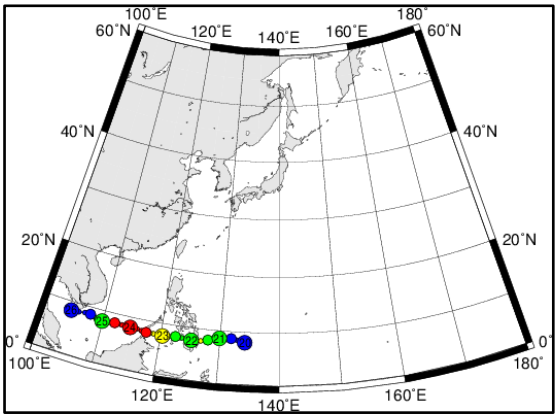
Qualitative analysis of satellite imageries as well as daily rainfall charts revealed rain cloud bands associated with typhoons and tropical storms are the contributing factor for heavy rain occurrence in parts of Malaysia. The rainfall charts of December 2017 (**Figure 4a**) showed heavy rainfall amount recorded over Sabah, Malaysia during the passage of Typhoon Tembin (**Figure 3**). Nevertheless, typhoons and tropical storms are not the only factors contributing to heavy rainfall in Malaysia, the monsoon surge also brought heavy rainfall into part of Malaysia.

Beside strong wind and heavy rainfall, high waves accompanied with storm surge also effect the Malaysia coastal areas facing the South China Sea and Sulu Sea. A number of strong wind and rough sea warnings within the Malaysian waters, South China Sea and Sulu Sea were issued during the passage of these tropical cyclones. During the passage of TS Kai-tak, twenty two strong wind and rough seas warning were issued, two for TY Tembin and eight for TS Sanba. Besides rough sea warnings, TY Tembin also brought heavy rainfall as it moved closer to Sabah and had caused strong wind and flooding at some areas in Sabah. The satellite images and 850hPa wind charts are shown in Figure 3a and Figure 3b below.

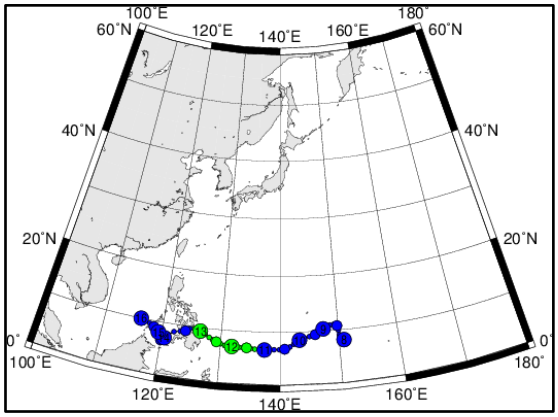
Figure 1: Map of Malaysia territorial waters under the responsibility of Malaysian Meteorological Department (MMD)



(a) TS KAI-TAK



(b) TY TEMBIN



(c)TS SANBA

Figure 2: Tracks of tropical cyclones entering the Malaysian waters under the responsibility of MMD. (Source: http://agora.ex.nii.ac.jp/digital-typhoon/latest/track)

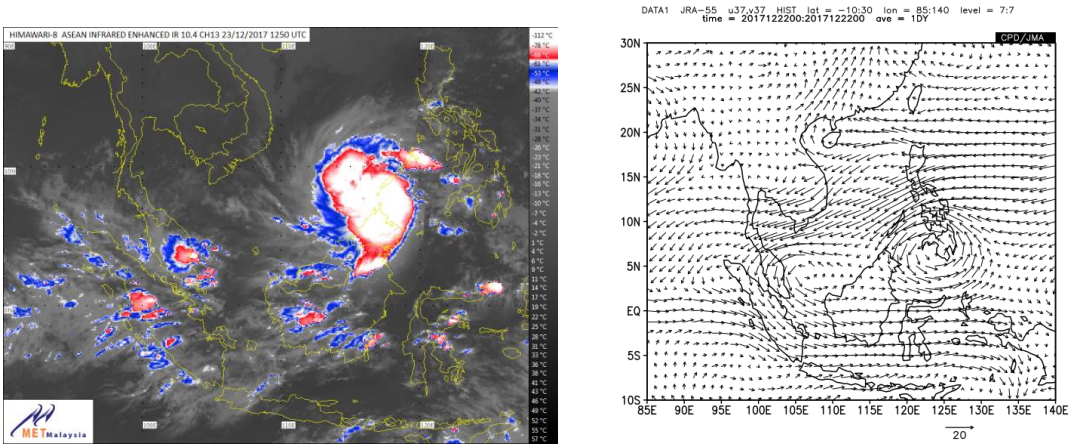


Figure 3: Himawari satellite image on 12:50UTC 23 December 2017 showing the rain cloud clusters (left) and 850 hPa wind charts (right) associated with Typhoon Tembin.

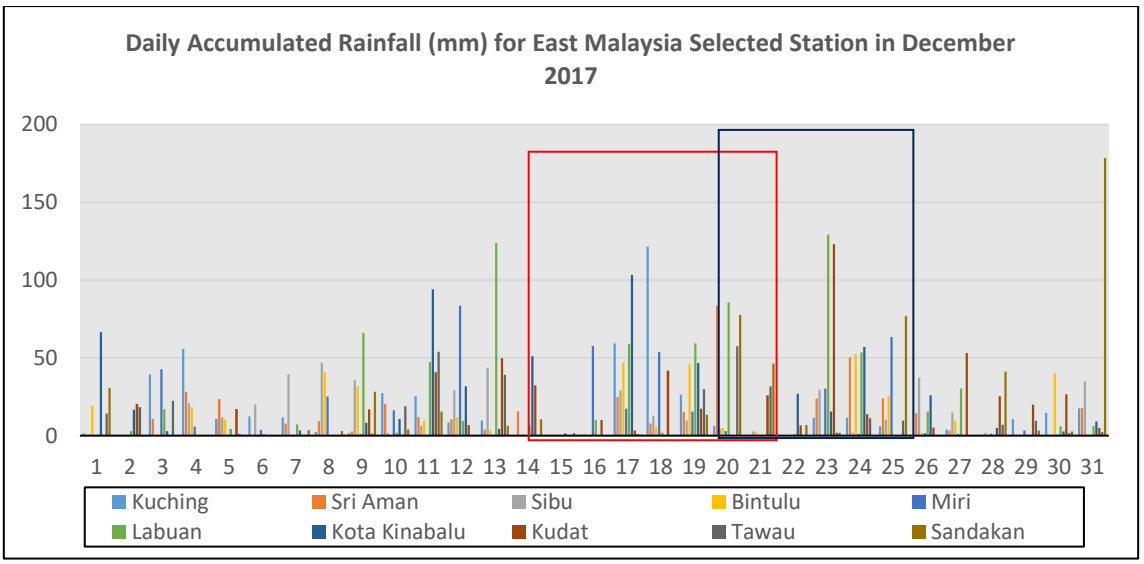


Figure 4b: Daily rainfall chart of selected meteorological stations in East Malaysia for December 2017 during Tropical Storm KAI-TAK (14-21 December 2017) and Typhoon TEMBIN (20-25 December 2017).

The formation of Typhoon Damrey over Vietnam had enhanced the low pressure area over northern Peninsula resulting in long hours of heavy rainfall causing flash flood, landslide and strong wing over Penang Island and parts of mainland on the 4th and 5th November 2017. The flash flood affected about 4,870 people in the states of Penang, Kedah and Perak. Similarly, Typhoon Tembin formed over the Philippines and move across northern Sabah on the 23rd December 2017 caused flooding and warranted the issuances of high seas warning over Sabah waters. Twelve villages in Kota Belud District were affected and strong winds were observed during the passage of the typhoon.

2. Hydrological Assessment (highlighting water-related issues/impact)

In March 2018, The Department of Irrigation and Drainage, Malaysia (DID) successfully establish the new National Flood Forecasting and Warning Centre (PRABN). The objectives of PRABN is to strengthen the operational flood forecasting and warning activities as well as to develop new flood forecasting and warning system which includes data collection, flood modeling, database and centralize system and warning dissemination capabilities. Establishment of PRABN is timely and concurrently with implementing The National Flood Forecasting and Warning Programme (PRAB) which is designed to develop the flood forecasting and warning system for 40 main river basins throughout the country.

To date, DID has develop 817 telemetry stations, 1223 manual flood gauges, 153 flood warning boards and 477 automatic flood warning sirens in flood prone areas. The number of hydrological stations and the warning system will increase gradually when the PRAB system completed. Currently, six flood forecasting models have been developed and used for operational flood forecasting and warning, namely:

1. National Flood Forecasting and Warning System for Muda River Basin
2. National Flood Forecasting and Warning System for Sarawak River Basin
3. National Flood Forecasting and Warning System for Padas River Basin
4. National Flood Forecasting and Warning System for Kerian River Basin
5. National Flood Forecasting and Warning System for Muar River Basin
6. National Flood Forecasting and Warning System for Kedah River Basin

Three new flood forecasting model have been developed and was in operation during monsoonal season from November 2017 to January 2018. The models are;

1. National Flood Forecasting and Warning System for Kelantan River Basin (NaFFWS Sg Kelantan)
2. National Flood Forecasting and Warning System for Terengganu River Basin (NaFFWS Sg Terengganu)
3. National Flood Forecasting and Warning System for Pahang River Basin (NaFFWS Sg Pahang)

All three NaFFWS models were developed using advance technology and new capabilities to simulate the flood inundation area using 2D analysis. By using High End Processing Server, accurate river profile and higher resolution Digital Elevation Model, the forecast flood location with flood depth can be determined in advance. The NaFFWS System is also integrating with NWP data from MMD HPC System as input for rainfall forecast to obtain the flood forecast up to 7 days ahead. NaFFWS System has successfully produced the flood forecast and provide flood warning to NADMA as well as to public for three monsoonal flood events during November 2017 to January 2018 floods period.

3. Socio-Economic Assessment (highlighting socio-economic and DRR issues/impacts)

In Malaysia, the National Security Council Directive No.20: The Policy and Mechanism for Disaster and Relief Management is still the main guideline for disaster management in Malaysia. The directive prescribes the mechanism for the management of disasters including the responsibilities and functions of related agencies under an integrated emergency management system. After 3 years of establishment of National Disaster Management Agency (NADMA), a shifting from disaster management to disaster risk management has shown a significant achievement, in line with Sendai Framework for Disaster Risk Reduction.

In March 2018, the United Nations Office for Disaster Risk Reduction (UNISDR) has launched a Sendai Framework Monitor System (SFM), a global on-line tool to monitor the implementation of seven targets of the Sendai Framework. SFM Orientation and Training Workshop has been conducted on 23-24 March 2018, in collaboration with UNISDR Asia & Pacific Regional Office and National University of Malaysia, to established a national disaster baseline, familiarization with the system and all the relevant data that need to be reported. Around 35 ministries and agencies have participated. Refresher course on SFM has been conducted recently on 4 Sept 2018, aimed to enrich the datasets of up to 2015.

Since Malaysia has yet to develop its own disaster risk reduction indicators, the Sendai Framework Monitor formed as a base to understand the data needed for effective disaster risk reduction, to calculate the impacts and cost of disaster as well as to provide

key data relevant to all phases of disaster risk management and to support decision making processes. Acknowledging the fact that disaster can cause serious impediment to socioeconomic development, Malaysia currently is working on the improvement of data collection and measuring method/tools on disaster losses as well as the impact of each disaster event, especially on critical infrastructures and main economic activities.

4. Regional Cooperation Assessment (highlighting regional cooperation success and challenges.

Typhoon information issued by Regional Specialized Meteorological Centre (RSMC), Tokyo Typhoon Centre and Joint Typhoon Warning Centre (JTWC), Hawaii are used to analyze the typhoon's track, intensity and weather related impact in the region. On WAM and storm surge models, MMD and JMA are working closely to improve thee output of these models and try to add new features into the model such as back tracking or drifting features for search and rescue proposes.

Another ongoing regional cooperation between MMD, TMD and JAM is about the development of radar composite map, Quality Control (QC) and Quantitative Precipitation Estimation (QPE). The Technical Meeting on Radar QC and QPE for TMD, MMD and JMA Experts held in the JMA Headquarters, Tokyo, Japan from 12th to 15th December 2017 to discuss the development and improvement of QPE techniques as well as the utilization of Doppler velocity data and detection of low level wind shear. In the meantime, the discussion about the calibration and quality control of radar data with the addition of utilization of dual polarization parameters in quality control provide the enhance knowledge to the MMD officers.

Group photo of participants during the Technical Meeting held on 12-15th December 2017

II. Summary of Progress in Priorities supporting Key Result Areas

1. Radar Integrated Nowcasting System (RaINS)

Main text:

Malaysian Meteorological Department (MMD) is implementing and operationalizing Radar Integrated Nowcasting System (RaINS) since August 2017 for continuously weather monitoring. RaINS is operationalized by integrating the reflectivity data from 12 radar stations throughout Malaysia and blending it with the Numerical Weather Prediction (NWP) of MMD. This technology was adopted from Short-range Warning of Intense Rainstorms in Localized System (SWIRLS) developed by Hong Kong Observatory (HKO) but tuned in-house for optimal results in Malaysia by MMD. RaINS uses an optical flow algorithm and backward semi-Lagrangian advection scheme to track the movement of radar echoes up to 3 hours ahead of time, based on past radar echoes. This approximation works well within a short period and the problem of growth and decay in thunderstorm cells are tackled by blending with NWP data. The comparison between observed and forecast of RaINS during the occurrences of low pressure system over

Penang on 4 November 2017 and Tropical Storm Kai-Tak on 23 December 2017 are shown in Figure 5 (a) and (b) below.

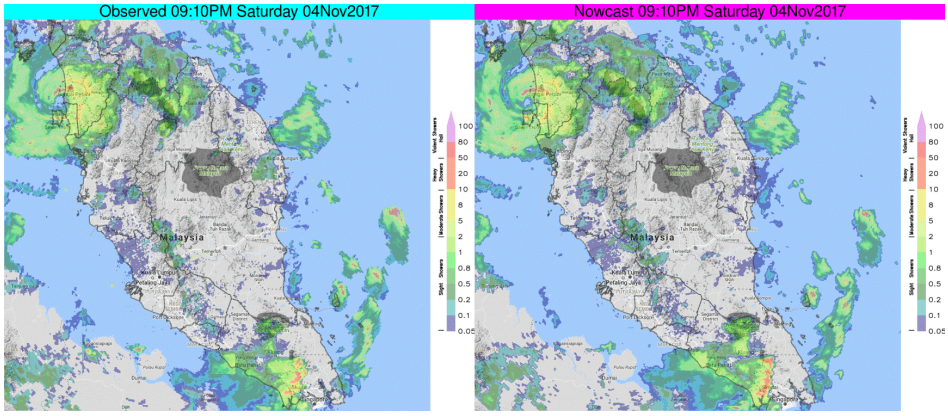


Figure 5(a): Low Pressure system over Penang on 4 November 2017

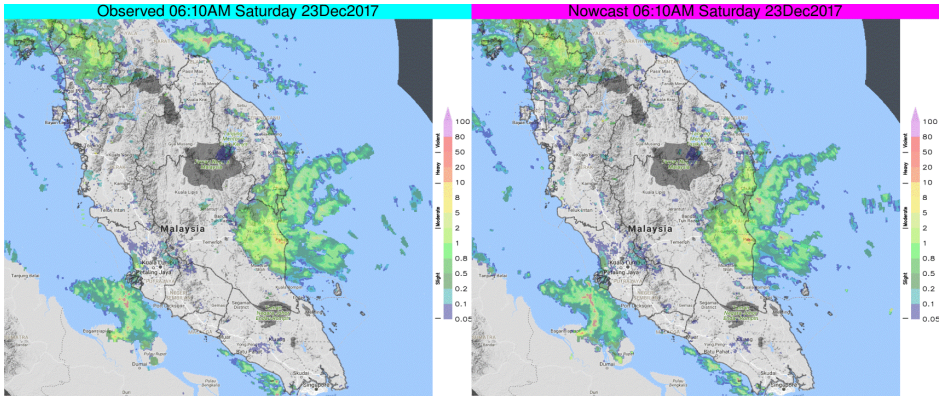


Figure 5(b): Tropical Strom Kai-Tak on 23 December 2017

Identified opportunities/challenges, if any, for further development or collaboration:

MMD will continue to collaborate with Hong Kong Observatory (HKO) to further improve the accuracy of RaINS for extreme weather event. MMD has submitted the proposal to Typhoon Committee Trust Fund (TCTF) requesting the budget for RaINS project to be included in one of the Preliminary Project of WGM in 2019. Conducting the workshop on RaINS to other interested Members is another option to be considered in the future.

Priority Areas Addressed:

<u>Meteorology</u>

1. To mitigate against the damaging impacts of typhoons and enhance the beneficial typhoon related effects for the betterment of quality of life through scientific research, technological development and operational enhancement.

2. To enhance capacity to generate and provide accurate, timely and understandable information on typhoon-related threats.

Hydrology

1. To strengthen typhoon related disaster risk management in various sectors, including hydrological and aviation sectors, through strategic partnerships and collaboration.

Contact Information:

Member: Malaysia
Name of contact for this item: Mr. Yip Weng Sang
Telephone: (603) 7954 2146
Email: yipws@met.gov.my

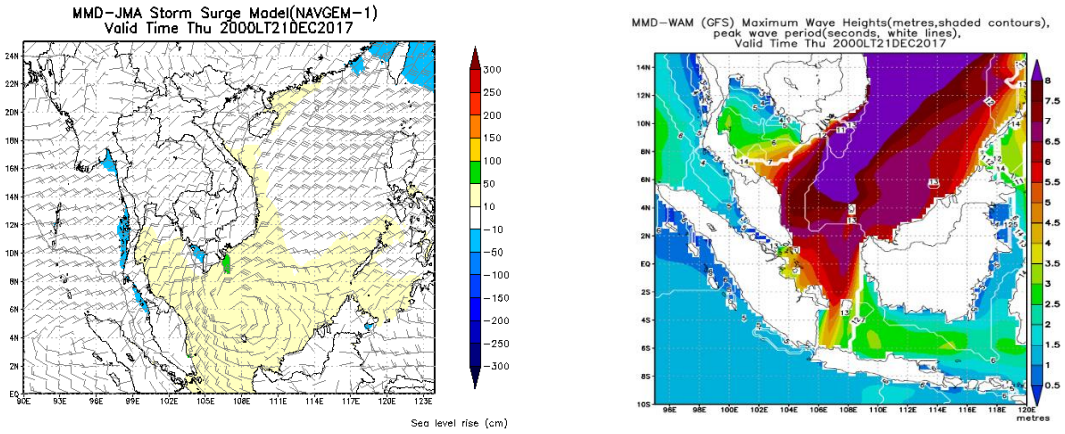
2. Utilizing Wave and Storm Surge Models during Tropical Strom

Main text:

Malaysian Meteorological Department (MMD) operates two wave models namely MMD adopted WAM cycle 4 wave model and Japan Meteorological-Meteorological Research Institute (MRI) third generation wave model (MRI III). Both models used one way nesting method to simulate the wave energy generated from local wind and swell propagation from well-organized strong wind system such as tropical storm. The wave model uses surface wind forecast form various NWP centre and has 2 domain namely coarse grid and fine grid domain. Output consist of significant wave height and direction, wind wave height and direction, swell height and direction, peak wave period and wave steepness.

MMD adopted the Japan Meteorological Agency (JMA) Storm Surge Model and operationalized it since March 2009. Although Malaysia is not located in the direct typhoon path but strong typhoon occurrence in Malaysia adjacent waters can cause the wind and mean sea level pressure fluctuation which can result in sea level rise due to wind and pressure setup. In addition to this, during the Boreal Winter season, strong north-east winds become predominant in south-east Asia region especially in the east coast of Peninsular Malaysia. Thus, the continuous run of the JMA-MMD storm surge model is essential to monitor and forecast sea level rise which can affected low lying coastal areas during typhoon or winter monsoon season.

During the Tropical Storm Kai-Tak, sea level rise was observed along the east coast of Peninsula Malaysia as well as Borneo facing the South China Sea as shown in Figure 6 (a). At the same time, South China Sea also experiencing the high wave due to strong wind and pressure setup as shown in Figure 6 (b).



(a) Storm Surge (b) Maximum wave height

Figure 6: Sea level rise (left) and maximum wave height (right) during TS Kai-Tak on 21 December 2017.

Identified opportunities/challenges, if any, for further development or collaboration:

MMD will continue to collaborate with Japan Meteorological Agency (JMA) to further improve the storm surge and wave models. MMD had successfully conducted the Workshop on Numerical Marine Model on 29 October 2018 – 2nd November 2018 facilitated by Mr. Nadao Kohno from Oceanography Research Department, Meteorological Research Institute, JMA. During the training workshop, new features is added into wave model such as back tracking/drifting trajectory to track the source of oil spill or point of sink of any ships/boats. This information is crucial for search and rescue team.

Priority Areas Addressed:

<u>Meteorology</u>

1. To mitigate against the damaging impacts of typhoons and enhance the beneficial typhoon related effects for the betterment of quality of life through scientific research, technological development and operational enhancement.
2. To enhance capacity to generate and provide accurate, timely and understandable information on typhoon-related threats.

Hydrology

1. To strengthen typhoon related disaster risk management in various sectors, including hydrological and aviation sectors, through strategic partnerships and collaboration

DRR

1. To enhance capacity to generate and provide accurate, timely and understandable information on typhoon-related threats.

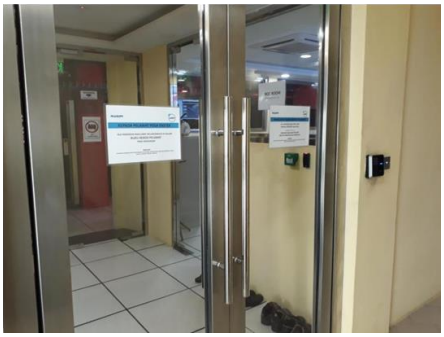
Contact Information:

Member: Malaysia
Name of contact for this item: Mr. Nursalleh K. Chang
Telephone: (603) 7954 2146
Email: nursalleh@met.gov.my

3. High Performance Computing (HPC)

Main text:

MMD's High Performing Computing (HPC) with processing capabilities of 100 teraflops (peak performance) has been operationalized since Jun 2017. It is a great help for department's operation in weather monitoring where the resolution has been increased from 4km to 1km and forecast lead time from five to seven days. It has three domains with resolution of 9km, 3km and 1km and able to generate more than 28 products of different meteorological parameters with forecast up to 7 days ahead. The forecast data is used by Drainage and Irrigation Department (DID) for their flood forecasting models, water reservoir, slope management and hydroelectric dam operators for plaining purposes.



Building housed MMD's High Performing Computing (HPC)

Identified opportunities/challenges, if any, for further development or collaboration:

Value added and additional features to the NWP final products will be enhanced to suit the stakeholder's demand.

Priority Areas Addressed:

Meteorology

1. To mitigate against the damaging impacts of typhoons and enhance the beneficial typhoon related effects for the betterment of quality of life through scientific research, technological development and operational enhancement.
2. To enhance capacity to generate and provide accurate, timely and understandable information on typhoon-related threats.

Hydrology

1. To enhance capacity to generate and provide accurate, timely and understandable information on typhoon-related threats.

Contact Information:

Member: Malaysia

Name of contact for this item: Mr. Muhammad Firdaus Ammar Abdullah

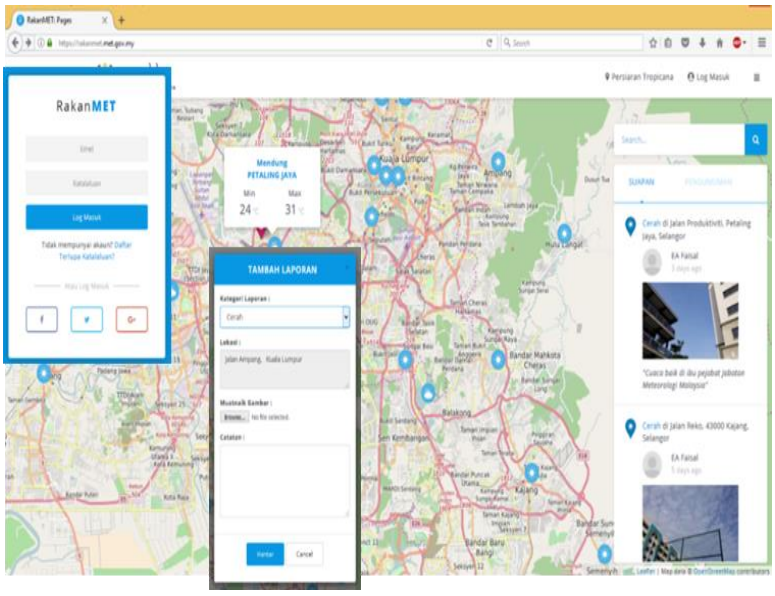
Telephone: (603) 7954 2146
Email: kumar@met.gov.my

4. Warning Dissemination System Using New Technologies

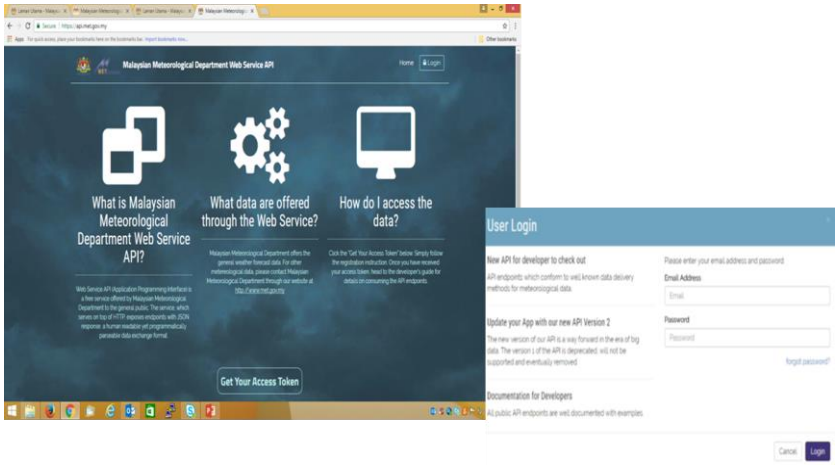
Main text:

MMD is embarking in new ways to disseminate weather warning and information to public in line with development of modern technologies. To improve our service delivery, MMD has refurbished its mini studio where live weather broadcasting with superimposed graphic through national TV stations were carried out more frequently. Besides that, public also can access to near real-time weather information and warning through our recently develop mobile application called myCuaca (myWeather in English). MMD also developed another interactive mobile application called RakanMET (Friends of Met in English), where the public can share weather conditions at their respective areas with our weather forecaster by sending comments, video or photos. MMD also develop web service API (Application Programming Interface), a free service offered to the general public.

myCuaca



RakanMET



MMD's web service API (Application Programming Interface)

Live Weather Broadcast via National Television Station from MMD's studio

Identified opportunities/challenges, if any, for further development or collaboration:

MMD will embark on new technology for warning dissemination if found suitable, reliable and easy access by the public and stakeholders

Priority Areas Addressed:

Meteorology

1. To strengthen the resilience of communities to extreme weather and typhoon related disasters through the intelligent use of data, information and communication technology

DRR

1. To enhance capacity to generate and provide accurate, timely and understandable information on typhoon-related threats
2. To enhance Typhoon Committee's governance and efficiency, and monitor the effectiveness of Typhoon Committee's activities.

Contact Information:

Member: Malaysia

Name of contact for this item: Mr. Ambun Dindang

Telephone: (603) 7954 2146

Email: ambun@met.gov.my

5. Impact Based Forecast (IBF)

Main text:

MMD is in the process of producing its impact based matrix table for major disaster affecting Malaysia including tropical cyclones. In collaboration with Met Office UK, meeting cum workshop on Impact Based Forecast (IBF) has been conducted on 25-27 June 2018 aimed to introduce the IBF to disaster management agencies, create and agreed to the impact table for major disaster such as thunderstorms, strong winds, floods and tropical cyclones and way forward for implementation of impact based forecast in Malaysia. Next steps is the stakeholder engagement to explain on how to use IBF and interpretation of IBF in different type of disaster and areas affected.

Participants during the Impact Based Forecast (IBF) Training workshop

Group of Participants preparing for the impact table.

Identified opportunities/challenges, if any, for further development or collaboration:

MMD will continue to collaborate with impact based forecast experts to develop the impact table for major disaster in Malaysia including tropical cyclone. The development of impact tables required the involvement of disaster management agencies such as National Disaster Management Agency of Malaysia (NADMA).

Priority Areas Addressed:

Meteorology

1. To strengthen the resilience of communities to extreme weather and typhoon related disasters through the intelligent use of data, information and communication technology.
2. To enhance Typhoon Committee's governance and efficiency, and monitor the effectiveness of Typhoon Committee's activities

DRR

1. To mitigate against the damaging impacts of typhoons and enhance the beneficial typhoon related effects for the betterment of quality of life through scientific research, technological development and operational enhancement.

Contact Information:

Member: Malaysia

Name of contact for this item: Mr. Ambun Dindang

Telephone: (603) 7954 2146

Email: ambun@met.gov.my

6. Operational System for Urban Flood Forecasting and Inundation Mapping (OSUFFIM)

Main text:

Malaysia is committed to WMO's Working Group on Hydrology (WGH) Annual Operating Plan (AOP) 4, Operational System for Urban Flood Forecasting and Inundation Mapping (OSUFFIM) with a preliminary site visit by Prof. Yangbo Chen carried out in August 2017. Lack of flood forecast model in urban area especially for tropical climate area and suffer with localize flood due by convective weather system. The implementing of OSUFFIM model hopefully will help to obtain the accurate and advance flood forecast at the urban area. Pinang river basin at the State of Pulau Pinang has been selected as pilot project area. Currently, Department of Irrigation and Drainage (DID) Malaysia and Prof Yang Bo Chen from Sun Yat Sen University, China actively sharing the catchment and hydrologic information as well as historical flood records for assessing the capability of OSUFFIM model on producing flood forecast.

Identified opportunities/challenges, if any, for further development or collaboration:

Lack of flood forecast model in urban area especially for tropical climate area and suffer with localize flood due by convective weather system.

Priority Areas Addressed:

Hydrology

1. To mitigate against the damaging impacts of typhoons and enhance the beneficial typhoon related effects for the betterment of quality of life through scientific research, technological development and operational enhancement.

Contact Information:

Member: Malaysia
Name of contact for this item: Ms. Paridah Anum Bt. Tahir
Telephone: (603)
Email: paridah_a@water.gov.my

7. National Flood Forecasting and Warning Centre (PRABN) website

Main text:

The observe rainfall, water level and flood information are disseminated to the authorities and public via mobile phone text messages, emailing and the website http://publicinfobanjir.water.gov.my.This website has been enhanced and improved in terms of latest flood alert information, flood forecast warning and flood reports. The website was designed based on client requirements in which has been separated for public/agencies use and internal PRABN officer website. The internal website has a content to meet the requirements of technical staff in monitoring and analysing the flood situation in the country. Besides that, DID, MMD and NADMA also constantly holds exhibitions to educate the public on severe weather conditions includes flood warning and preparedness to be taken.

Identified opportunities/challenges, if any, for further development or collaboration:

The limitation of the warning dissemination system at remote area due to less communication coverage, scattered population, and lack of public infrastructure and the education level of the local peoples is the challenge the Department especially during flood. The Government of Malaysia will cooperate with the other countries as well as experts in this area and try to overcome the problem via implementing successful Best Practices modules.

Priority Areas Addressed:

Hydrology

1. To strengthen the resilience of communities to extreme weather and typhoon related disasters through the intelligent use of data, information and communication technology

Contact Information:

Member: Malaysia
Name of contact for this item: Ms. Paridah Anum Bt. Tahir
Telephone: (603)
Email: paridah_a@water.gov.my

8. Preparedness: Earthquake and Tsunami Simulation Exercise

Main text:

In order to build a resilient nation towards disaster, in 2018, National Disaster Management Agency (NADMA) has conducted a series of awareness programmes and simulation exercises which serve as a platform to convey information on disasters to risk prone communities, to enhance the preparedness among state and local disaster players and to enable community to take action to save themselves, family, neighbours and community members when disaster strikes. On 7th August 2018, NADMA in collaboration with United Nations Development Program (UNDP) has conducted an Earthquake and Tsunami Simulation Exercise at Kota Kuala Muda with the involvement of State and local disaster players such as first responders, District Disaster Management Committee, students from primary and secondary schools, academicians, local communities and non-governmental Organizations (NGO). This programme managed to instill awareness and equipped them with knowledge on how to properly react during disaster.

Students and local community representatives

Participants from local responders

Identified opportunities/challenges, if any, for further development or collaboration:

This kind of programme should be conducted more frequently with the involvement of all sectors and participants, taking into consideration of various geological, hydrological and meteorological hazards and risks in Malaysia.

Priority Areas Addressed:

DRR

1. For better disaster preparedness and building more resilient community.

Contact Information:

Member: Malaysia

Name of contact for this item: Ms. Che Siti Noor Che Mamat

Telephone: (603) 8870 4903

Email: chesitinoor@nadma.gov.my

9. Regional Cooperation: 33rd Meeting of ASEAN Committee on Disaster Management, 6th ASEAN Ministerial Meeting on Disaster Management and related meetings

Main text:

Leaders from ASEAN National Disaster Management Office gathered in Putrajaya, Malaysia from 1- 5 October 2018 for the 33rd Meeting of the ASEAN Committee on Disaster Management (ACDM). This biennial meeting provides oversight to the

implementation of the Work Programme under the ASEAN Agreement on Disaster Management and Emergency Response (AADMER), the legally binding agreement of all 10 ASEAN member states. The outcomes of the meeting are directly report to the Ministers in charge of Disaster Management, who also serve as Conference of the Parties (COP) during ASEAN Ministerial Meeting on Disaster Management (AMMDM). This year, Malaysia is the chairman of ACDM and AMMDM with the theme of Public-Private Partnership. The ASEAN Disaster Day was also launched during the opening ceremony by Prime Minister of Malaysia. The significant outcomes from this meeting among other is to continue a progressive work by 5 Working Groups, to increase the AADMER annual fund and to work on the implementation of roadmap of One ASEAN One Response.

The 6th ASEAN Ministerial Meeting on Disaster Management chaired by the Deputy Prime Minister of Malaysia

Identified opportunities/challenges, if any, for further development or collaboration:

In future, is it anticipate that the disaster risk reduction and management will be more intense in terms of frequency and complexity, taking into consideration the influence of the climate change, rapid urban development and human-induced disaster. The understanding of risk need to be improved, the governance should be strengthened, the effort on investment to lessen the impact when disaster strikes should be enhanced and post- disaster build back better need to be proper planned.

Priority Areas Addressed:

DRR

1. To enhance the partnership and cooperation within regional organization in DRR planning, strategies and activities.

Contact Information:

Member: Malaysia

Name of contact for this item: Ms. Che Siti Noor Che Mamat

Telephone: (603) 8870 4903

Email: chesitinoor@nadma.gov.my