

MEMBER REPORT

ESCAP/WMO Typhoon Committee
7th Integrated Workshop

THAILAND

Nanjing, China
26-30 November 2012

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I Overview of tropical cyclones which have affected/impacted Member's area in 2012

1. Meteorological Assessment (highlighting forecasting issues/impacts)

During 1st January to 31st October 2012, there was only one tropical cyclone directly affected Thailand namely tropical storm “Gaemi (1220)” which developed from the low pressure cell over the middle of the South China Sea (13.5 °N, 113.0 °E) at 0000 UTC on 30th September. This depression had moved northwards on the first day and then northeastward. It intensified into a tropical storm at 0600 UTC on 1st October and turned southeastward and eastward, respectively. It continued to develop to a severe tropical storm on 3rd October and reached its peak intensity with the maximum wind of 50 knots near its centre. Gaemi made a large cyclonic loop during its lifetime and made landfall in Qui Nhon, Vietnam on 6th October as a tropical storm. It then entered Cambodia and downgraded into the tropical depression and moves further into Sa Kaew province, Thailand on late 7th October. Gaemi became low pressure cell over the eastern and central regions of Thailand on the following day and intensified the monsoon trough, lying across central and eastern regions of Thailand. This resulted in plentiful rain mainly over the central and eastern Thailand. The highest daily rainfall was 92.1 mm in Tak Fah District, Nakhon Sawan Province on 8th October. The track of Gaemi and accumulated amount of rainfalls are show as in figures 1 and figure 2.

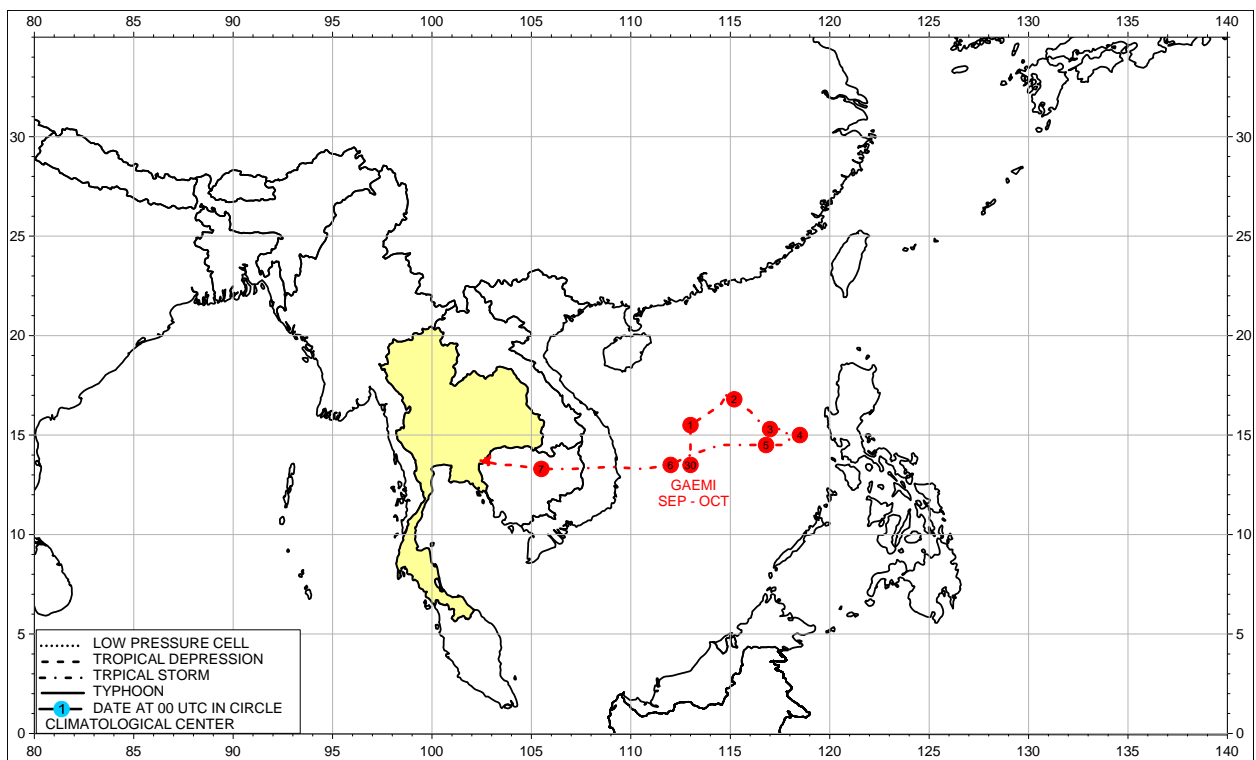


Figure 1 Track of Tropical Storm GAEMI (1220), 2012

Source: Climatological Center, Meteorological development Bureau, Thai Meteorological Department

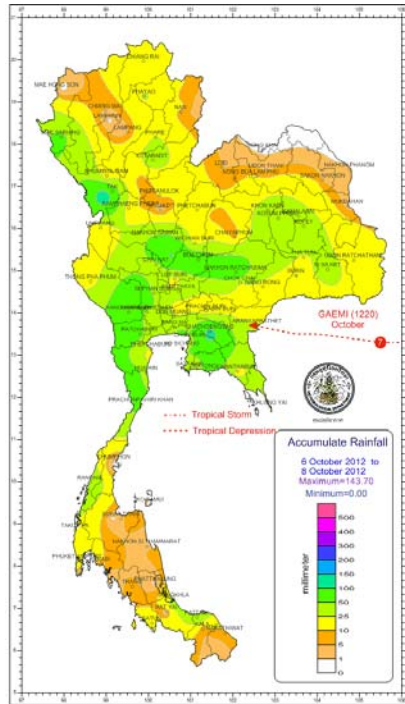


Figure 2 Accumulated amount of rainfalls since 6th October until 8th October 2012

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

During 1st January to 31st October 2012, it seems that the occurrence of both drought and flash floods in some parts of Thailand. During the rainy season, rainfall across the country was slightly lower than normal but the distribution was highly uneven in time and space. The Southwest Monsoon was strong this year and an intense monsoon trough was found to lie across the entire country, especially extending from the North, Central and Eastern part of Thailand. This strong monsoon caused flash floods at various locations throughout the country especially the western part of Thailand (from North to South) there are more affected by the Southwest monsoon. The areas affected by flash floods include the Northern region (in Mae Hong Son province and Lampang province), Western region (Tak province and Kanchanaburi province) and Southern (Ranong province) regions of the country.

During the year, only one tropical cyclone “GAEMI” had an impact on the hydro-climatology of the country. TC Gaemi did not cause any flood but brought more rainfall to the Northeastern and central parts of Thailand.

Serious drought occurred in 2012. The Northeastern part of Thailand was most affected. Water inflow from major rivers such as Ping, Wang, Nan and Chao Phraya were slightly less than their long-term average levels. However, the water levels indicative of potential flooding were reached in the Prachin river in the East and Yom river at Sukhothai province.

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

During year 2012 (January to October), Thailand faced 2 types of disaster phenomena, Drought and Flood. The situation and damage is less harmful than last year. Detail as follows;

Drought

Since February to May, The affected areas in 51 provinces 513 districts 3,523 sub-districts and 37,546 villages. The victims are 12,806,004 people by 3,475,573 families. The damages agricultural areas were 1.021,258 rai. (Approx. 134,526,241 Baht) The budget for water allocation and consumption were 283,641,413 Baht. (as of June 29,2012)

Flood

Since September to October, The affected areas in 36 provinces 116 districts divided by region as follow; Northern 12 provinces (Phitsanulok, Phrae, Chiang Mai, Lampang, Uttaradit, Mae Hong Son, Phichit, Tak, Chiang Rai, Nakhon Sawan, Uthai Thani and Phetchaboon) Central 12 provinces (Sukhothai, Nonthaburi, Ayutthaya, Sara Buri, Suphan Buri, Chainat, Ang Thong, Nakhon Pathom, Ratchaburi, Kanchanaburi, Bangkok and Samut Prakan) Northeast 2 provinces (Surin and Chayaphoom) East 5 provinces (Sakaeo, Rayong, Prachin Buri, Trad and Chon Buri) and South 4 provinces (Phuket, Satul, Surat Thani, Phangya and Ranong). (as of October 16, 2012)

4. Regional Cooperation Assessment (highlighting regional cooperation successes and challenges)

4.1 Development of regional radar network

The achievement of the radar composite project, which under the Typhoon Committee (WMG) AOP 6, is establishing the radar composite map in the area of UFRM pilot city of Hat Yai in the first step. Thai Meteorological Department (TMD) selected 3 radars such as Phuket Radar station, Krabi Radar station and Sathing Pra Radar station as the pilot sites for the composite map (Figure 3). Following with RSCM Tokyo conducts training for two radar experts from TMD on 19 – 22 November 2012.

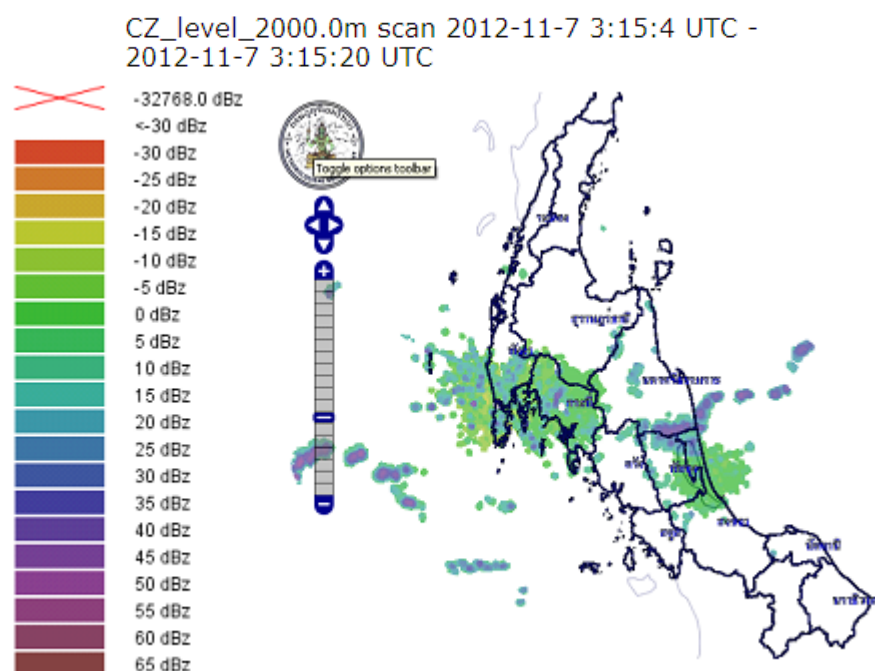


Figure 3 Radar composite map which cover in the area of UFRM pilot city at 0315 UTC on Nov. 7th,12

4.2 Urban Flood Risk Management (UFRM) Project

This project was launched in 2008 and led by China. Thailand has proposed Hat Yai, Songkhla Province to be one of Pilot Cities in the Cross-Cutting Project of Urban Flood Risk Management (UFRM) of Typhoon Committee. The activity in 2012 was a senior hydrologist from RID attended Urban Flood Risk Management (UFRM) Training Course for Pilot Cities in Guangzhou, China from 24 to 26 September 2012.

The 1st Meeting of TC working Group on Hydrology on “Comprehensive Counterplan for Extra-ordinary Flood” was held in Seoul, Korea on 7-10 October 2012, hosted by the Ministry of Land, Transport and Maritime Affairs (MLTM), Republic of Korea. Director of Hydrology division and Senior Hydrologist from RID attended the event. From this meeting, Hai Yai of Thailand selected as the pilot city for the project Development of Operational System for Urban Flood Forecasting and Inundation Mapping (OSUFFIM) in 2013.

II. Summary of progress in Key Result Areas *(For achievements/results which apply to more than one Key Result Area, please describe them under the most applicable Key Result Area. Then, at the end of the description, place in parentheses () the other applicable Key Result Areas)*

1 Progress on Key Result Area 1: Reduced Loss of Life from Typhoon-related Disasters

Strategic Goal 1: To enhance cooperation among TC Members to reduce the number of deaths by typhoon-related disasters by half in the ten years of 2006 – 2015 (using the ten years of 1990 - 1999 as the base line).

a. Meteorological Achievements/ Results

Satellite Reception

There are two types of weather satellites, the geostationary and polar-orbiting satellites. At present, Thai Meteorological Department (TMD) has ground receiving system for the MTSAT, FY-2, TIROS (NOAA), Terra/Aqua Direct Broadcast (MODIS) and CMACast satellites. This year, China Meteorological Administration (CMA) donated the installation work of CMACast station included CMACast station antenna, indoor equipment and the installing, training of CMACast system, FY 2E , FY 2D and Meteorological Information Comprehensive Analysis and Process System (MICAPS) to TMD.

Weather Forecasting Service

Thai Meteorological Department issues the routine day-to-day weather forecast and the tropical cyclone warning. For public awareness and advice, much more weather advisories are issued at frequent interval if tropical cyclones form in areas between latitude 0°-25° N and longitude 90° – 120° E. The bureau will then transmit weather products to public and related agencies by telephone, fax, e-mail, website, and mass media.

NWP Model

Thai Meteorological Department has been using the Unified Model (version 4.3) of the United Kingdom Meteorological Office for operational numerical weather prediction (NWP) with resolutions of 100 km for the whole globe, 50 km for Southeast Asia and 17 km for Thailand. The model is run 4 times a day (00, 06, 12, 18 UTC). The forecast products are provided in the main run at 00 and 12 UTC. The intermediate run at 06 and 18 UTC only

generate background fields for the next main run. Objective analysis and initialization are performed by using nudging method. The Global models extended forecast from 3 days to 7 days. Southeast Asia Model forecasts to 3 days and Thailand model extended forecasts from 36 h to 48 h (Figure 4).

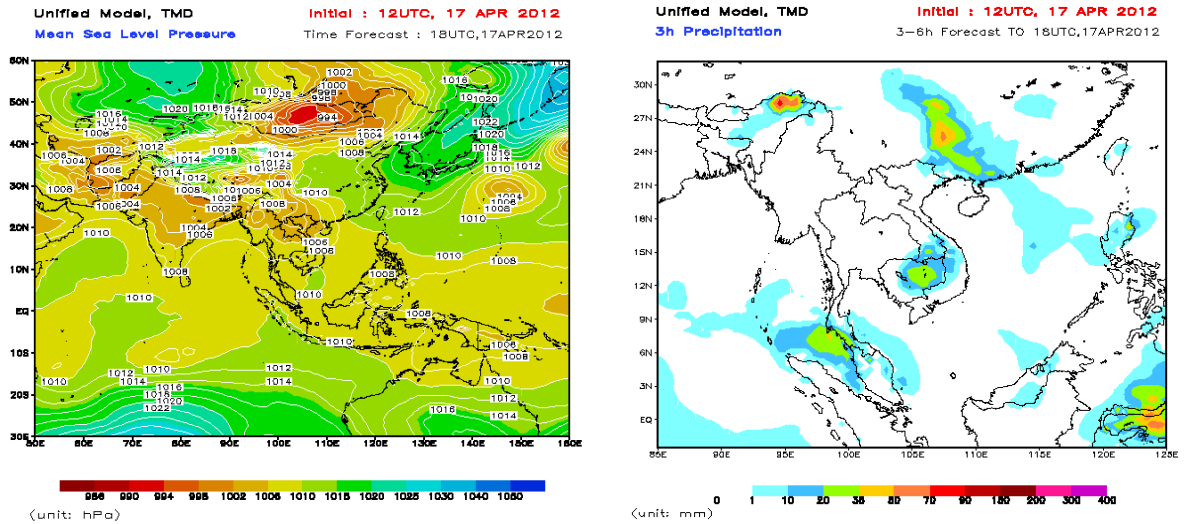


Figure 4 NWP Products from the Unified Model on 12 UTC, 27 April 2012 (MSLP from Global Model and Rain from SE Asia Model)

Wave Forecast System

Thai Meteorological Department has provided daily wave analysis and 24-hour wave forecasting charts to the general public. The domain covers from longitudes 95E to 105E and from latitudes 5N to 15N, which encompasses the Gulf of Thailand, Andaman Sea and South China Sea. The significant wave and wave spectral methods are the major tools to make wave analysis and forecast in the operation run (Figure 5).

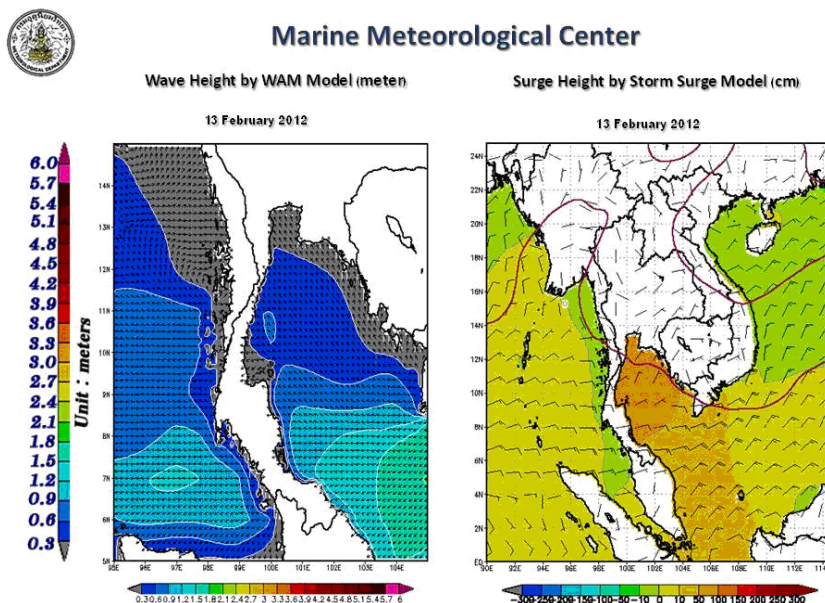


Figure 5 Wave and Surge height

The Meteorological Telecommunication

The South East Asia Meteorological Telecommunication Center, RTH Bangkok has been upgraded to a new system to support both new code, TDCF (Table Driven Code Form), and old format, TAC (Traditional Alphanumeric Code) to be exchanged in GTS network. Due to the increasing amount of data in the network, the heavier traffic data are better taken care of in this system.

The progress of WIS (WMO Information System) implementation for Bangkok DCPC is in the process of preparing WIS demonstration document including validation of relevant technical requirements with GISC Tokyo. The full operation of Bangkok DCPC will be started in 2013. According to the plan, the minimum area of responsibility of new Bangkok DCPC WIS Portal will correspond with current GTS network. Additional products from the center will be chosen, developed and disseminated through our WIS Portal. Internet speed was also upgraded to 6 Mbps (guaranteed) to cope with high volume of data through WIS Portal and internet traffic for GTS network (Hong Kong, Myanmar and Cambodia).

The new Volmet system was also upgraded to replace the outdate system. This new sophisticated system has been serving effectively and more flexible for many years to come.

b. Hydrological Achievements/Results

Royal Irrigation Department (RID) and Water Resource Department (DWR) of Thailand are responsible for water management. DWR's main functions relates to water policy, planning and strategy. RID is responsible for water source development, water management, including flood and drought relief, especially in floodplains and downstream watershed, whereas DWR takes care of natural rivers and steep-slope upstream watershed.

The Water Watch and Monitoring System for Warning Centre (WMSC) was set up to monitor flood situations on a 24 hourly basis by RID to decrease the loss of lives and property. There is also collaboration with other related organizations to plan flood prevention. Local flood protection systems were set up in important economic areas where severe floods may occur. In addition, early warning systems using various technologies were established. This includes a telemetry and flood forecasting system for water management.

The RID to date has installed and operated about 300 telemetric stations in 23 projects on 17 of 25 river basins in Thailand. In addition, 555 manual river gauges and 2,294 manual rain gages were installed and operated all over country. As part of the local flood warning system, DWR has developed and installed early warning systems in 458 villages of the total 2,370 villages in Thailand and included with automatic flood-warning sirens are being operated.

Flood Forecasting and Warning System for protecting in 25 basins are being developed. For this system, In this 2012 the new telemetric stations and infrastructure networks will be installed telemetering and in 2013 the new telemetering will be installed 7 networks together with a flood modeling system that include both hydrometeorology and hydrodynamic such as MIKE11, MIKEGIS, INFO-WORK and AIT Rivernetwork.

c. Disaster Prevention and Preparedness Achievements/Results

Department of Disaster Prevention and Mitigation, Ministry of Interior

Authority

Pursuant to Disaster Prevention and Mitigation Act B.E. 2550 (2007), Department of Disaster Prevention and Mitigation has been designated as the principal government entity to be responsible for implementing disaster prevention and mitigation activities nationwide. Main responsibilities of this department include; formulating National Disaster Prevention and Mitigation Plan; implementing disaster management activities, coordinating for multi – agency joint efforts in disaster management; providing support and assistance to other government agencies as well as local administration organizations, and private sector in conducting disaster prevention and mitigation activities; conducting initial relief efforts for affected people; and providing advice and training on disaster management to the staff of government agencies, local administration organizations and private sector. In addition, under Section 14 of Disaster Prevention and Mitigation Act B.E. 2550 (2007), director general of this department has been designated as Central Incident Director, therefore, he has been obliged to perform task on disaster prevention and mitigation nationwide, and has been empowered to control, oversee the performance of duties of other Incident Directors, Incident Deputy Director, Incident Assistant Director, state official and voluntary corps nationwide.

Role and Task

Department of Disaster Prevention and Mitigation plays crucial role in disaster preparedness operations for flood prevention and mitigation, provision of assistance to flood affected people during and after flooding.

Before Flooding:

- 1) Establish National Disaster Prevention and Mitigation Center as focal point to integrate multi – agency joint operations.
- 2) Notify provincial governor, chief of district office, and chief executive of local administration organization to set up Disaster Prevention and Mitigation Operations Center in their jurisdictions and assign the staff to function at the center.
- 3) Develop master plan on prevention and mitigation operations of different types of disaster including floods to provide framework and guidelines for systematic and collaborative flood prevention and mitigation. Examples of these master plans, among others include Master Plan on Prevention Measures and Provision of Assistance to Flood, Tropical Storm, and Landslides Affected People, Mater Plan for Evacuation of People from Flash Floods and Mudslides Risk Areas, Strategic National Action Plan on Disaster Risk Reduction 2010 – 2019 etc.
- 4) Develop Provincial Disaster Prevention and Mitigation Plan to provide framework and guidelines for systematic and integrated disaster management. This plan should encompass the followings; disaster management approach which is compatible with existing disaster risk condition in locality; warning information notification, communication procedures; lists of emergency personnel, equipments; data regarding areas at risks, evacuation plan and designation of safe areas and places to accommodate evacuees etc.
- 5) Ensure operational readiness of officials, emergency response teams/tambon – based rescue teams, civil defense volunteers; main and auxiliary communication and telecommunication devices, equipments and vehicles/vessels, water pumps, and bailey bridges. Prepare equipments for immediate cleaning waterways and immediate repairing of damages roads/bridges.

6) Assign the officials to keep, follow weather condition information from Thai Meteorological Department on 24/7 basis, and keep in close contact with Chief of Disaster Prevention and Mitigation Provincial Office for disaster situation information in locality.

7) Put in place warning dissemination system through official communication network, mass media, close – circuit community radio broadcasting to keep people in areas at risk well – informed of disaster situation and to follow news and information from Thai Meteorological Department and “Minister Warning” village – based disaster warning volunteers. As a consequence, those who are at risk will have enough time to prepare for confronting with approaching disaster and for evacuating to safe place when required.

8) Notify people at risk to prepare for coping with potential disaster, storing emergency foods, drinking water, medicine, emergency tool kits, and to create flood dykes.

9) Notify local administration organizations to give high priority to water retention area management, and to finance waterway recovery projects and to eliminate aquatic weeds obstructing water flow.

10) Organize disaster exercise in conjunction with all stakeholders at national, provincial cluster, provincial, and district levels.

During Flooding

1) Assign primary situation assessment team to collect primary data for useful purpose of providing assistance.

2) Dispatch tambon- based rescue teams and emergency response team of the department to conduct rescue operations.

3) Notify provincial governor, acting as Provincial Incident Director, to issue directives to all agencies within jurisdiction to activate the tasks, e.g.,

3.1) Provincial Highway Office and local administration to put up warning signs/roadblocks to warn road users of flood dangers.

3.2) Provincial military or police official and civil defence volunteer corps to assist in facilitating traffic movement in specific areas, and as well, requesting for helicopter operational efforts.

3.3) District office/local administration organization in conjunction with foundation, private sector etc., to prepare ready – to – eat meals, drinking water and other basic necessities to provide to people in affected areas, as well as providing other assistance and temporary shelters to affected people. Government agencies responsible for providing relief assistance to affected people are entitled to properly and appropriately spend Provincial Emergency Relief Contingency Fund, and should keep in mind that provision of relief assistance is very important and urgent mission that should be given the highest priority.

4) Issue directives to Disaster Prevention and Mitigation Regional Center to mobilize equipments to conduct road clearance operations and to install bailey bridges where they are required.

After Flooding

1) After the floods receded, notify Provincial Highway Office, Provincial Rural Office or local administration organization to dispatch road maintenance and repairing teams along with equipments to conduct emergency road repair of key transport routes damaged by floods immediate and temporary use. In case where those routes were heavily damaged, provincial agencies concerned should request for assistance from nearby mobile army development unit or Disaster Prevention and Mitigation Regional Centers.

2) Coordinate with foundations and charitable organizations which include Princess – Pa – Foundation, Thai Red Cross Society, Poh Teck Tung/Ruam Katanyu Foundations, voluntary units and charitable organizations in locality to provide foods and other basic necessities for survival to affected people.

3) Improve/restore flood devastated areas to normal condition as soon as possible.

4) Provide relief assistance to affected people according to Ministry of Finance Regulations on Emergency Relief Fund B.E. 2546 (2003) and its revised addendum. The provincial governor has been authorized to approve the Provincial Emergency Relief Contingency Fund allocated to each province for providing relief assistance to disaster affected people and for implementing disaster prevention activities which include

- Installing sandbag wall to reduce the impact of flooding, removing objects obstructing water flow etc.
- Providing meals, drinking water and other basic necessities for survival (to be done within 24 hours after an occurrence of disaster)
- Providing cash compensation for repairing damaged hours due to disaster
- Providing compensation for funeral expense (to be done within three days)
- Repairing damaged roads, bridges, dykes etc.

d. Research, Training, and Other Achievements/Results

Local Training

During 1 January – 31 October 2012, TMD had provided training course to its staffs on the regularly basis with the hope to be enhance their potentials in order to prepare them to cope with the advanced technology and concerned recent academic development. The local training had been conducted in country are show in the table below:

No.	Course Title (s)	Duration	No. of participant(s)
1.	Train the trainer Phase 1 Phase 2	9-11 January 30-31 August	59 55
2.	Training course on Knowledge Management on Academic Performance	9 February	60
3.	Training Workshop on Quantitative Precipitation Estimation - QPE/Quantitative Precipitation Forecasting – QPF	12-16 March	30
4.	Training course on Weather forecasts and Warning Phase 1 Phase 2 Phase 3	26-30 March 14-18 May 11-15 June	37 34 35
5.	Technical Training on the Integrated CMACast System	18-20 June	20
6.	Training course on Fundamentals of Meteorology Phase 1 Phase 2 Phase 3	23 May 6 June 27 June	89 77 88
7.	Training course on English for Aeronautical Meteorology	48 hrs/course (3 courses)	45

Overseas Training

During 1 January – 31 October 2012, the staff of TMD had participated in six overseas trainings as shown in the table below:

No.	Course Title (s)	Duration	Country	No. of participant(s)
1	Training on Operational Tropical Cyclone Forecasting	19 February – 3 March 2012	India	1
2	Workshop on Application of Space Technology to Enhance the Activities of Typhoon Committee	27 February – 2 March 2012	China	1
3	Training Course on Weather Radar Operation and Data Utilization	4 – 17 March 2012	Republic of Korea	1
4	Training Workshop on Capacity Building on Acid Deposition and Impact Assessment Analysis	5 – 16 March 2012	Japan	1
5	International Training Seminar on Methods for short-term Climate Prediction	26 March – 7 April 2012	China	1
6	APEC Training Course on Quantitative Precipitation Estimation/Forecasting (QPE/QPF)	27 – 30 March 2012	Philippines	1
7	Typhoon Committee Research Fellowship Scheme 2012	1 May - 29 June 2012	Republic of Korea	1
8	Training Course under Japan-East Asia Network of Exchange for Students and Youths (Topic : Flood Management of Thailand)	11 – 19 May 2012	Japan	1
9	Training on Natural Disaster Management (Colombo Plan)	28 May – 15 June 2012	Thailand	1
10	Training on Climate Prediction and Application for Green Growth in Developing Countries (APCC-GGGI Training Program)	4 – 15 June 2012	Republic of Korea	2
11	Training Course on McIDAS-V Software Application in Satellite Meteorology	11 – 21 June	China	1
12	Training Course on Capacity Building in Regional Numerical Weather Prediction Based on the COSMO Model	16 - 27 July 2012	Germany	2
13	CSSTEAP's P.G. Diploma Course in Satellite Meteorology and Global Climate (SATMET-8)	1 August – 30 April 2013	India	1
14	Fourth International Training Workshop on Climate Variability and Change	8 – 17 August 2012	Costa Rica	1
15	The Ewha International School on Data Assimilation (EISDA 2012)	22 – 24 August 2012	Republic of Korea	1
16	Training Course for Weather Forecasters	16 – 27 September 2012	China	1

e. Regional Cooperation Achievements/Results

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f. Identified Opportunities/Challenges for Future Achievements/Results

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2. Progress on Key Result Area 2: Minimized Typhoon-related Social and Economic Impacts.

Strategic Goal 2: To reduce the socio-economic impacts of typhoon-related disasters per GDP per capita by 20 per cent in the ten years of 2006- 2015 (using the ten years of 1990 - 1999 as the base line).

a. Meteorological Achievements/Results

TMD has been effort to improve Severe Weather Alarm which an important awareness parameter. This parameter divided into 4 – level color code see as figure 6.

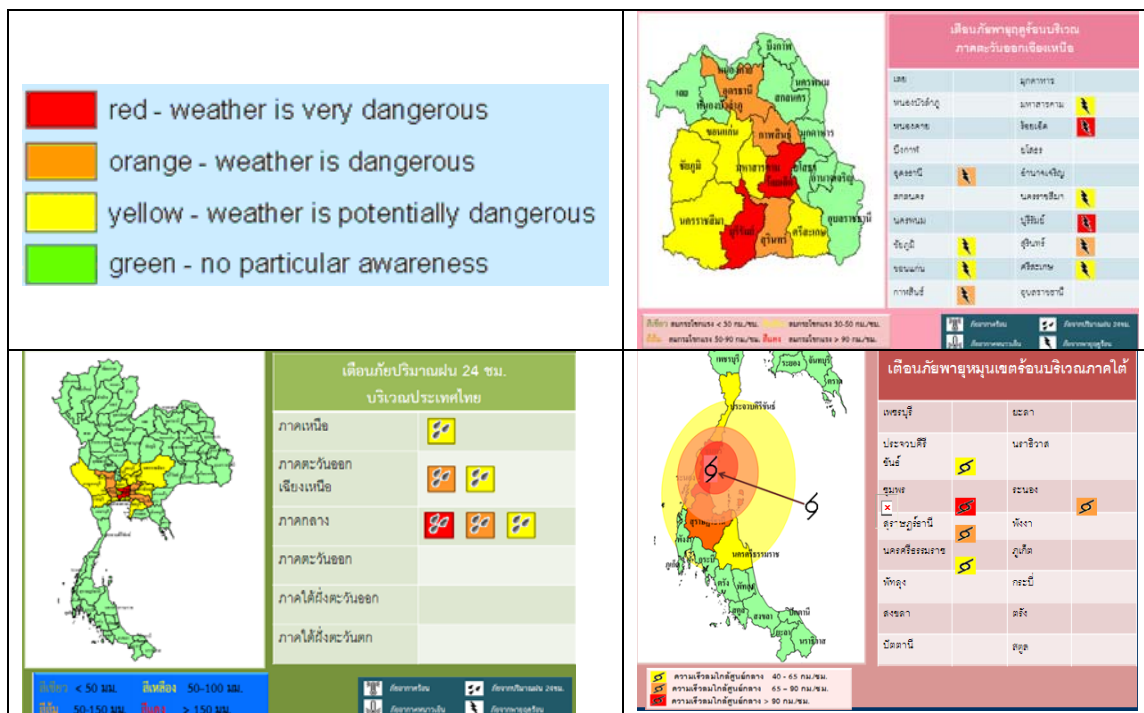


Figure 6 Examples for Weather Alarm

b. Hydrological Achievements/Results

Please refer to KRA 1b

c. Disaster Prevention and Preparedness Achievements/Results

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d. Research, Training, and Other Achievements/Results

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e. Regional Cooperation Achievements/Results

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f. Identified Opportunities/Challenges for Future Achievements/Results

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3. Progress on Key Result Area 3: Enhanced beneficial typhoon-related effects for the betterment of quality of life.

Strategic Goal 3a: To identify and explore the beneficial use of resources such as rainfall brought by typhoon.

Strategic Goal 3b: To study and promote the increasing use of typhoon-related beneficial effects among the Members.

a. Meteorological Achievements/Results

-

b. Hydrological Achievements/Results

Please refer to KRA 1b

c. Disaster Prevention and Preparedness Achievements/Results

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d. Research, Training, and Other Achievements/Results

Please refer to KRA 1d

e. Regional Cooperation Achievements/Results

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f. Identified Opportunities/Challenges for Future Achievements/Results

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4. Progress on Key Result Area 4 : Improved Typhoon-related Disaster Risk Management in Various Sectors.

Strategic Goal 4a: To provide reliable typhoon-related disaster information for effective decision making in risk management in various sectors.

a. Meteorological Achievements/Results

-

b. Hydrological Achievements/Results

Flood hazard mapping in Chiangmai city, Nan city and Lampang city were completed. The hazard maps are provided to concerned local government unit. The new project will be installing for important city within next year.

c. Disaster Prevention and Preparedness Achievements/Results

DPP related:

Mainly, water and flood management in Thailand has based on the following related mechanisms :

1. National Disaster Prevention and Mitigation Plan B.E. 2553 – 2557 (2010 – 2014)

This national plan was developed by National Disaster Prevention and Mitigation Committee and approved by the Cabinet on 17 November, 2009. It has served as the principal plan for conducting disaster prevention and mitigation activities to minimize disaster risks and losses of life and proper to meet international standard. In addition, this national plan has provided guidelines and direction for all agencies of all sectors and at all levels, local to national to facilitate and ensure the systematic and integrated collaboration during all phases of disaster.

2. National Disaster Prevention and Mitigation Plan B.E. 2553 – 2557 (2010 – 2014) : Water and Flood Management Chapter : this chapter has been added to the national plan after having been approved in principle by National Disaster Prevention and Mitigation Committee on 30 August, 2012. It has provided guidelines for integrating all state agencies' flood management plans and implementation in a practical and concrete manner. It has as well designated focal point entity to be responsible for identifying water and flood management related policy as well as for ensuring concerted, unitary, and rapid ways of managing and performing tasks, directing and commanding, and solving water and flood management related problems.

3. Water Resource Management Strategy: this strategy has been identified by Strategic Committee on Recovery and Building Future for the Nation. It serves as guidance for long – term national development which takes disaster risk management and upgrading quality of physical infrastructure to meet international standard into consideration. In this context, “Build Back Better” and “No Regrets Investment” strategy will be applied to prevent, mitigate, and minimizing damage that medium and large – scale disasters can inflict on life and property. Additionally, to rebuild foreign confidence towards Thailand and to rebuild stability, increase farmer, urban sector and national income, as well as managing water, soil, and forest resources for sustainable utilization.

4. Mater Plan on Water Resource Management : Formulated by Strategy Committee on Establishing Water Management System, this master plan encompasses eight work plans as follow :

1. Work Plan for Restoration and Conservation of Forest and Ecosystem : Key activities and interventions under this work plan aim at rehabilitating upper mid and lower forested watershed areas where water absorption occur and at slowing down the velocity of the water, and developing additional water retention areas according to plots of land available, and to develop land use plan that fits physical feature in locality. Additionally, to accomplish the objectives identified, the implementation of the following key activities is required; rehabilitating of degraded forested watershed areas, conserving forest in watershed areas, formulating and implementing soil and water conservation projects, encouraging and promoting commercial reforestation and community forestry projects, improving and conserving mangrove forests; improving water use efficiency and land use, constructing reservoirs and water retention areas, and revising and drafting relevant laws.

2. Work Plan for Major Reservoir Management and Formulation of Annual Water Management Plan: This work plan aims at preventing and mitigating the perennial flooding by implementing the following activities; developing water management plan for controlling water in major dam reservoirs located in major river basins, formulating water management plan for improving water management system for specific and different purposes, improving water usage graph or the rule curve enabling to reflect the equilibrium in water management of all sectors concerned, and disseminating water related information and maps to the public.

3. Work Plan Restoration and Efficiency Improvement of Existing and Planned Structures: This flood prevention and mitigation work plan comprises four sub – work plans which including the followings; (1) improving to increase efficiency of existing dykes, drainages, water control facilities etc. located general area (2) excavating canals, improving water channels and eliminating all objects obstructing the flow of rivers, canals, and waterways (3) enhancing efficiency in draining off water and managing floods in specific areas (4) strengthening dykes and taking the King's initiatives into account. As the consequence, in the long term, several structural projects will be materialized

including a construction of floodways or water diversion channels, land use planning, flood protection walls for key economic zones and densely populated communities.

4. Work Plan for Development of Data Warehouse, Forecasting and Warning System: This work plan provides practical guidance on putting data system in place, creating flood simulation scenarios by basing on technical content, and establishing water management entity and enhancing the capacity and efficiency of warning system. The followings are key activities to be implemented to accomplish objectives outlining in this work plan: (1) establishing National Water Data Center (2) Building hydrological simulation scenarios, forecasting and warning system (3) enhancing national warning system to be capable of monitoring and analyzing water situation in a timely manner by improving and increasing additional water monitoring stations in main rivers, installing close – circuit television at water gates and water pumping stations, enhancing efficiency and efficacy of satellite and remote sensing systems, and reorganizing and developing warning system.

5. Work Plan for Emergency Response in Specific Area: This work plan aims at ensuring state of being well – prepared for coping with floods by implementing the following activities; developing flood prevention and mitigation system for specific areas which include agricultural, industrial and densely populated areas etc., initiating system for negotiating with affected parties, arranging for building warehouses for the storage of tools and equipments, as well as conducting as analysis on the impacts of private sector’s flood prevention practices etc.

6. Work Plan for Designating Flood Retention Areas and Compensation Measures: Key activities to be implemented under this work plan include; locating the areas in upper and lower Chao Phraya River basins to be designated as water retention, improving and developing flood retention areas to slow down water flow in case of flash flood occurrence, and developing a plan for diverting water into retention areas, and simultaneously putting damages compensation measures in place for distributing extraordinary compensation to areas designated for water retention purpose.

7. Work Plan for Improving Water Management Entity: Key activities to be implemented under this work plan encompass; designating water management focal point agency to shoulder responsibility for planning, supervising, directing, monitoring and evaluation, and improving relevant rules and regulations. This focal point entity required to be fully empowered to made immediate decision if needed particularly in case of emergency or during flood crisis. In an urgent phase, it is essential to constitute Ad – Hoc Committee chaired by the Prime Minister or assigned Deputy Prime Minister, and ministers of or permanent secretaries for ministries concerned are members. In a long – term, integrated water management entity should be permanently established.

8. Work Plan for Building Understanding, Acknowledgement, and Involvement of Multi – Stakeholders in Large – Scale Flood Management: This work plan aims at building rapport and fostering cooperation in coping with flood situation among all sectors of society. Additionally, it aims at enabling all stakeholders to cope with flood in an appropriate and proper manner.

Mechanisms for Putting the Water and Flood Management Policy into Concrete Action

1. Committee on National Water and Flood Policy (CNWFP): Main tasks and responsibilities of this committee encompass identifying policy for further formulating work plans or national flood prevention and mitigation, and identifying policy regarding systematic water and flood management to be interpreted into action by all agencies concerned.

2. Committee on Water and Flood Management (CWFM): This committee is assigned to formulate action plan and to manage water and floods according to the policy identified by CNWFP and perform any other relevant task assigned by CNWFP. In addition, this committee is as well responsible for identifying operating procedures for all state agencies, to assure that flood prevention and mitigation activities have been properly implemented and according to action plan, as well as performing any task for the useful purpose of managing the water, ensuring preparedness for preventing and mitigating floods, and issuing directives to urge state agencies to take any action relevant to water and flood management.

3. Office of National Policy and Water and Flood Management: This entity function as Secretariat Office of CNWFP and CWFM to coordinate with concerned state agencies regarding the collection of data on weather conditions, water status in river basins, dams and water retention areas, physical features of areas where water flowing through, warning procedures, plans and projects and other actions relevant to water and flood management, and data on relief efforts, for useful purpose of analysis and submits the results to CNWFP and CWFM. This office as well, manages overall plan, coordinates the administration and implementation of action plan or putting the directives of CWFM into concrete action, as well as overseeing and providing advice to implementing agencies

4. National Disaster Prevention and Mitigation Joint Operations Center: An establishment of this center aims at putting unified national disaster management system in place and to ensure that each and all agencies concerned work and share relevant data in a collaborative and proper manner. In addition, aiming at setting up focal point entity to execute single command and control and as well functioning as coordinating center. All implementing agencies aim to collaboratively carry out the assigned missions to achieve common objective and the efficient and effective communication system is Operational Guideline have been put in place as follow:

1) **In normal situation:** Key – focused activities to be implemented during this phase include; coordinating, integrating data, and conducting follow up the ongoing preparation of resources such as emergency personnel, equipments and operational plans of implementing agencies to ensure their disaster operational readiness in the wake of disaster

2) **Situation of imminent disaster:** Key – focused activities to be implemented during this phase include making arrangements for emergency preparedness for activating response operations; keeping close watch on, analyzing and assessing ongoing disaster situation; informing and providing advice to incident commander for further decision making about disaster response efforts.

3) **During disaster:** Key activities to be implemented include setting up National Disaster Prevention and Mitigation Headquarters according to National Disaster Prevention and Mitigation Plan B.E. 2553 – 2557 (2010 – 2014). This national headquarters is responsible for coordinating, integrating and directing joint disaster

operations. In the face of disaster, National Joint Disaster Operation Center will be transformed into administrative support mechanism of National Disaster Prevention and Mitigation Headquarters.

2011 Destructive Flood Management

Government efforts to prevent and mitigate 2011 destructive floods have been based on Disaster Prevention and Mitigation Act B.E. 2550 (2007) which is principal national disaster management legal mechanism. Accordingly, the government has identified and put in place the systematic policy for flood prevention and mitigation. An identification of flood prevention and mitigation policy has been carried out in an integrated manner (One Stop Service) and under 2P2R principle. (Preparation: for being well – prepared; sustainable Prevention; proper and timely Response; Recovery) according to National Disaster Prevention and Mitigation Plan B.E. 2553 – 2557 (2010 – 2014). This policy has encompassed 3–R strategy which is divided into three paralleled phases delineated as follow:

1) Urgent Phase – Rescue : all key activities included in this phase were required to be completed within 1 – 2 months time frame. Flood Relief Operations Center (FROC) was established to be responsible for overseeing and managing complaints, solving problems regarding relief assistance needs, managing donations, providing medical services and temporary shelter etc.

2) Short – term Phase – Restore : all key activities includes in this phase were required to be completed within one year time frame. The efforts during this phase aimed at restoring all disrupted systems to resume normal functions as soon as possible. Other activities included providing compensation, loans and other relevant privileges. Committee and Mechanisms on Flood Victims Recovery and Rehabilitation has been established to be responsible for overseeing restoration efforts carried out by all agencies concerned.

3) Long – term Phase – Rebuild : an implementation of activities during this phase aimed at rebuilding foreign confidence and reliability toward Thailand as well as rebuilding national wealth and stability. Two committees have been constituted to oversee the implementation of activities included in this phase, namely;

- 3.1) Strategic Committee on Recovery and Building Future for the Nation; and
- 3.2) Strategic Committee on Water Resource Management and System Planning.

d. Research, Training, and Other Achievements/Results

Please refer to KRA 1d

e. Regional Cooperation Achievements/Results

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f. Identified Opportunities/Challenges for Future Achievements/Results

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5. Progress on Key Result Area 5 : Strengthened Resilience of Communities to Typhoon-related Disaster.

Strategic Goal 5a: To promote and enhance culture of community-based disaster risk management among the Members.

a. Meteorological Achievements/Results

TMD Website:

Thai Meteorology Department (TMD) website is designed to support information and warnings such as storm warning, storm track reports in the range of latitude 90-131, radar and satellite images, and data of NWP model in both Thai and English format (Figure7).



Figure 7 Display the home page of the TMD website in English when storm warning is announced and the storm track is near Thailand.

In addition, there are warnings of severe weather and earthquake. The figure 8 is an example of earthquake which is close to Thailand.



Figure 8 Display the home page of the TMD website in Thai when earthquake is near Thailand.

Regional Meteorological Center

Broadcast of weather forecasts and natural disaster warning

1.1 To distribute the daily weather forecast news and natural disasters warnings to the Meteorological station in responsible area and organizations concerned by e-mail and FAX. As well as broadcast the news to the general public by radio stations and local television stations.

1.2 Warning about severe weather feature that will cause natural disasters in the responsible region including

- Warning about severe thunderstorm
- Warning about heavy rain and flashflood
- Warning about Tropical Cyclone such as Tropical storm “GAEMI”

b. Hydrological Achievements/Results

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c. Disaster Prevention and Preparedness Achievements/Results

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d. Research, Training, and Other Achievements/Results

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e. Regional Cooperation Achievements/Results

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f. Identified Opportunities/Challenges for Future Achievements/Results

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Strategic Goal 5b: To promote education, training and public awareness of typhoon-related disasters among the Members

a. Meteorological Achievements/Results

Strategic Goal 5b: To promote education, training and public awareness of typhoon-related disasters among the Members.

Public Awareness:

Public awareness was designed to educate students, teachers and public all about weather as seen successful projects, namely, “The dissemination knowledge of meteorology and climatology in risk areas” and “Creating awareness and providing public education about meteorology and natural disasters”. Otherwise, we stressed on news distribution through public via media.

Publicizing the WMO activities on the occasion of the WMO Day and TMD Day by organizing seminars to educate public better understanding and appreciating the roles of WMO, Typhoon Committee and TMD on weather monitoring, typhoon and flood forecasting and disaster risk management.

b. Hydrological Achievements/Results

Staff of RID attended various training classes, workshops and conference both local and overseas to acquire the latest knowledge on advanced technology relating to flood forecasting and water resource management such as Training course on capacity development for flood risk management with IFAS in Japan and Training course on Water

related disaster management (Preparedness, mitigation and reconstruction) in Asian region at Japan.

A Senior hydrologist from RID visited Philippines on 5-10 June 2012 with the hydrological expert mission to Philippines and Thailand to conduct the investigation and analysis of historical flood damage for implementation on project Development of comprehensive counter plan for extra ordinary flood. On 11-14 June 2012, RID hosted for expert team to investigate 2011 flood in Thailand.

c. Disaster Prevention and Preparedness Achievements/Results

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d. Research, Training, and Other Achievements/Results

TMD have been studying research on drought index in Thailand. The objective of this study created a spatial drought index in the study area. The drought index are consists of eight indices.

1. Effective Drought Index (EDI)
2. Generalized Monsoon Index (GMI)
3. Standardized Precipitation Index (SPI)
4. Moisture Available Index (MAI)
5. Aridity Anomaly Index (AI)
6. Soil Moisture Estimate (Smest)
7. Normalized Difference Vegetation Index (NDVI)
8. Soil Moisture Index (SMI)

The study on the relations of the drought index, with the soil moisture measured from the field in the depth of soil at 10, 20, 30, 40, 60 and 100 cm in a cultivated area of sugarcane, cassava, corn , paddy fields and grass land in Sukhothai Province in the Northern part of Thailand, Udonthani, Khon Kaen, Chaiyaphum and Mahasalakam Province in the Northeastern part of thailand, Lop Buri Province in the Central part of thailand, Chacherngsao Province in the Eastern part of Thailand and Phetchaburi and Prachuap Khiri Khan in the South Eastern part of Thailand.

The result from this study can be used to decide drought in Thailand in the future.

e. Regional Cooperation Achievements/Results

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f. Identified Opportunities/Challenges for Future Achievements/Results

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6. Progress on Key Result Area 6 : Improved capacity to generate and provide accurate, timely and understandable information on typhoon-related threats.

a. Meteorological Achievements/Results

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b. Hydrological Achievements/Results

-

c. Disaster Prevention and Preparedness Achievements/Results

-

- d. **Research, Training, and Other Achievements/Results**
-
 - e. **Regional Cooperation Achievements/Results**
-
 - f. **Identified Opportunities/Challenges for Future Achievements/Results**
-
- 7. Progress on Key Result Area 7 : Enhanced Typhoon Committee's Effectiveness, Efficiency and International Collaboration.**
- a. **Meteorological Achievements/Results**
-
 - b. **Hydrological Achievements/Results**
-
 - c. **Disaster Prevention and Preparedness Achievements/Results**
-
 - d. **Research, Training, and Other Achievements/Results**
-
 - e. **Regional Cooperation Achievements/Results**
-
 - f. **Identified Opportunities/Challenges for Future Achievements/Results**
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III. Resource Mobilization Activities

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IV. Update of Members' Working Groups representatives

1. Working Group on Meteorology

Mr. Chamnong Kaeochada
Deputy Director-General
Thai Meteorological Department
4353 Sukhumvit Road, Bangna, Bangkok 10260, Thailand
Tel: (662) 399 2355 Fax : (662) 398 9229
E-mail: tmd_inter@tmd.go.th

Remark : Update of Working Group on Meteorology will report on TC meeting

2. Working Group on Hydrology

Mr. Thada SUKHAPUNNAPHAN
Director of Hydrology Division
Division of Hydrology, Office of Hydrology and Watermanagement
811 Royal Irrigation Department, Sam Sen Road, Bangkok, Thailand 10300
Tel: (662) 6695048 Fax : (662) 6695048
E-mail: thada999@yahoo.com

3. Working Group on Disaster Prevention and Preparedness

Mr.Chatchai Phromlert

Director-General of Disaster Prevention and Mitigation Department.

3/12 U-Thong Nok Road, Dusit, Bangkok 10300, Thailand

Tel: (662) 637 3654 Fax : (662) 243 5279

E-mail: foreign_dpm@yahoo.com

Thailand