MEMBER REPORT

ESCAP/WMO Typhoon Committee
10th Integrated Workshop

THAILAND

Kuala Lumpur, Malaysia
26-29 October 2015

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I. Overview of tropical cyclones which have affected/impacted Member's area in 2015

1. Meteorological Assessment (highlighting forecasting issues/impacts)

From 1st January to 30th September 2015, there was only one tropical cyclone that posed severe direct effects to Thailand namely tropical storm "Vamco (1519)". It formed as a tropical depression over the middle of the South China Sea (15.5 °N, 112.5 °E) at 0600 UTC on 13th September, then moved generally westwards and upgraded to a tropical storm at 1800 UTC on the same day. It continued to move in the same direction towards the central part of Vietnam and made landfall south of Da Nang as tropical storm at 1500 UTC on 14th September and continued moving to Lao PDR before downgraded to a tropical depression in the next morning. It then moved towards Amphoe Khong Chiam, Ubon Ratchathani province, Thailand in the morning of 15th September and moved west-southwestwards pass Si Sa ket, Surin and Buriram provinces. Vamco became a low pressure cell over the lower portion of northeastern region in the afternoon and moved to cover eastern and central regions of Thailand on the following day. Finally it covered Myanmar and the upper Bay of Bengal respectively on 18th September. The influence of Vamco, abundant rain is likely over Thailand in the northeastern eastern, central and southern regions during 14th - 18th September with the highest daily rainfall of 162.5 mm in Amphoe Khlong Yai, Trat Province on 16th September. Flooding was reported in Si Sa Ket, Surin, Chanthaburi, Chon Buri, Nakhon Nayok, Trat, Saraburi, Chumphon, Phang-Nga, Ranong and Satun provinces. The track of Vamco and accumulated amount of rainfalls are shown in Figure 1 and Figure 2, respectively.

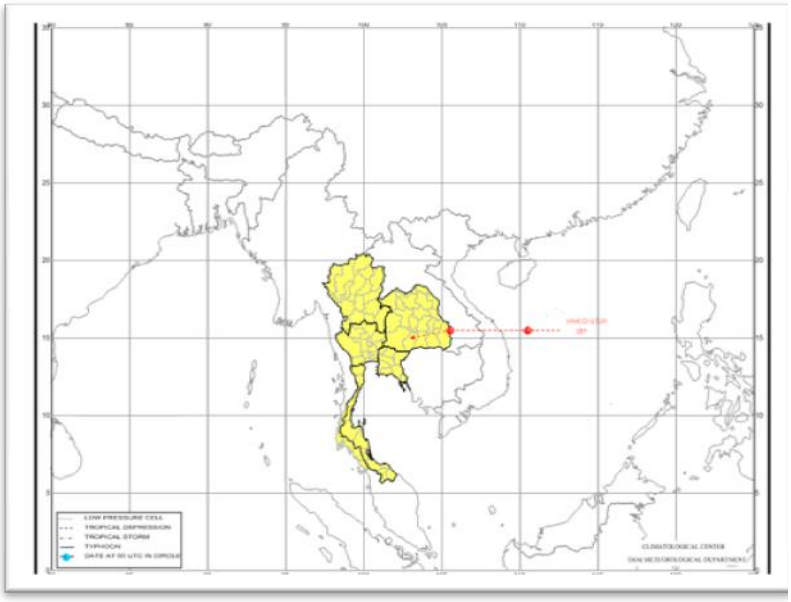


Figure 1: Track of Tropical Storm Vamco (1519)

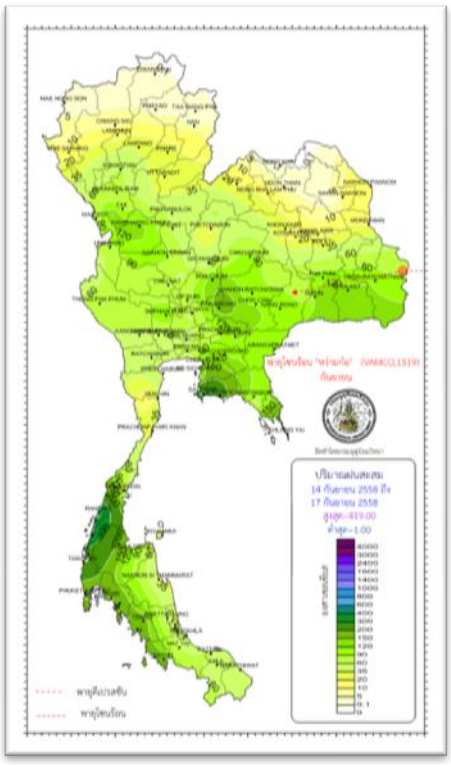


Figure 2: Accumulated amount of rainfalls during 14-17 September 2015

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

Rainfall

The average rainfall over Thailand from 1st January to 30th September 2015 was 1094.2 mm with was about 12 % below normal. Figure 3 showed that the monthly rainfall from February to June and August was below the 1981-2010 normal especially in May and June, which was 46% and 23 % below normal over the whole areas, respectively. However, the passage of the westerly trough in January, unseasonal rainfall occasionally occurred in northern and central parts of Thailand with 865 % (39.8 mm) and 67 % above normal rainfall respectively, resulting in 41 % above normal over Thailand although there was plenty of dry for most areas. In July, Thailand received plentiful rainfall and slightly above normal in northern part, northeastern part and southern part (west coast) by the influence of active southwest monsoon that periodically prevailed over the Andaman Sea and the Gulf of Thailand, the monsoon trough and active low pressure cell which occasionally located in upper Thailand. In August and September, it turned drier than normal in upper Thailand on the other hand southern Thailand was wetter than normal.

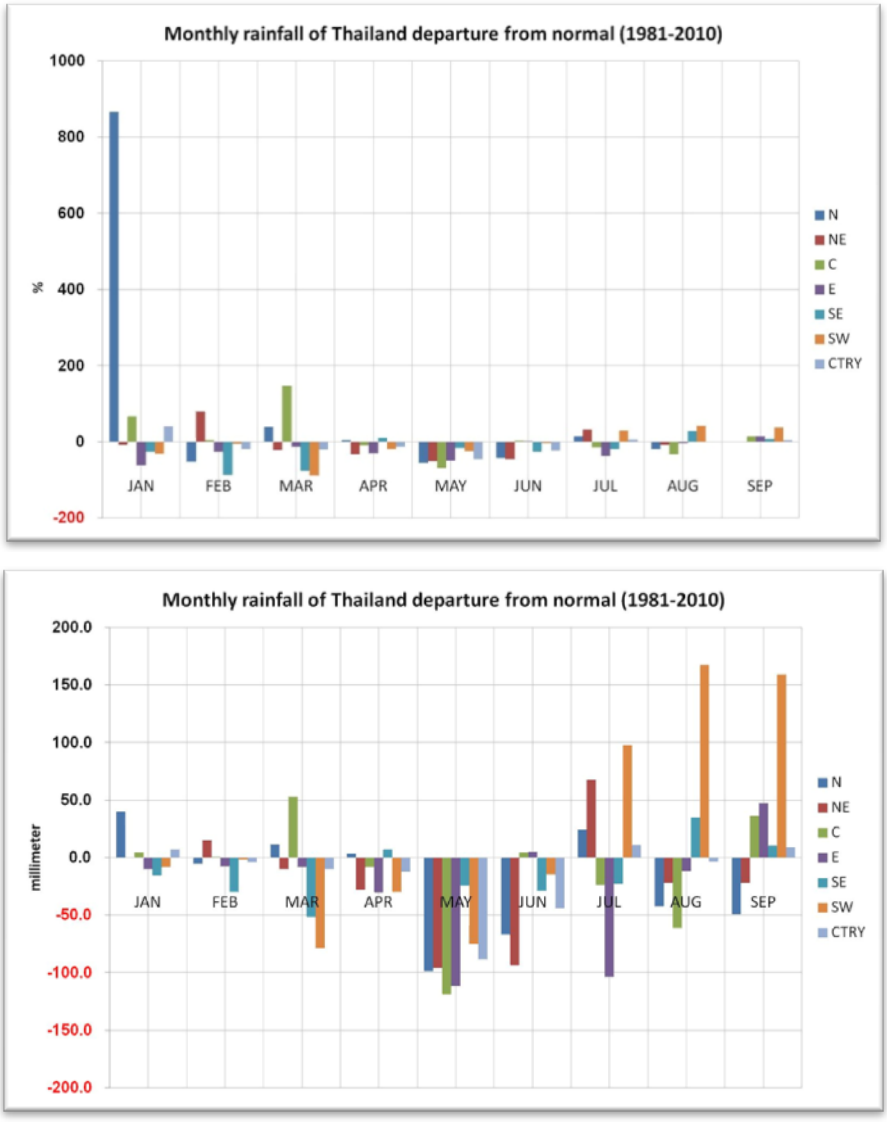


Figure 3: The monthly rainfall of Thailand departure from normal (1981-2010)

Temperature

During January and February 2015 Thailand was mostly characterized by a cool condition. Mean temperature over the country was below the 1981 - 2010 normal mainly in January by 0.6° C and over a central part by 1.1° C. These were the results from the high pressure from China occasionally extended its ridge to cover upper Thailand coupled with the northeast monsoon prevailing over Thailand and the Gulf of Thailand. From late February to late May heat low pressure cell occasionally covered upper Thailand associated with the southerly and southeasterly winds caused increase in temperature over the country and mean temperature was 1.4°C above normal in May and over northeastern part 1.9° C. After that, Thailand still experienced warmer than normal in all regions. Thailand's monthly temperatures are shown in Figure 4.

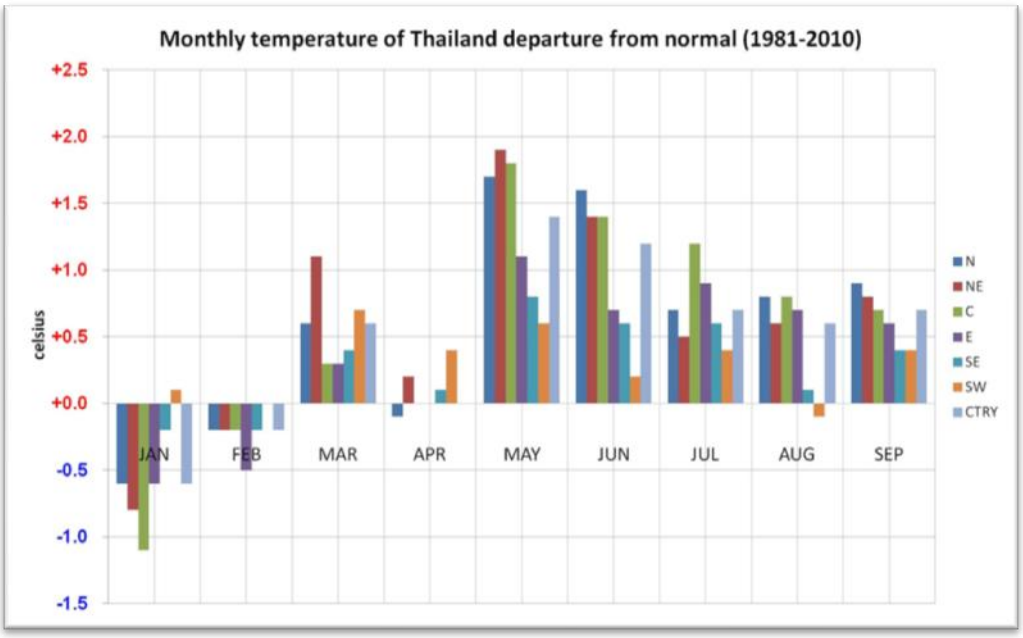
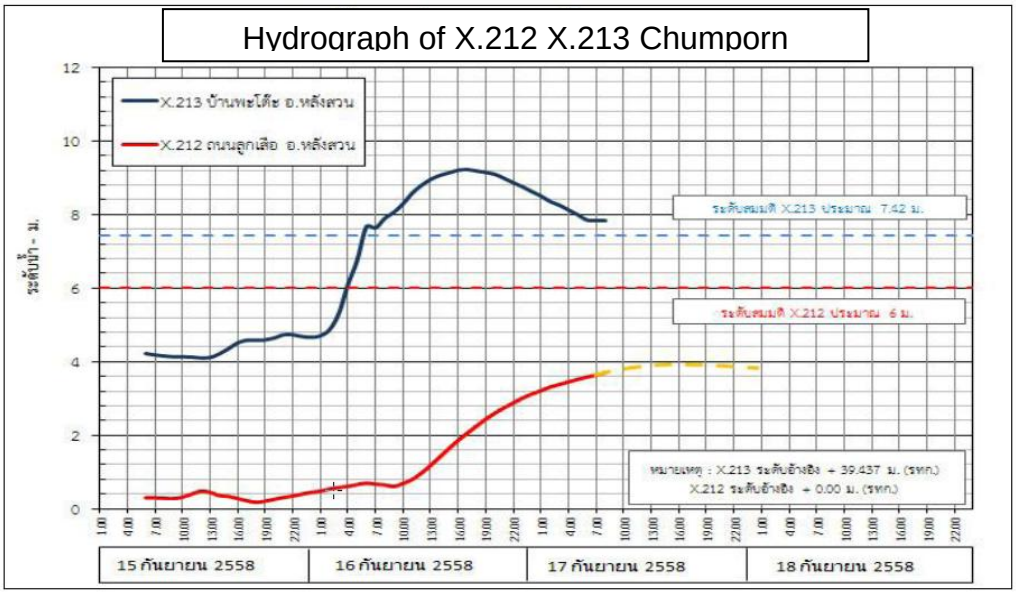


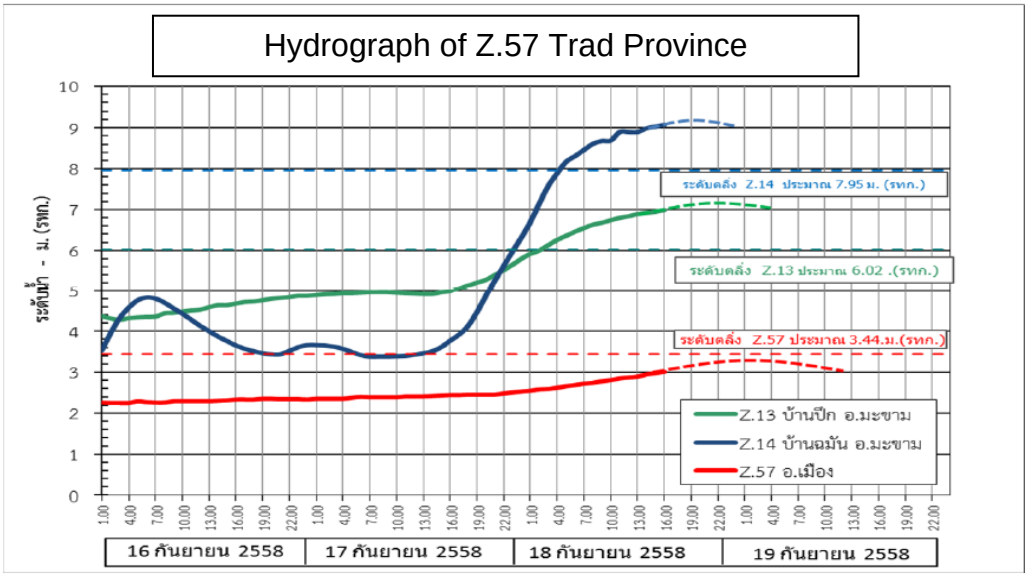
Figure 4: The monthly mean temperature of Thailand departure from normal (1981-2010)

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

During 1st of January until end of August, the trend of the precipitation is a bit less than average compare with the past record. It's the main reason to make the capital water in the reservoir is rather less than normal and this cause the strong drought area in the central of Thailand. The amount of rainfall occur in the lowland and downstream of the large reservoirs like Bhumibol Dam and Sirikit Dam so it's complicated to support the agriculture activities and also the water supply.

However in September, the impact of the tropical storms 'VAMCO' and the southwest monsoon caused the floods in some regions of Thailand. There were flooding in the Eastern and Southern Part of Thailand in September.





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

In January, provinces; including Chanthaburi, Trat, ChiangRai and Pattani were hit by seasoning storm, 1 house was damaged and 2 fishing boats were capsized.

In February, affected provinces increased to 23 provinces. 5 people were injured, social and economic damage was estimated at 12,614,689 Baht.

In March, affected provinces increased to 46 provinces. 2 people died, 6 people were injured, social and economic damage was estimated at 13,672,626 Baht.

In April, affected provinces reduced to 42 provinces but social and economic damage increased to 44,736,454 Baht.

In September, Typhoon Vamco hit the eastern, northeastern, central and Southern part of Thailand, 19 provinces have been affected by it. 2 people died, 1 people injured, it is under progress of surveying social and economic losses.

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

4.1 TMD has been working in close collaboration with JMA under the Typhoon Committee (WMG) AOP 6 Development of regional radar network. TMD has successful to created nationwide radar composite map with technical assistance of JMA. These composites are generated by combining the 19 radar network with lowest level intensity techniques (EIL) at 2 kilometers base on reflectivity every 15 minutes.

The National Typhoon Center (NTC) of KMA was invited to TMD for the transfer of TAPS technology on 14 – 16 October 2015.

4.2 DDPM has the office in all provinces that cooperate with communities and other government organizations to help victims and manage disaster. (include typhoon and storm). DDPM Regional Centers have set up Emergency Operation Center for mergency response to encounter with the effects from the above mentioned typhoons.

In normal situation, DDPM by Disaster Prevention Promotion Bureau cooperates with DDPM provincial offices for conducting CBDRM (Community Base Disaster Risk Management) to promote risk prone communities to handle with disaster risk because we believe nobody understanding disaster risks better than people who live in prone areas.

By Cooperated with JICA, DDPM had implemented the Project on Capacity Development in Disaster Management in Thailand Phase I-II in Phuket, Maehongsorn, Chumporn, Lampang, Lamphun and Nakon Sri Thammarat that was successful. So now we extend the project activities other areas.

The main challenge is Thailand has more than 10,000 communities that are difficult to cover all areas in a short period of time

II. Summary of progress in Key Result Areas
TC Members' Report
Summary of Progress in KRAs

Title of item 1 : Enhanced public weather service

TMD headquarter has providing routine day-to-day weather forecast and useful weather information such as delivery of meteorological information, severe weather warnings, radar images as well as the tropical cyclone warning via TMD's website and the media. TMD has improved website metalarm to provide Severe Weather Alarm map with detailed information about the warnings in the awareness reports issued and tropical cyclone information.

TMD headquarter and the Regional Meteorological Center has disseminated weather report and natural disaster warning to various government agencies and local people via internet, email, Fax, radio stations, television stations as well as social network such as Line, Facebook.

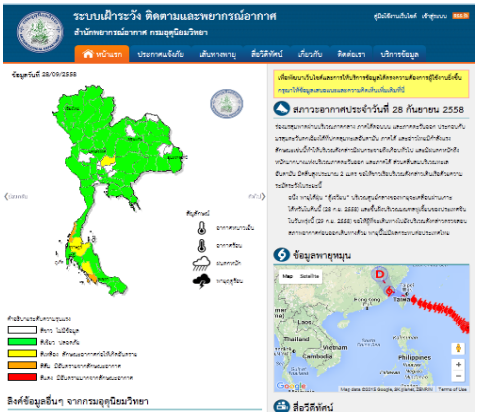
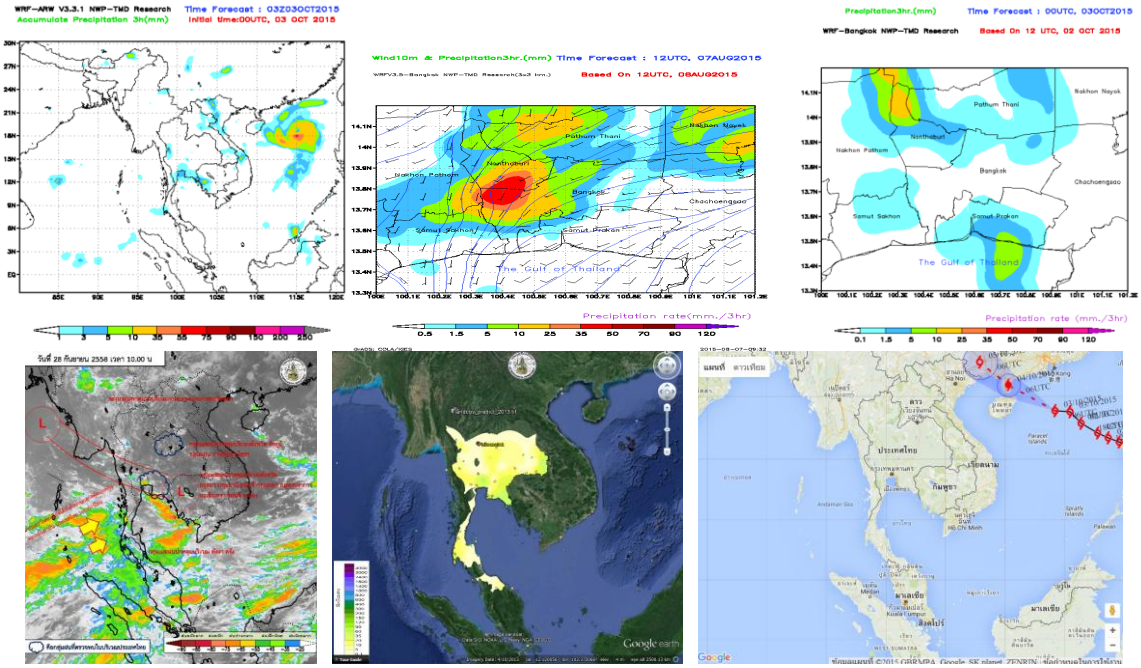


Figure 5: a) http://www.tmd.go.th b) http://www.metalarm.tmd.go.th



c) NWP product and weather information

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

Summary Table of relevant KRAs and components (please tick boxes, can be more than one, as appropriate):

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

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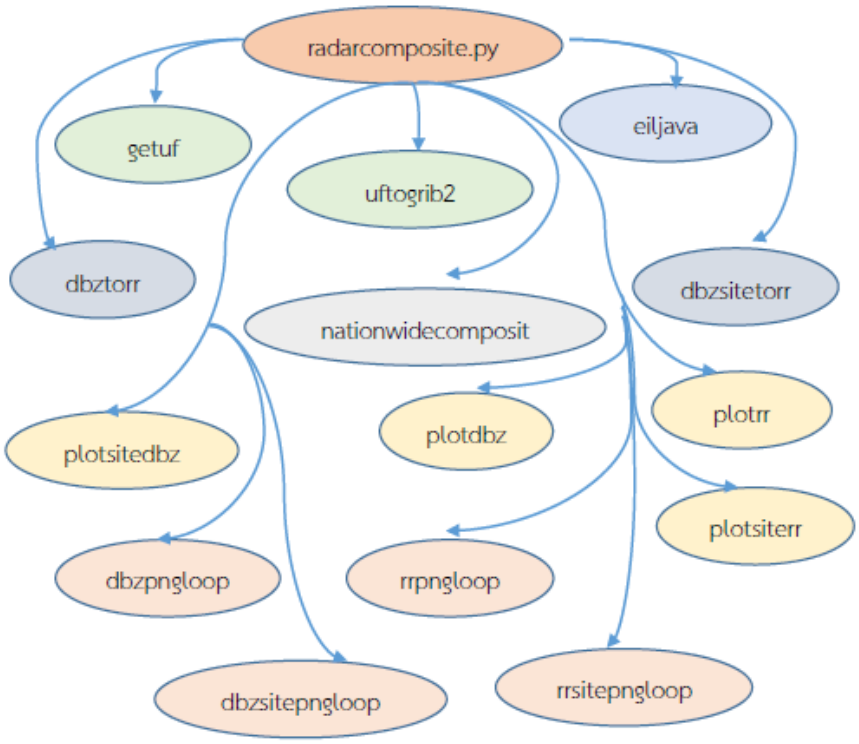
Title of item 2 : Nationwide Radar Composite Map

In year 2015, the TMD has been generating and archiving nationwide composites of radars base reflectivity every 15 minutes. These composites are generated by combining the 19 radar network (as shown in the table) with lowest level intensity techniques (EIL) at 2 kilometers.

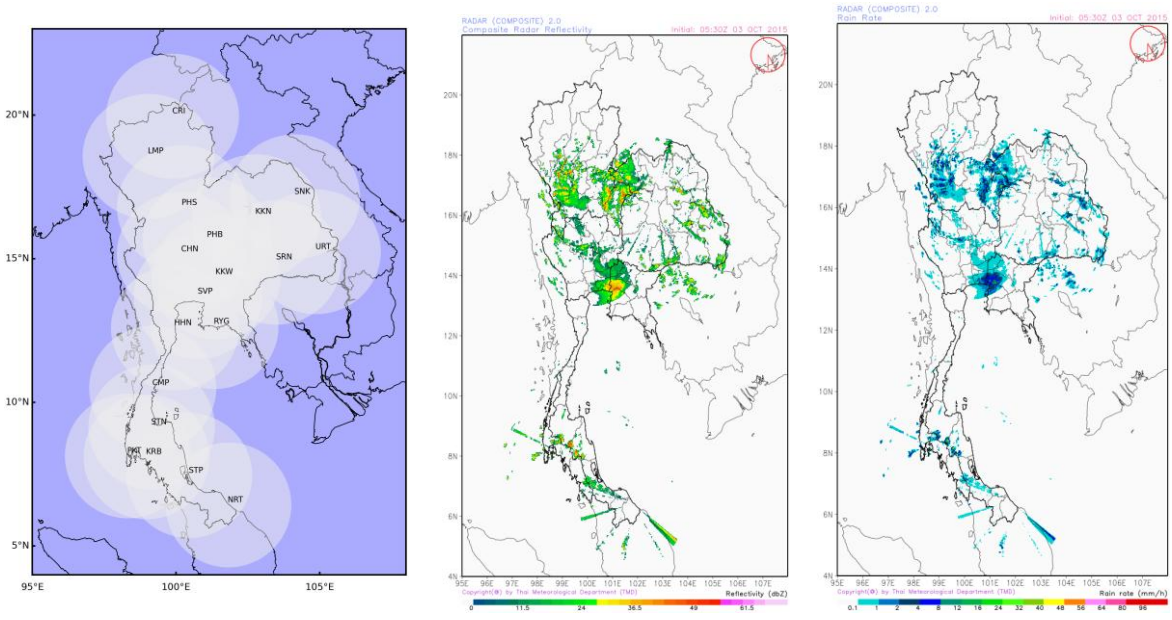
WMO NO	CODE	NAME	LATITUDE	LONGITUDE	HEIGHT	RANGE	SCAN TILT	Polarization
48308	CRI*	CHIANGRAI	19 57 41.00N	99 52 52.98E	440	240	0.9 1.3	Single
48329	LMP**	LAMPHUN	18 33 55.44N	99 02 30.12E	320	240	0.8 1.6 2.6 3.5	Single
48356	SNK	SAKON NAKHON	17 09 22.91N	104 07 57.33E	196	240	0.5 1.5 2.4 3.4	Dual
48378	PHS	PHITSANULOK	16 46 31.30N	100 13 4.39E	72	240	0.5 1.5 2.4 3.4	Dual
48379	PHB	PHETCHABUN	15 39 24.98N	101 06 18.98E	97	240	0.5 1.5 2.4 3.4	Single
48381	KKN	KHONKAEN	16 27 45.00N	102 47 9.17E	217	240	0.5 1.5 2.4 3.4	Dual
48402	CHN	CHAINAT	15 9 28.27N	100 11 28.55E	40	240	0.5 1.0 1.5 3.4	Dual
48407	URT*	UBON RATCHATHANI	15 14 37.00N	104 52 29.02E	155	240	0.6 1.0	Single
48417	KKW	KHAO KEAW	14 21 44.00N	101 23 35.02E	1261	240	0.5 0.9 1.3 2.4 3.4	Single
48429	SVP*	SUVARNABHUMI	13 41 11.00N	100 46 03.00E	28	240	0.9 1.5	Single
48432	SRN	SURIN	14 52 33.34N	103 29 45.27E	176	240	0.5 1.0 2.0 4.0	Single
48475	HHN*	HUAHIN	12 35 10.00N	099 57 45.00E	30	240	0.8 1.6	Single
48478	RYG**	RAYONG	12 38 01N	101 20 26E	34	240	0.7 1.3 2.2 4.0	Single
48517	CMP	CHUMPHON	10 29 35.16N	99 11 17.53E	32	240	1.0 1.6 2.8 4.0	Single
48551	STN*	SURAT THANI	09 08 8.00N	99 09 07.02E	33	240	0.7 0.7 1.1	Single
48563	KRB	KRABI	08 06 5.00N	98 58 41.02E	52	240	1.0 1.3 1.7 2.2	Single
48565	PKT	PHUKET AIRPORT	08 08 1.00N	98 19 46.00E	281	240	0.0 0.5 1.0 1.5 2.0 2.5	Single
48568	STP	SATHING PHRA	07 26 59.98N	100 27 35.98E	33	240	0.5 1.5 2.4 3.4	Single
48583	NRT	NARATHIWAT	06 25 36N	101 49 30.59E	32	240	0.5 1.5 2.4 3.4	Dual

(*) not every 15 minutes
(**) out of function

TMD has developed radarcomposite.py python script to control and management the nationwide radar composite map such as collecting, converting, plotting, and disseminating result in NetCDF format and images via intranet and internet at www.tmd.go.th.



(a) command to manipulation nationwide radar composite map



(b) coverage area (c) reflectivity (dBZ) (d) QPE (mm/hr)

Figure 6**:** Nationwide radar composite map

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

Nil

Summary Table of relevant KRAs and components (please tick boxes, can be more than one, as appropriate):

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

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Title of item 3 : Improved the ability of weather nowcasting

In 2015, two new dual-polarization C-band Doppler radars have been installed at Sakon Nakhon and Narathiwat Radar stations. It is making a total of 6 operational dual-polarization C-band Doppler radars (Chai Nat, Phitsanulok, Sakon Nakhon, Khon Kaen, Sakon Nakhon and Narathiwat) over the Thailand. By the end of this year, Japan Meteorological Agency (JMA) will be donated the components of equipment for receiving HimawariCast data and training of the HimawariCast system to TMD. Both of equipments will improve the ability of weather nowcasting.

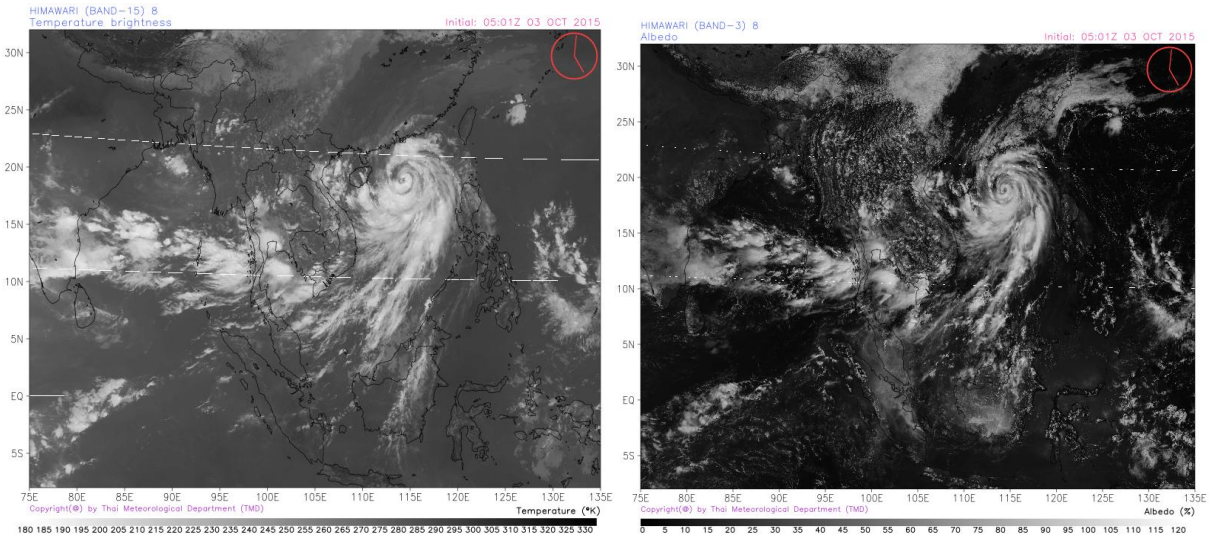

Figure 7 : (a) Himawari (band-15) temperature brightness on 0501Z, 03 October 2015

(b) Himawari (band-3) Albedo on 0501Z, 03 October 2015

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

Nil

Summary Table of relevant KRAs and components (please tick boxes, can be more than one, as appropriate):

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

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Title of item 4 : The communication networks of TMD

The communication networks of TMD have been evolved over time for better services. The domestic network is mainly used to collect observation data from and disseminate local weather forecasts including warnings to corresponding weather stations and relevant agency. The IP network scheme has been deployed to improve collecting all of data for both automatic and regular weather stations.

The international network which is called GTS (Global Telecommunications System) network is a implemented essentially through dedicated telecommunication means with a guaranteed quality of service. This GTS network is used for international exchange among meteorological/hydrological organization, satellite data centers and numerical weather prediction centers. Regarding to the request from New Delhi, India, we have established a new connection through internet for replacing the leased line connection in the future. This will reduce the cost of operation. There is another new internet link between Bangkok and Thimphu, Bhutan. This connection has been started since May 2015 making that the total number of international links to GTS Network is fourteen countries.

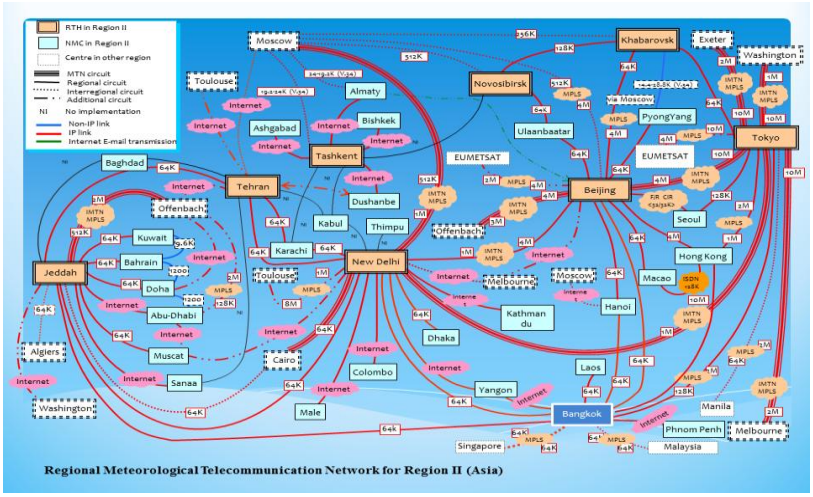

Figure 8: GTS Network for RA II

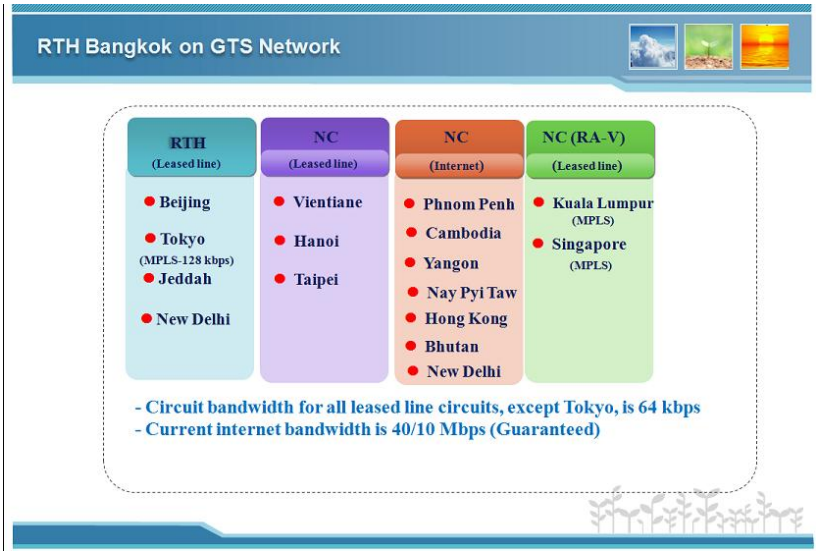

Figure 9: GTS Network for RTH Bangkok

The progress of WIS (WMO Information System) implementation for DCPC Bangkok has been officially endorsed by WMO Congress since June 2, 2015. All necessary documents for the audit were submitted to the committee for evaluation. The GISC Tokyo, as the primary GISC of Bangkok, was assigned to perform the tests according to the proposed documents and completed the test in January 2015. According to the plan, the minimum area of responsibility of new Bangkok DCPC WIS Portal will correspond with current GTS network. The metadata for bulletin headings will be added to DCPC Bangkok system. Additional products from the center will be chosen, developed and disseminated through our WIS Portal. Internet speed was also upgraded to 10 Mbps internationally and 40 Mbps domestically (both are guaranteed) to cope with high volume of data through WIS Portal and internet traffic for GTS network.

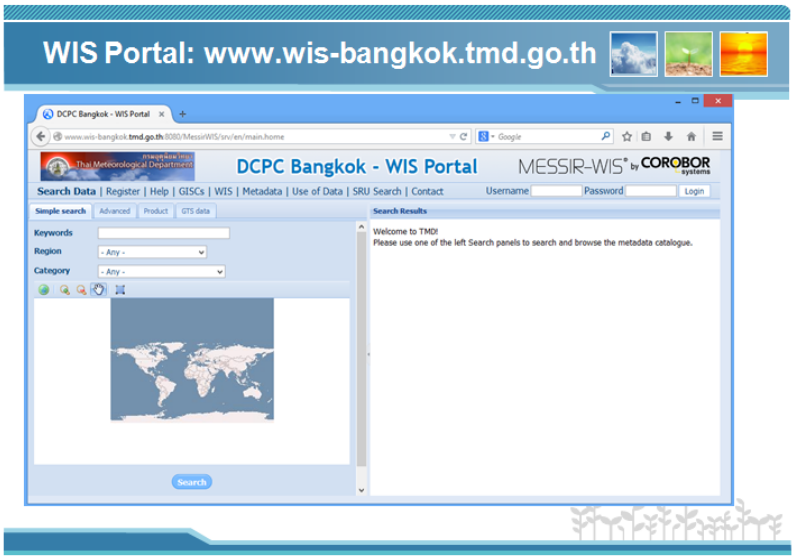

Figure 10: DCPC Bangkok WIS Portal

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

Nil

Summary Table of relevant KRAs and components (please tick boxes, can be more than one, as appropriate):

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

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Title of item 5 : Capacity Building for Meteorologist

During 1st January to 30th September 2015, the staff of TMD had participated in training workshops and beneficial in their course of work supported by WMO and TCTF as shown in the table below:

Course Title (s)	Duration	Country
High Impact Weather (HIWeather) Project Workshop	20 – 23 January	Ningbo, China
GURME Training Workshop on urban air quality modeling for ASEAN countries	7 – 10 April	Met Malaysia , Petaling Jaya, Selangor, Malaysia
Typhoon Committee Research Fellowship Scheme 2015	20 April – 1 May	Jeju Island, Republic of Korea
The Fifth International Port Meteorological Officers (PMO) Workshop	20 – 24 July	Vina del, Chile
Attachment Training at RSMC Tokyo 2015	22 – 31 July	Tokyo, Japan
Training of Trainers Course on climate Field Schools (ToT on CFS) and Workshops on the Global Framework for Climate Services for Asia-Pacific Countries (GFCS Workshop)	25 – 28 August	Regional Training Center, Citeko, Indonesia
Training on Meteorological Disaster Management for Official from Developing Countries	7 – 18 September	WMO RTC Beijing
The Common Alerting Protocol (CAP) Jump-Start Training Session and CAP Implementation Workshop	22-24 September	Rome, Italy
The Third WMO/WWRP Monsoon Heavy Rainfall Workshop	22 – 24 September	New Delhi, India

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

Nil

Summary Table of relevant KRAs and components (please tick boxes, can be more than one, as appropriate):

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

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Title of item 6 : Flood impact from Southwest Monsoon in August and VAMCO in September

The Southwest monsoon from Andaman Sea happened since late July and became stronger in August effect to the southwest region of Thailand. Many Andaman provinces like Ranong, Phuket, Phangnga, Krabi, Trang were become flooding and inundation.

Lately on 16th September the tropical storm 'VAMCO' that downgrade to tropical depression caused flooding in many provinces of Thailand from northeastern, eastern to western and southern region.

Northeastern region include Ubon Ratchathani, Sri Saket and Surin provinces.

Eastern region include Trad, Chanthaburi, Rayong, Chonburi, Chacherngsao and Nakhon Nayok provinces.

Western and Central region include Saraburi, Ratchabuti, Suphanburi and Nakhon Phatom provinces.

Southern region include Petchaburi, Chumporn and Phatthalung provinces.

The RID was responsible for monitoring, forecasting and mitigation of flood situation along with the other agencies.

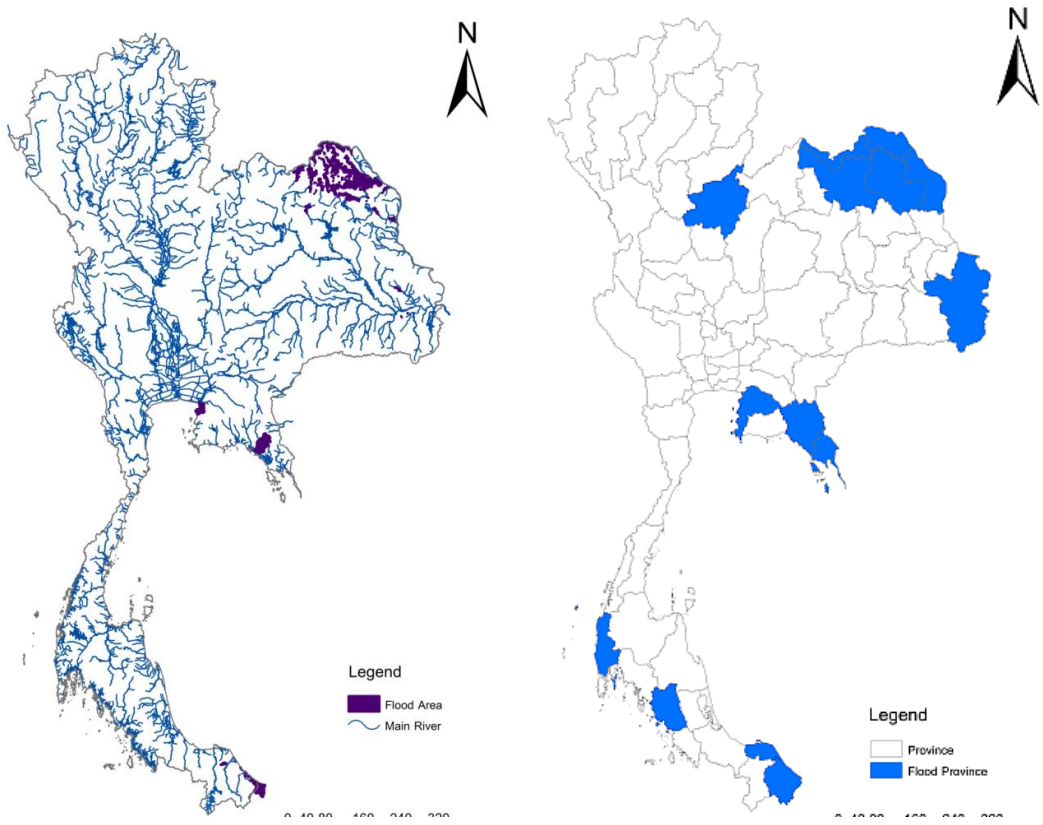

Figure 11: Map of Flooding Province in Thailand 2015

The collaboration between RID and other agencies happened twice a week in term of the meeting and committee to monitoring, mitigation and summarized the situation including announce to media or public.

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

Summary Table of relevant KRAs and components (please tick boxes, can be more than one, as appropriate):

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

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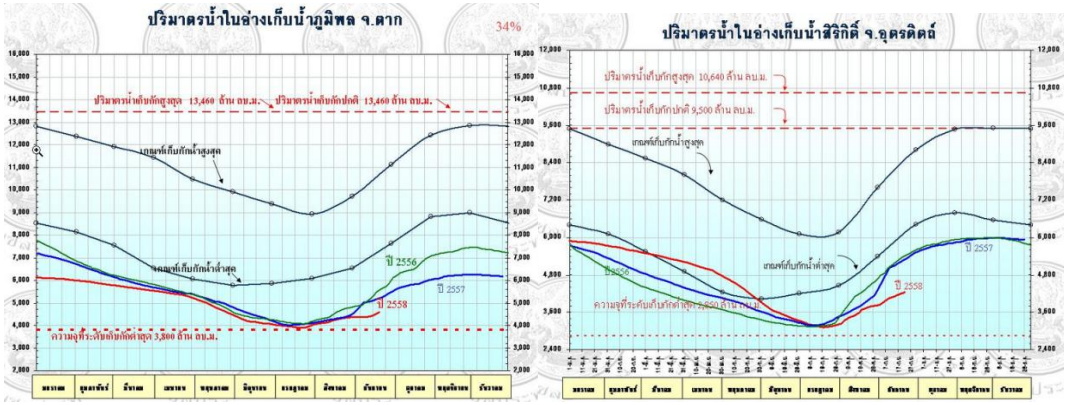
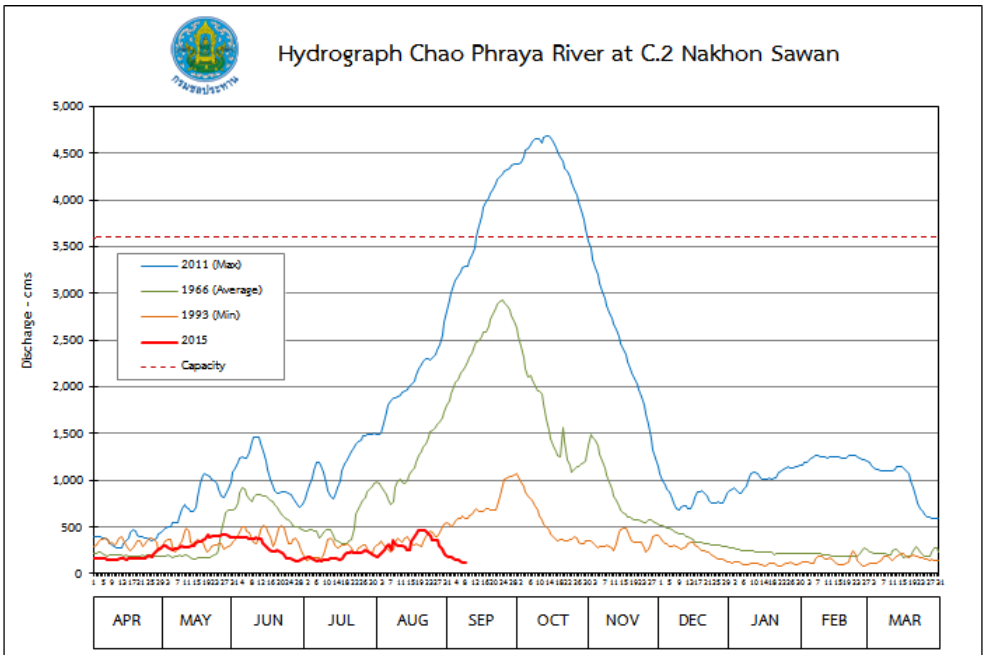
Title of item 7 : Drought in upstream area.

From the 1st of May the capital water in the large reservoirs in Thailand like Bhumibol Dam and Sirikit Dam were less than normal as well as the natural flow in the river that occurred near the minimum record.





These graphs show that the year 2015 is suspected to be drought for agriculture activities and also water supply. This is caused the obstruction for the economy development.

However, RID has duties to measure the water quality and provide for the water supply and agriculture in the irrigation area.

Summary Table of relevant KRAs and components (please tick boxes, can be more than one, as appropriate):

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

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

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Title of item 8 : OSUFFIM Project (AOP4)

Operational System for Urban Flood Forecasting and Inundation Mapping (OSUFFIM) project activities this year was the field survey in the southern region of Thailand for select the most suitable pilot city. Due to the activities last year was field survey in Chiang Mai and introduction program in Guangzhou, this year RID as the working group of hydrology took opportunity to visit the Phuket, Phangnga, Krabi, Trang and Hat Yai. According from Prof.Chen Yang Bo, the project's leader, Hat Yai city was chosen for the pilot city in Thailand.

This program is the operation system for urban flood and will be very useful for the local officer to monitoring, forecasting, mitigation and decision making in flood situation.

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

Nil

Summary Table of relevant KRAs and components (please tick boxes, can be more than one, as appropriate):

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

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Title of item 9: Capacity Building for Disaster Resilient
For integrating early warning systems for vulnerable communities into development process, DDPM promoted CBDRM approach for risk communities to train them how to properly prepare and respond to disasters. The CBDRM activities include risk assessment, making risk map, warning system for community etc.

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

Summary Table of relevant KRAs and components (please tick boxes, can be more than one, as appropriate):

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

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Title of item 10 : The Progress of Business Continuity Plan in Thailand
DDPM understands the importance of socio-economic impact reduction from disaster. So, we are cooperating with JICA and ADPC to promote BCP (Business Continuety Plan) into private sector efforts. BCP can help them work smoothly while disaster occurs and reduce socio-economic lost from disaster.

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

Summary Table of relevant KRAs and components (please tick boxes, can be more than one, as appropriate):

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

Title of item 11 : Enhance Disaster Preparedness and Capacity Building
As we mentioned before on Strategic Goal 1-2, DDPM has been working in close collaboration with related sectors to strengthen capacity of private sector through BCP, and risk prone communities by CBDRM approach. In addition, in normal situation we conduct exercises with other government organizations and other sectors to make sure of our disaster preparedness.

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

Summary Table of relevant KRAs and components (please tick boxes, can be more than one, as appropriate):

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

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Title of item 12 : Regional Collaboration with ACDM
According to ADDMER's SASOP, Asian Member countries are obliged to prepare and be ready to mobilize resources for DRM activities, in particular emergency management

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

Summary Table of relevant KRAs and components (please tick boxes, can be more than one, as appropriate):

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

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