MEMBER REPORT
THAILAND

ESCAP/WMO Typhoon Committee
12th Integrated Workshop
Jeju, Republic of Korea
30 October – 3 November 2017

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

1. Meteorological Assessment (highlighting forecasting issues/impacts).

Three tropical cyclones directly affected Thailand during 1st January to 30th September 2017 and their tracks are shown in : Tracks of the three tropical cyclones entering Thailand in 2017. They were Tropical Storm Talas (1704) in middle July, Tropical Storm Sonca (1708) in late July and Typhoon Doksuri (1719) in middle September.

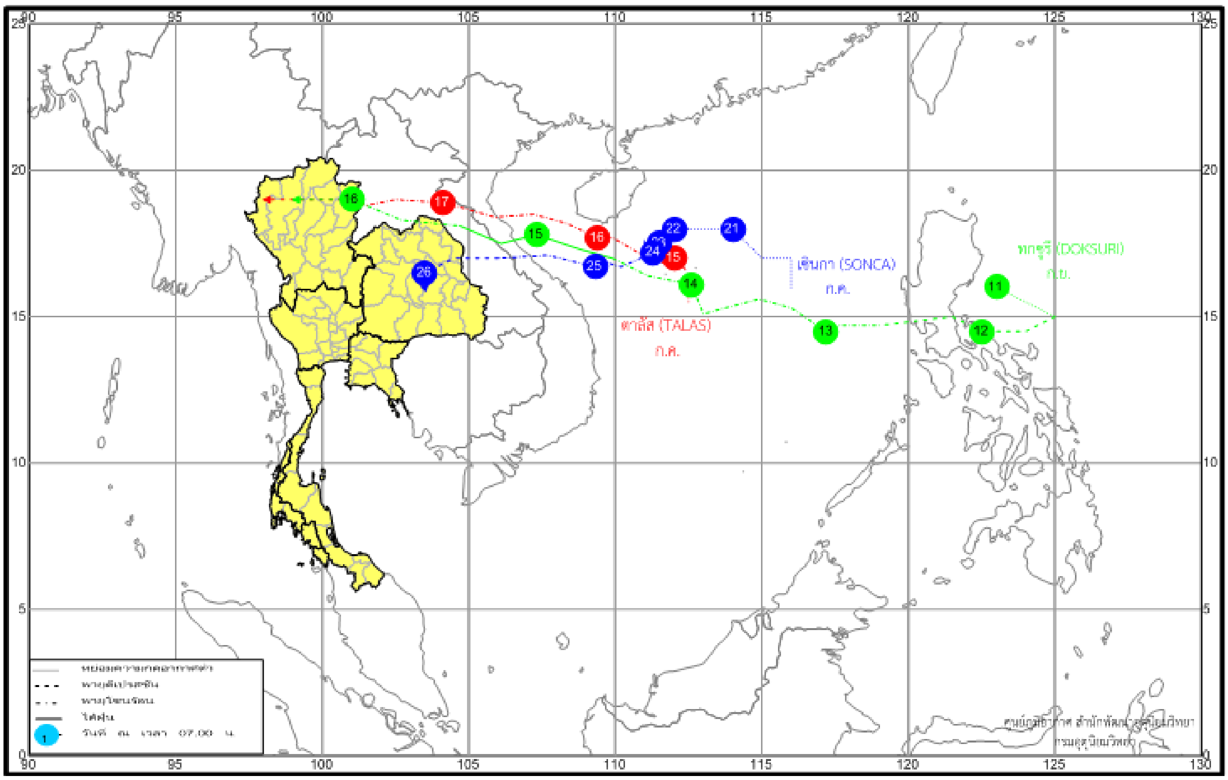


Figure 1 : Tracks of the three tropical cyclones entering Thailand in 2017

Tropical Storm Talas (1704)

Talas was the first tropical cyclone entering Thailand this year. It formed as a tropical depression over the central part of the South China Sea in the evening of July 14 and intensified into a tropical storm in the following afternoon and moved west-northwestwards then made landfall over southern Hanoi, Vietnam in the morning of July 17 and passing Laos before entering Thailand at Nan province in the afternoon on the same day. After that, it later downgraded into the tropical depression and active low pressure cell covering upper northern part of Thailand and Myanmar on the following day. Under the influence of Talas, rainfall was relatively increased with widespread rain and heavy to very heavy rainfall in upper Thailand during 15-18 July with the highest daily rainfall was 145.0 mm at Amphoe Phu Phiang in Nan Province on 17th July. For the accumulated amount of rainfalls is shown in Figure 2.

Tropical Storm Sonca (1708)

Sonca was the second tropical cyclone entering Thailand. It formed as a tropical depression over the upper of the South China Sea (18.0° N, 112.5° E) at 1800 UTC on 21st July. This depression moved generally westwards and intensified into a tropical storm at 0600 UTC on 23rd July before making landfall over Dong Hoi, Vietnam in the afternoon of July 25 and weakening into a tropical depression, passing Laos and moving further into Thailand at Nakhon Phanom province at 1800 UTC on 25th July. After weakening into the active low pressure cell, the remnant of Sonca persisted in the upper northeastern part and finally dissipated in the evening of July 28. Under these influences, the northern and northeastern parts experienced plentiful rainfall during 25-28 July, many areas of the northeastern part obtained consecutive days of heavy to very heavy rainfall inducing inundation in many places. For central and eastern parts, fairly widespread to widespread rain was found with heavy to very heavy rainfall in some areas. The heaviest daily rainfall in upper Thailand was 250.8 mm at Amphoe Phang Khon in Sakon Nakhon province on 28th July with floods occurred in Phichit, Mae Hong Son, Ubon Ratchathani, Maha Sarakham, Burirum, Si Sa Ket, Khon Kean, Sakon Nakhon, Nakhon Ratchasima and Lop Buri provinces during 25-26 July and at Uttaradit, Sukhothai, Phitsanulok and Kalasin provinces on 27th July. The accumulated amount of rainfalls is shown in Figure 3.

Typhoon Doksuri (1719)

In September, the third tropical cyclone entered northern and northeastern Thailand namely Doksuri. It formed as a tropical depression over the eastern of Luzon, the Philippines in the afternoon of September 11 and moved across center of Luzon Island to the middle South China Sea on the next day. It intensified into the tropical storm Doksuri in the evening within the same day then moved into upper South China Sea and further intensified into a typhoon in the evening of September 14. Doksuri made landfall over the Southern Vinh, Vietnam at 0300 UTC on 15th September then moved pass Laos and weakening into the tropical storm before entering Thailand at Bung Kan province at 1500 UTC on the same day. After that, it moved through Laos and downgraded into tropical depression then moved further into Nan province in the morning of September 16 with its track the same as Talas. It weakened gradually while moving pass the upper northern Thailand and finally degenerated into the active low pressure cell over northern Thailand before moving to cover the coastal Myanmar and Gulf of Bengal on 17th September. It accompanied with the southwest monsoon which prevailed over the Andaman Sea and Thailand and was strengthened during 15-17 September. Doksuri brought torrential rain and flooding to several areas of the northern and northeastern parts of Thailand during its passage. Accumulated amount of rainfalls are as in Figure 4.

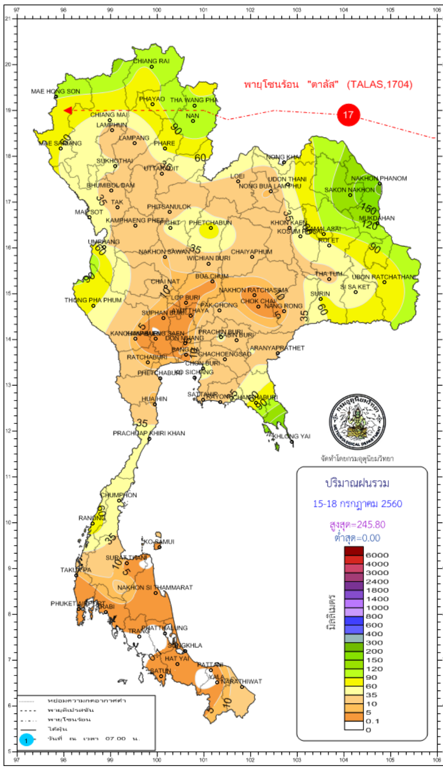


Figure 2 : Accumulated amount of rainfalls during 15-18 July 2017

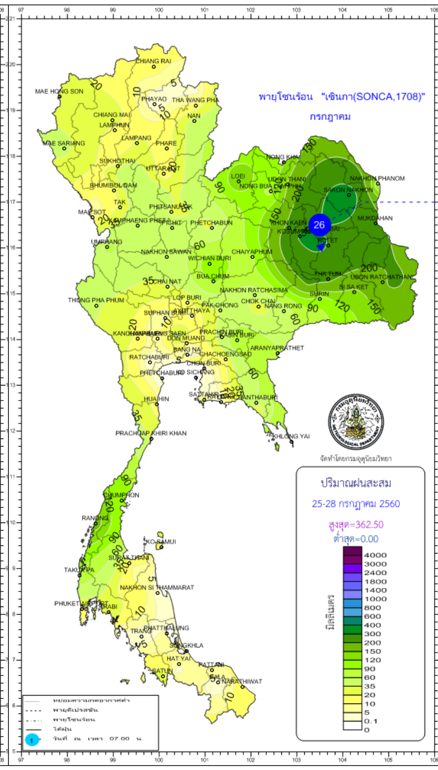


Figure 3 : Accumulated amount of rainfalls during 25-28 July 2017

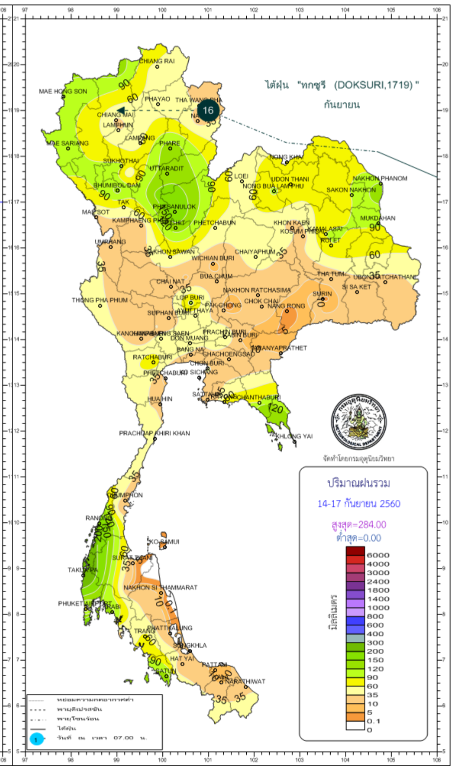
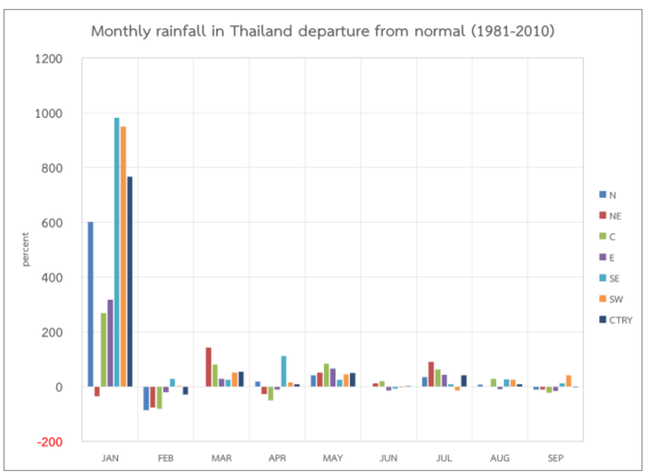
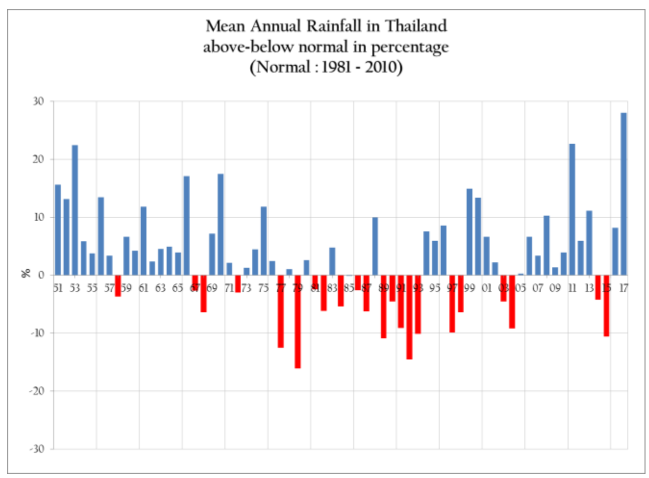


Figure 4 : Accumulated amount of rainfalls during 14-17 September 2017

<u>Rainfall</u>

The average rainfall over Thailand from 1st January to 30th September 2017 was 1605.3 mm or about 28% above normal which was wetter than usual as shown in Figure 6 showed that monthly rainfall in January and during March to August was above the 1981-2010 normal especially in January which was 130.3 mm or 767% above normal over the whole areas. These affected from the prevailing of the southeasterly wind over upper Thailand and the passage of the westerly trough through the northern part, causing unusual rainfall in upper Thailand during the first half of January. While in southern Thailand under the influence of the northeast monsoon prevailing over the Gulf of Thailand and southern part was active during early and late January coupled with the covering of the low pressure cell over Malaysia and lower southern part and over the Andaman Sea for few days. These resulted in plentiful of rain nearly the whole January especially along the east coast that experienced successive of very heavy rainfall in several areas inducing flash flooding in many areas during early and late January. During summer season from March to mid-May, unseasonable rain occasionally occurred with thundershower, gusty wind and hail in some areas of upper Thailand due to the influence of the high pressure area from China extending its ridge to cover upper Thailand, the passage of the westerly trough over the northern and northeastern parts accompanied with the prevailing of the southerly and southeasterly wind for few days. Rainy season was started as normal on 16th May and the southwest monsoon which prevailed over the Andaman Sea, Thailand and the Gulf of Thailand was periodically strengthened in addition with the monsoon through lay across Thailand in some period and the influence of low pressure cell near Thailand causing above normal rainfall in most areas of Thailand nearly the whole season. However, rainfall in upper Thailand was below normal in February and September resulted in 30% and 3% below normal over Thailand, respectively.





Remark: Data updated till 1 October 2017

Figure 5 : Mean Annual Rainfall in Thailand above-below normal in percentage (Normal: 1981 – 2010)

Figure 6 : The monthly rainfall in Thailand departure from normal (1981-2010)

<u>Temperature</u>

Monthly temperature of Thailand during 1st January to 30th September 2017 was dominated by warmer and wetter conditions in most of the regions. Mean temperature over Thailand was above the 1981-2010 normal nearly the whole period mainly in January which was 1.1° C above normal with the mean temperature rising to 1.8° C above normal in northeastern part. The temperature over Thailand and mean temperature in February, April and July were below normal especially in April which was 0.2° C below normal with the mean temperature dropping to 0.6° C below normal in west coast of southern part. Thailand's monthly temperature is shown as Figure 7.

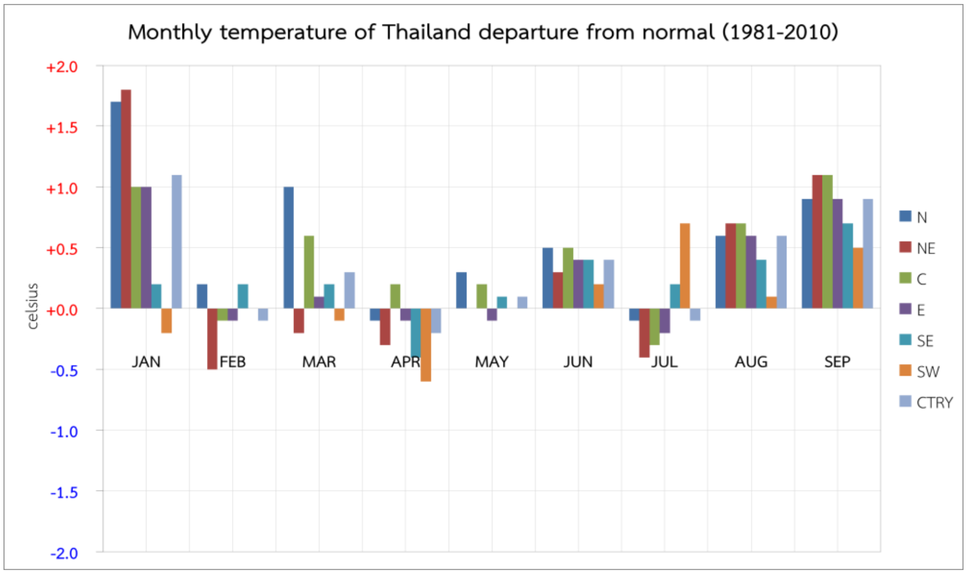


Figure 7 : The monthly mean temperature of Thailand departure from normal (1981-2010)

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

Starting from January to the mid of October 2017, the trend of the precipitation was higher than the average zone. In some regions, the accumulated rainfalls were highest compare with the past 10 years.

There were three tropical storms namely: Tropical Storm Talas, Tropical Storm Sonca and Typhoon Doksuri that affected Thailand causing flood and inundation in many provinces area.

Tropical Storm Talas affected the northern part of Thailand during 15-19 July. The heavy rainfall and inundation occurred in Nan and Phayao provinces.

Tropical Storm Sonca affected the northeastern part of Thailand during 25-31 July. The heavy rainfall occurred in mostly provinces of northeastern region. Sakon Nakhon, Roi Et, Yasothon, Loei and Kalasin provinces were the most impacted provinces.

Typhoon Doksuri affected the northern part and northeastern part of Thailand during 14-16 September. According to the previous flood, Doksuri made the water situation more difficulty for management and solution especially for Chi, Mun river basin because the water storage in the dams was more than 80% of dam capacity.

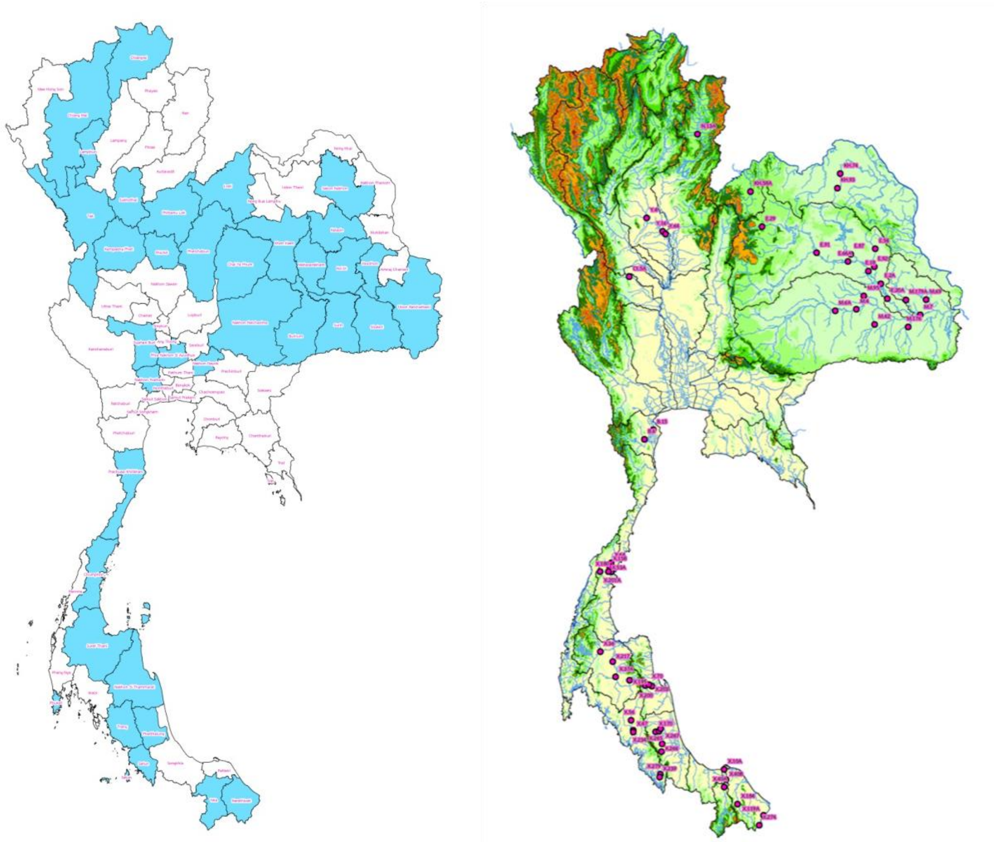


Figure 8 : Thailand's provinces and discharge stations that flood occurred in 2017

E.2A E.20A

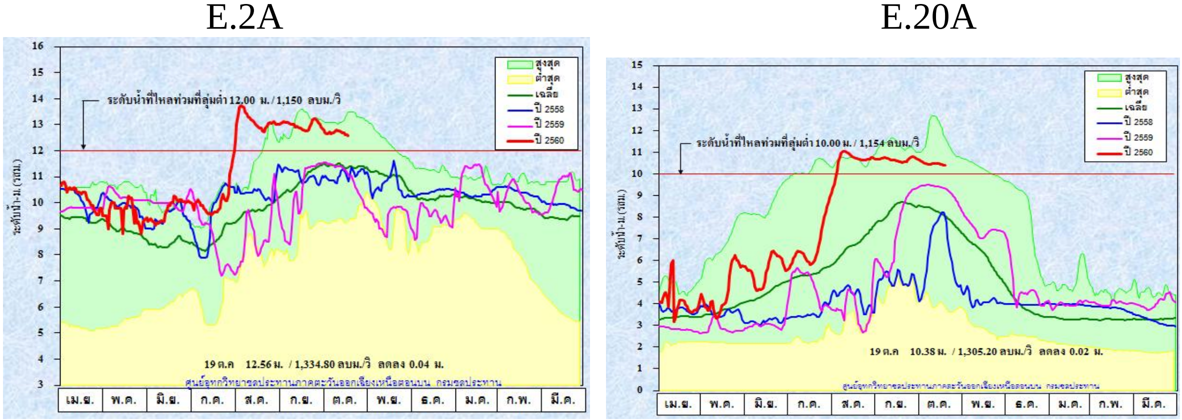


Figure 9: Chart of daily gauge height of Chi river, E.2A and E.20A at Yasothon province

E.87 E.54

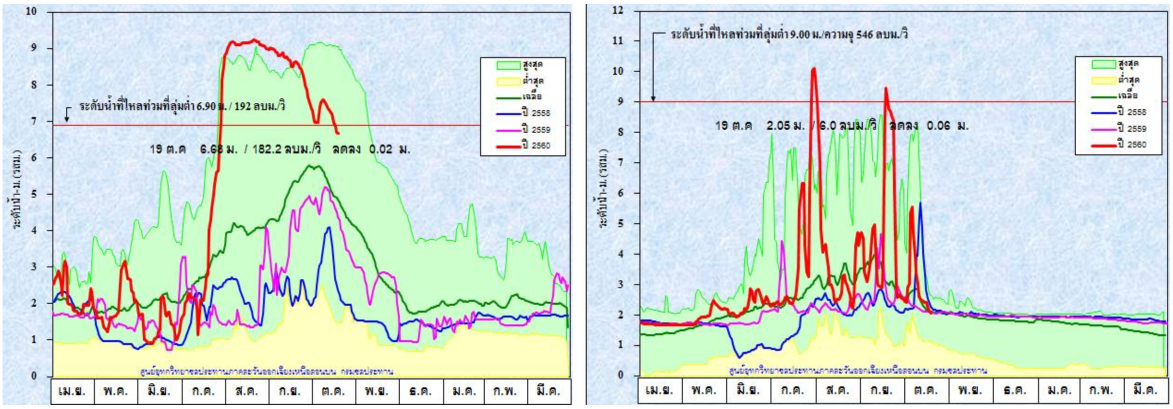


Figure 10: Chart of daily gauge height of Chi river sub-basin, E.84 (Nam Lampao) and E.54 (Nam Yang) at Kalasin province

KH.58A KH.74

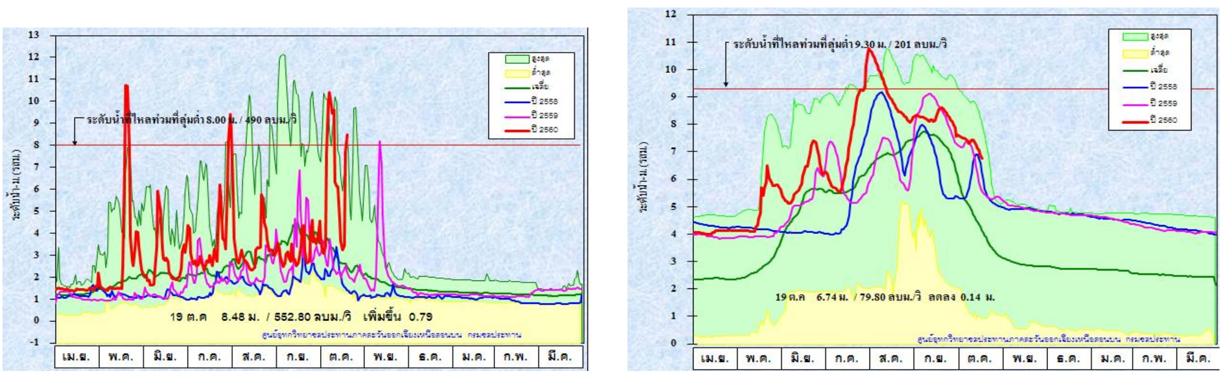


Figure 11: Chart of daily gauge height of Khong river sub-basin, KH.58A (Nam Loei) at Loei province and KH.74 (Nam Songkhram) at Sakon Nakhon province

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

Heavy rainfall, low pressures and Tropical Strom Talas, Sonca and Doksuri were the main causes flooding in 2017. Flood started since mid of May until September, 2017.

Tropical Storm Talas and Sonca affected Thailand from 5 July to 15 August in 44 provinces, 302 districts, 1,724 sub-districts, 14,105 villages, 609,425 households and 1,898,322 people. Nowadays, 43 provinces are recovery from flood excepting one province which is Ubon Ratchathani Province.

12 provinces, 34 districts, 94 sub-districts, 347 villages were affected by Typhoon Doksuri since 15 – 20 September, 2017; however, all flooded areas had been recovered to normal situation.

Victim Assistance

Short Term Assistance, the Thai Government provided an initial assistance under the Ministry of Finance's regulation for 44 dead people and also provided assistance for 4,816 partially damaged houses and 17 fully damaged houses. Additionally, in agricultural sector (plant, fishery and livestock), the Royal Thai Government provided assistances to 398,349 farmers and also supported to 3,000 Baht per household. Besides, on the 1st August, 2017, the cabinet approved the tax incentive for flood relief donors and tax exemption for premises rehabilitation included the SMEs credits. All basic infrastructures system such as irrigation, electricity and water supply system had been recovered.

Medium Term Assistance, the Ministry of Social Development and Human Security provided social welfare and recovery plan and livelihood victim assistance for their occupation in female society and youth group in Northeastern part of Thailand at the amount of 42,155,370 Baht.
Regarding the basic infrastructure, the Department of Highways and Department of Rural Roads have proposed their rehabilitation plan and the Budget Bureau will approve the budget.

Long Term Recovery Plan, it is divided to 3 categories namely; 1) Improving the Basic Infrastructure system; for example, surveying obstacle of flood way, constructing pipelines, etc. 2) Developing natural resources and environment such as eco-based system and improving water supply at the community level and 3) Improving City Planning, designing flood way and utilizing inclusive structural measures.

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

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II. Summary of Progress in Priorities supporting Key Result Areas

1. Improving Weather Forecasting
2. Long-range forecast
3. The regional experimental data exchange of radar data for composite map
4. iAeroWIS
5. Smart Water Operation Center (SWOC)
6. CBDRM Project
7. Implementing Sendai Framework Indicators at National Level in Thailand

1. Improving Weather Forecasting

Main text:

Operational Room

The Operational Room had been developed for the meteorologists to use observations, seismic, numerical weather prediction and climate models data in supporting the meteorologists, experts, administrators for making decision on weather forecast such as the very short range, short range, medium range and long range forecast that would be useful to relevant authorities, public and private sectors in data management.

Figure 12: Operational Room

Cloud Top Temperature and GsMap

TMD used the Cloud-top height product from Himawari Satellite and estimated rainfall from Global Satellite Mapping of Precipitation (GSMaP) in supporting the forecasters for making the very short range and short range weather forecast. All of products provide on the website Satellite Analysis (http://www.satda.tmd.go.th/).

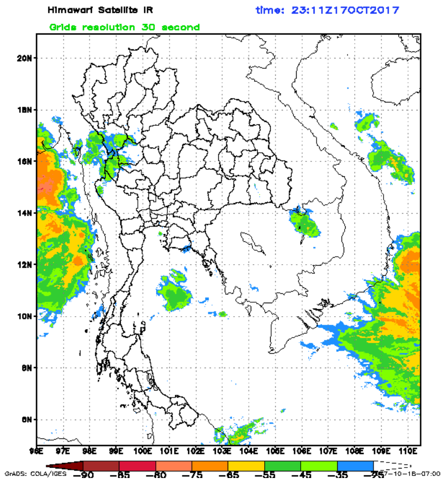

Figure 13: Cloud-top height from Himawari Satellite data (Oct 17, 2017 at 2311Z)

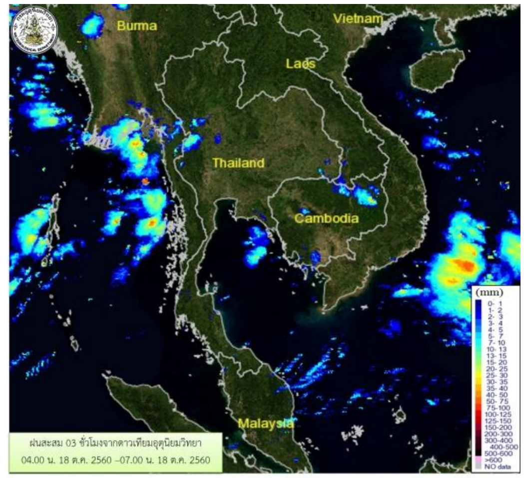

Figure 14: The estimate 3 hourly Rainfall from GSMaP

<u>Tropical Cyclone Monitoring</u>

TMD has applied data from Numerical Typhoon Prediction Website (NTP) for improving the Tropical cyclone track forecast by consensus technique .And TMD plots the graphical track forecast overlay on Google Map provides the public and disaster management agencies.

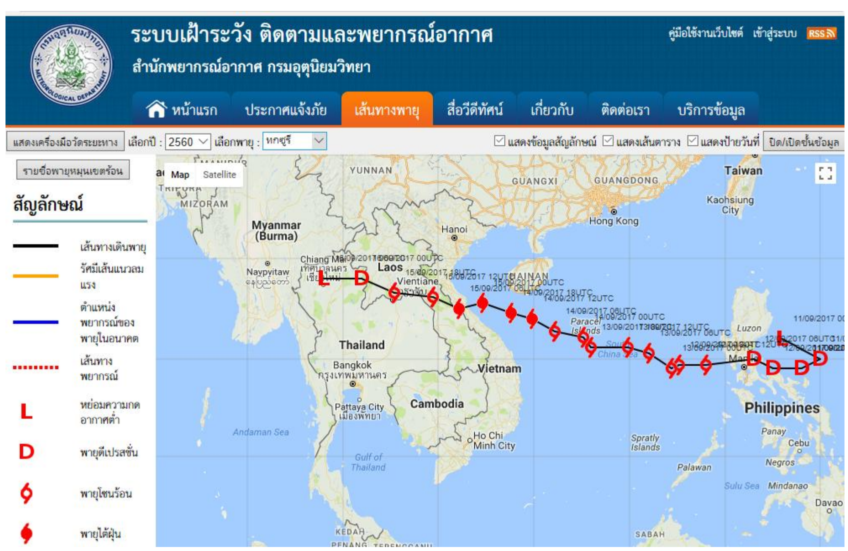

Figure 15: Graphical track forecast of Tropical Cyclone overlay on Google Map

Meteorological Satellite

TMD provides the general public with Satellite images and NWP product from HimawariCast over the Asian and Thailand domain through the satellite website (http//:www.sattmet.tmd.go.th/satmet/mergesat.html). A type of satellite imagery is shown in this website such as VIS, IR, WV, IR-Enh, IR+VIS and Day convective.

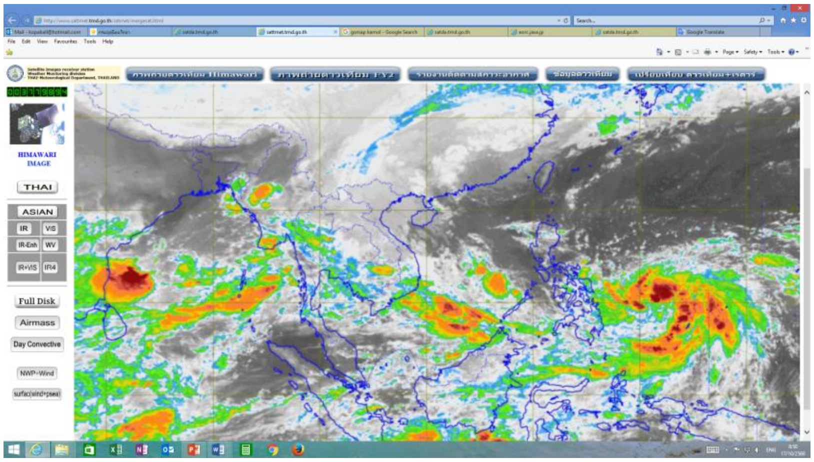

Figure 16: Satellite website (http//:www.sattmet.tmd.go.th/satmet/mergesat.html).

Priority Areas Addressed:

Enhance the capacity to monitor and forecast typhoon activities particularly in genesis, intensity and structure change.

Enhance and provide typhoon forecast guidance based on NWP including ensembles and weather radar related products, such as QPE/QPF.

KRA 2: Enhance capacity to generate and provide accurate, timely and understandable information using multi-hazard impact-based forecasts and risk-based warnings.

KRA 4: Strengthen typhoon-related disaster risk reduction activities in various sectors, including increased community-based resiliency with better response, communication, and information sharing capability.

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2. Long-range forecast

Main text:

The Long-range forecast or Climate forecasting can be better considered as the statistical summary of the weather event than snapshot of continually changing atmospheric condition. In Thailand, there are three seasons cycle annual depends on Asian Monsoon; winter, summer and rainy season. For long-range forecast in Thailand (4-week forecast, Fortnight forecast, One-month forecast, Three-month forecast and Seasonal forecast) have consensus processes are as follows:

1. Consider current conditions and forecast of key drivers of seasonal climate:
   -ENSO monitoring and outlook
   - IOD monitoring and outlook
   - Sub-seasonal (MJO) monitoring and outlook
   - Asian monsoon monitoring and outlook
   - SST monitoring and outlook
2. Global climate model forecast as a basis (ECMWF, JMA/TCC, BCC, APCC, IRI, etc.)
3. Probabilistic forecast by using CCA technique running by TMD
4. Deterministic and Probabilistic forecast by using CPT
5. Include forecast inputs from local expert of Thailand climate
6. Strike a balance between consistencies among all inputs (model and local expert)
7. Make an outlook (showed as Figure 17)
8. Issued and provide on the website in Thai and English

The long-range forecast is issued and provided on Thai Meteorological Department and TMD climate center website in Thai and English language.

http://www.tmd.go.th or http://www.tmd.go.th/en/ on climate tab
http://www.climate.tmd.go.th/ (Thai version only)

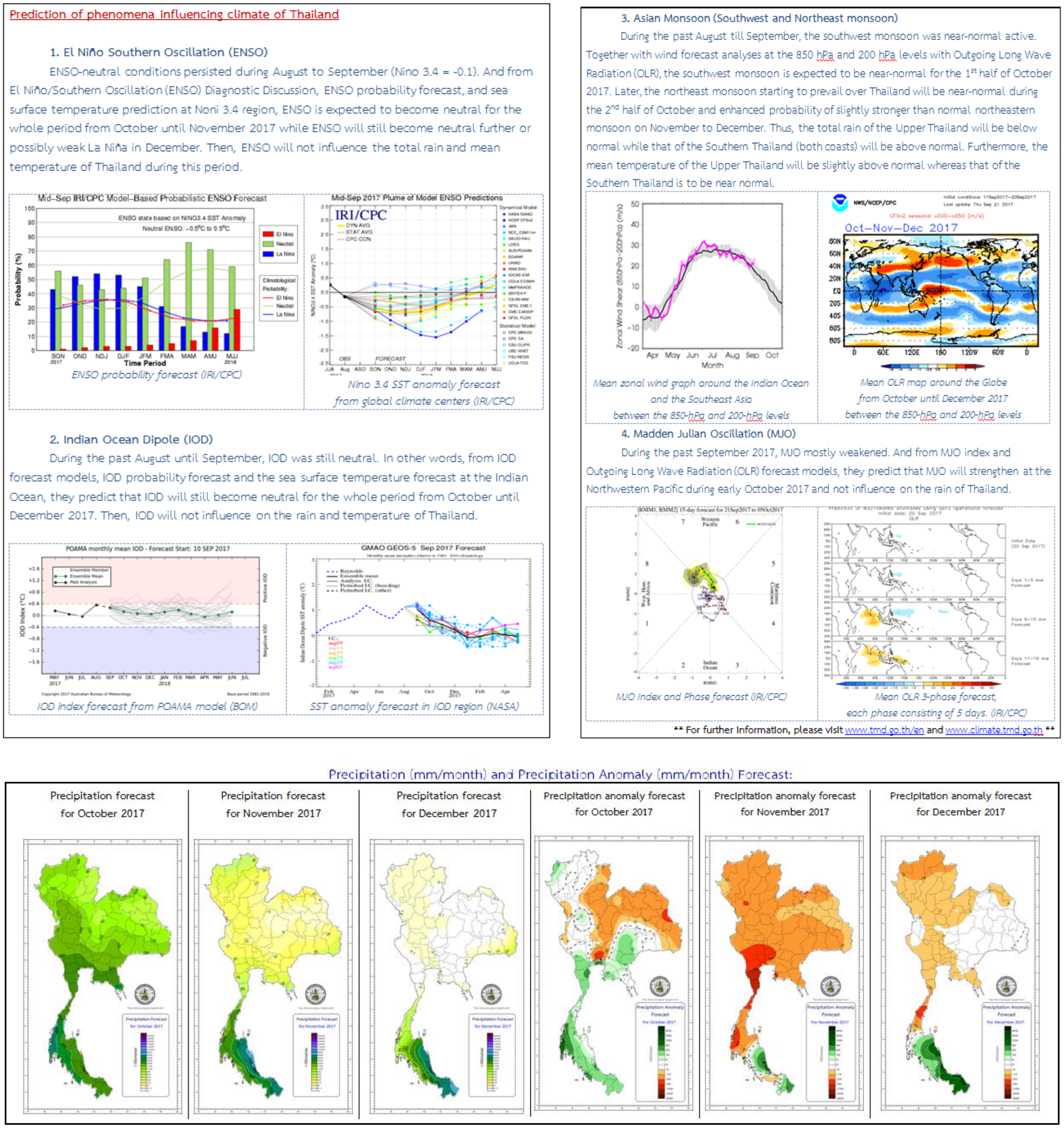

Figure 17: The Long-range forecast outlook

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

The main challenge is briefing for including forecast inputs from local expert of Thailand climate and strike for a balance between consistencies among all inputs (model and local expert) before making a forecast.

Priority Areas Addressed:

Enhance activities to develop impact-based forecasts and risk-based warning.

KRA 2: Enhance capacity to generate and provide accurate, timely and understandable information using multi-hazard impact-based forecasts and risk-based warnings.

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3. The regional experimental data exchange of radar data for composite map

Main text:

To support the regional experimental data exchange, in collaboration with JMA of Japan and MMD of Malaysia, TMD has been successfully uploading radar composite data of the southern part of Thailand in the near real-time hourly basis to the JMA WIS portal site at https://www.wis-jma.go.jp/radar.pub/ is shown as Figure 18. All three countries can access these data with username and password at this GISC Tokyo portal site.

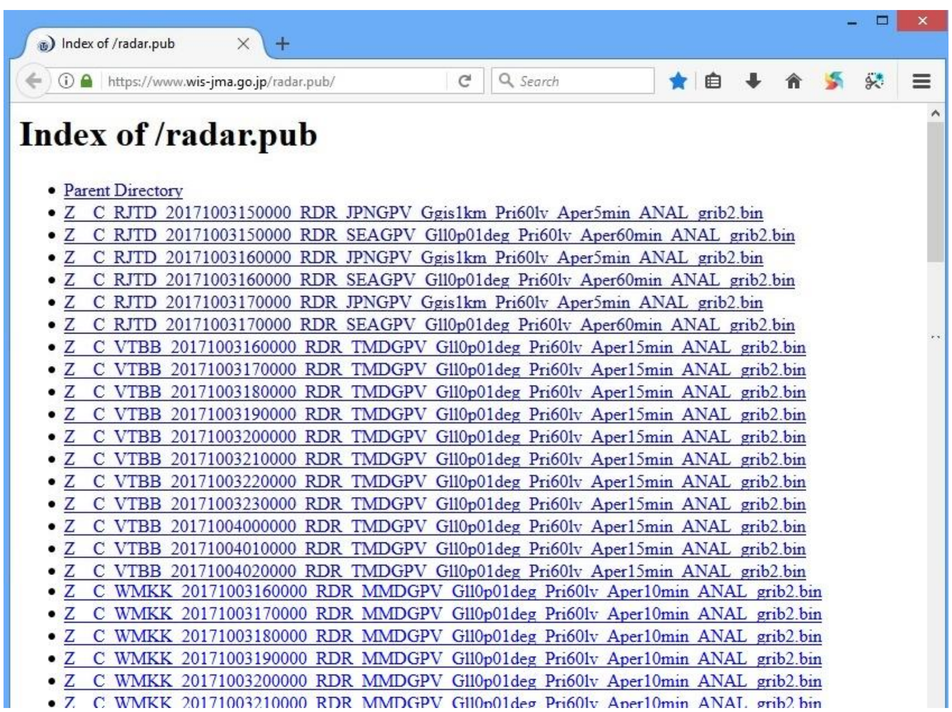

Figure 18: Uploaded data at GISC Tokyo WIS portal site

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

To continue experimental test of radar data sharing among JMA, TMD, and MMD, and to share the experiences of the test with the RA II WIGOS project related to radar techniques in Southeast Asia.

Priority Areas Addressed:

Enhance collaborative activities with other regional/international frameworks/organizations, including TC and PTC cooperation mechanism

KRA 5: Enhance Typhoon Committee’s Regional and International collaboration mechanism.

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4. **iAeroWIS**

Main text:

The domestic telecommunication network has been evolved from time to time. The current total numbers of synoptic observational stations is 124. Using internet connection, all of them have sent observational data to a communication center at headquarters, called METNET, to collect and incorporate to WMO bulletin messages. The dissemination of these bulletins will be made by AMSS (RTH Bangkok) via GTS (Global Telecommunications System) network for international exchange.

For efficient operation, strengthening of RTH role and support new data format (IWXXM) in aviation, the plan of integrated new system between meteorology information exchange system in aviation and WMO meteorological data exchange system (AMSS), called "iAeroWIS", has been started. The winner bidder was selected and the contract was signed. The data flow diagram is shown as followed.

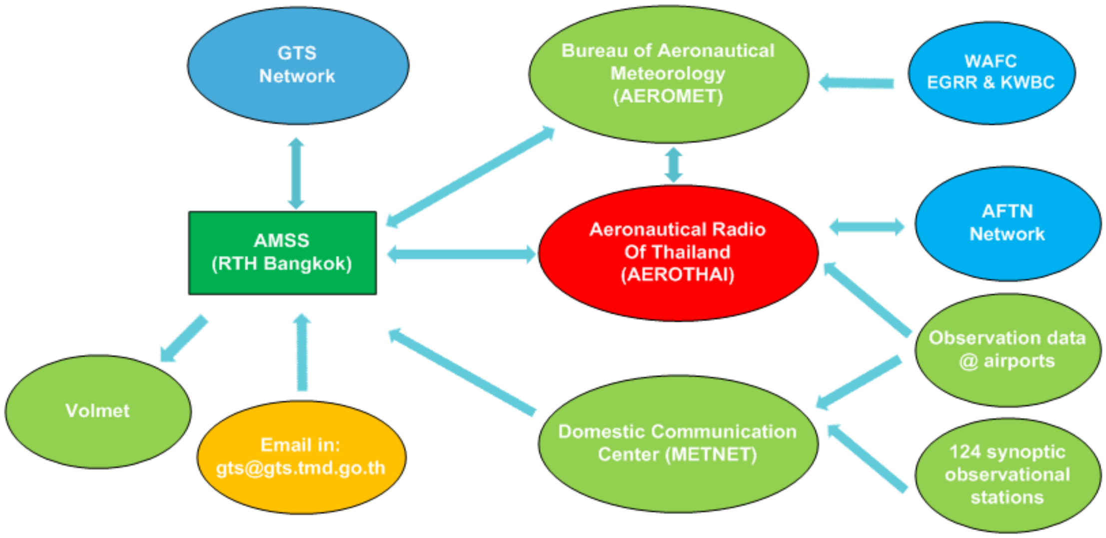

Figure 19: Data flow diagram

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

The plan of integrated new system between meteorology information exchange system in aviation and WMO meteorological data exchange system (AMSS) will be completed in the beginning of 2019.

Priority Areas Addressed:

Enhance collaborative activites with other regional/international frameworks/ organizations, including TC and PTC cooperation mechanism.

KRA 5: Enhance Typhoon Committee's Regional and International collaboration mechanism.

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5. Smart Water Operation Center (SWOC)

Main text:

The Royal Irrigation Department by the Ministry of Agriculture and Cooperative had established the Smart Water Operation Center in June 2017 which is located at the RID headquarters

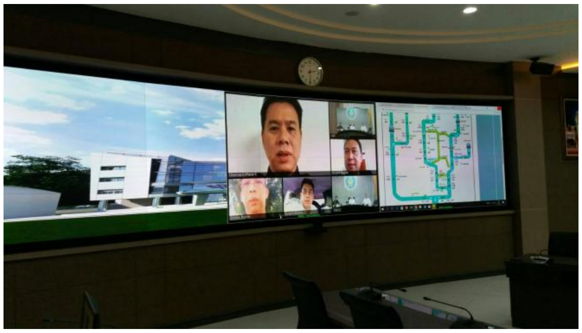
Identified opportunities/challenges, if any, for further development or collaboration:

SWOC is responded from the government policy 4.0 (Thailand 4.0). It purposes to be the Single Command for monitoring the weather and rainfall, watch and monitoring and analyzing the water situation and public relations with fast process. SWOC can support the decision making to government official with high accuracy, quickly and sharply update as the slogan 'FAST'

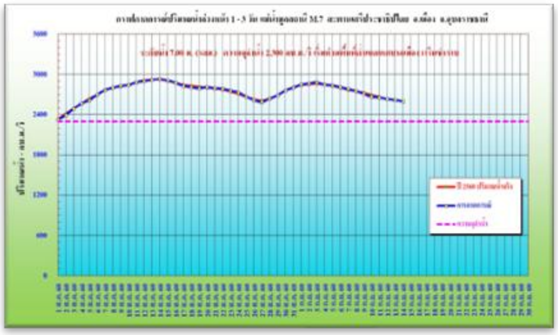
F - Fusion Database (Data center integration from various departments)
A - Accurate Technique (Correct according to academic principles)
S - Speedy Process (Fast process)
T - Targeted Solution (Achieve targeted results)

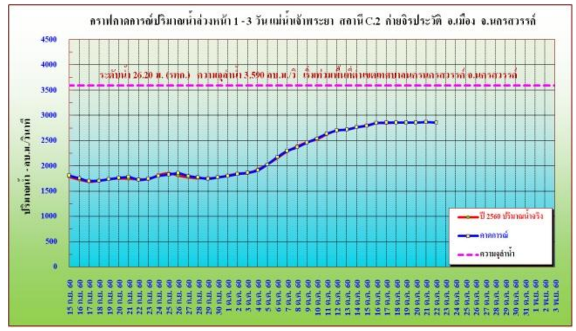
Priority Areas Addressed:

Enhance capacity to monitor weather, rainfall and water situation



Enhance capacity to generate and provide accurate information using flood modeling





Strengthening the communication, and information to the public

ข่าว กรมชลประทาน

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สำนักงานเลขานุการกรม
โทร. 0-2241-0965 โทรสาร 02-2243-6926

กรมชลฯ ชี้ปริมาณน้ำที่ไหลจากสระเก็บน้ำ อ.โคกสำโรง ลพบุรี จะไม่ส่งผลกระทบต่อพื้นที่ในเขตเมือง พร้อมประสานหน่วยงานที่เกี่ยวข้องนำ Big bag ปิดทำนบดินที่ชำรุด คาดแล้วเสร็จภายในวันนี้

จากกรณีที่มีข่าวเกี่ยวกับอ่างเก็บน้ำโคกสำโรงแตก จังหวัดลพบุรี ประกาศประชาชนรีบเก็บของหนีน้ำ ซึ่งเผยแพร่ทางสื่อสังคมออนไลน์นั้น นายสมเกียรติ ประจำวงษ์อธิบดีกรมชลประทาน กล่าวว่า ได้มอบหมายให้เจ้าหน้าที่กรมชลประทานลงพื้นที่อย่างเร่งด่วนเพื่อตรวจสอบสถานการณ์ ขอเรียนว่า อ่างเก็บน้ำที่ระบุในข่าวคือ สระเก็บน้ำภายในพื้นที่มหาวิทยาลัยเกษตรศาสตร์ วิทยาเขตลพบุรี เป็นงานจัดหาแหล่งน้ำสนับสนุนพื้นที่ มหาวิทยาลัยเกษตรศาสตร์ ความจุ 700,000 ลูกบาศก์เมตร ลักษณะโครงการเป็นสระเก็บน้ำ ไม่ใช่อ่างเก็บน้ำตามที่ปรากฏในข่าว โดยเหตุการณ์เกิดขึ้นเมื่อ 04.00 น. ของเช้าวันที่ 18 ตุลาคม 2560 ขณะเกิดเหตุมีน้ำอยู่ประมาณ 600,000 ลูกบาศก์เมตร คาดการณ์ว่าจะมีน้ำไหลออกจากสระ ประมาณ 320,000 ลูกบาศก์เมตร คงเหลือค้างสระประมาณ 280,000 ลูกบาศก์เมตร ปริมาณน้ำดังกล่าวจะไหลหลากผ่านทุ่งนา ประมาณ 200 ไร่ ความลึก เฉลี่ยประมาณ 25 เซนติเมตรลงคลองห้วยปลาหมอ ผ่านหมู่บ้านหนองบัว เกาะแก้ว วังกระทุ่ม ลำละเลง และ ลงสู่ฝายหนองขนะชัยต่อไป

ปัจจุบัน ฝายหนองขนะชัยมีระดับน้ำต่ำกว่าสันฝายประมาณ 1 เมตร ยังสามารถรองรับปริมาณน้ำส่วนนี้ไว้ได้ทั้งหมด ซึ่งปริมาณน้ำทั้งหมดจะคงอยู่ในลำน้ำ ไม่ล้นตลิ่ง หรือ ส่งผลกระทบต่อบ้านเรือน และพื้นที่ตอนล่างในเขตพื้นที่อำเภอบ้านหมี่ แต่อย่างใด ล่าสุด สำนักงานชลประทานที่ 10 สำนักงานป้องกันและบรรเทาสาธารณภัย จังหวัดลพบุรี หน่วยทหารในพื้นที่ องค์การบริหารส่วนตำบลเพนียด และกรมทางหลวง ได้ร่วมกันดำเนินการนำเครื่องจักร เครื่องมือ เข้าปิดทำนบที่ชำรุดดังกล่าว ด้วยเสาเข็มไม้ และถุงBig bag คาดจะดำเนินการแล้วเสร็จในวันนี้

กรมชลประทาน
18 ตุลาคม 2560

KRA 1: Enhance capacity to monitor mortality and direct economic loss caused by typhoon related disasters.

KRA 2: Enhance capacity to generate and provide accurate, timely and understandable information using multi-hazard impact-based forecasts and risk-based warnings.

KRA 4: Strengthen typhoon-related disaster risk reduction activities in various sectors, including increased community-based resiliency with better response, communication, and information sharing capability.

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6. CBDRM Project

Main text:

The Department of Disaster Prevention and Mitigation (DDPM) and DDPM provincial offices have conducted Community Based Disaster Risk Management (CBDRM) in risk prone communities to build up villagers capacity to prepare themselves for disaster management. The CBDRM concept is implemented in Thailand since 2003 by the initiatives of technical cooperation between JICA and DDPM.

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

There are 26,297 flood and land slide risk prone communities, so it is difficult to complete CBDRM training for all risk prone areas in a short period. In 2017, DDPM conducted CBDRM in 1,205 communities and the total amount of CBDRM training course from 2005 - 2017 was 12,786 communities

Priority Areas Addressed:

Share experience/knowhow of DRR activities including legal and policy framework, community based DRR activities

KRA 4: Strengthen typhoon-related disaster risk reduction activities in various sectors, including increased community-based resiliency with better response, communication, and information sharing capability.

Contact Information:

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7. Implementing Sendai Framework Indicators at National Level in Thailand

Main text:

DDPM has conducted the Implementing of Sendai Framework Indicators Workshop at National Level in August and September, 2017, DRR Focal Point of Ministry/organization level and relevant stakeholders had discussed, exchanged and shared their experiences and knowledge to set up these 7 Indicators to be implemented in Thailand.

The initial output of the above mentioned workshop has identified terminology definition among all agencies to monitor all 7 indicators such as mortality rate and direct economic loss which caused by disasters and increase the availability to access to multi hazard early warning. System.

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

The main challenge is each organization has its own method for collecting data, information for its specific purpose. They also define different indicator meaning, therefore, it is too difficult to combine and integrate data and information from different forms.

Priority Areas Addressed:

Provide reliable statistics of mortality and direct disaster economic loss caused by typhoon-related disasters for monitoring the targets of the Typhoon Committee.

KRA 1: Enhance capacity to monitor mortality and direct economic loss caused by typhoon related disasters.

KRA 2: Enhance capacity to generate and provide accurate, timely and understandable information using multi-hazard impact-based forecasts and risk-based warnings.

Contact Information:

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