



Hydro and Agro Informatics Institute

Ministry of Science and Technology
Thailand

S&T for Water Management Focusing on Applying Hydroinformatics for Water Resources Management

By Dr. Surajate Boonya-aroonnet
Director of Hydroinformatics Division, Hydro and Agro Informatics Institute, Thailand

Thailand 2011 Flood Leads to the Establishment of NHC

Early warning and real time decision making

Flood
sensorweb

Forecast &
modeling

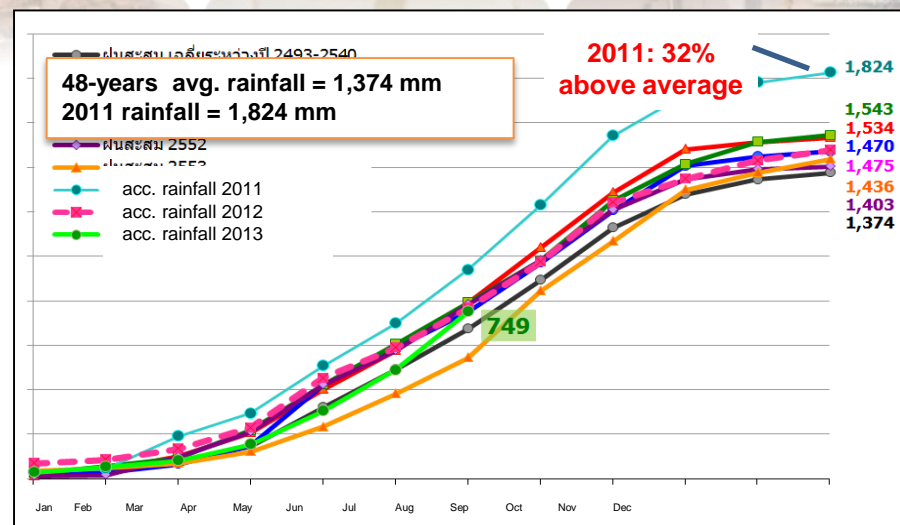
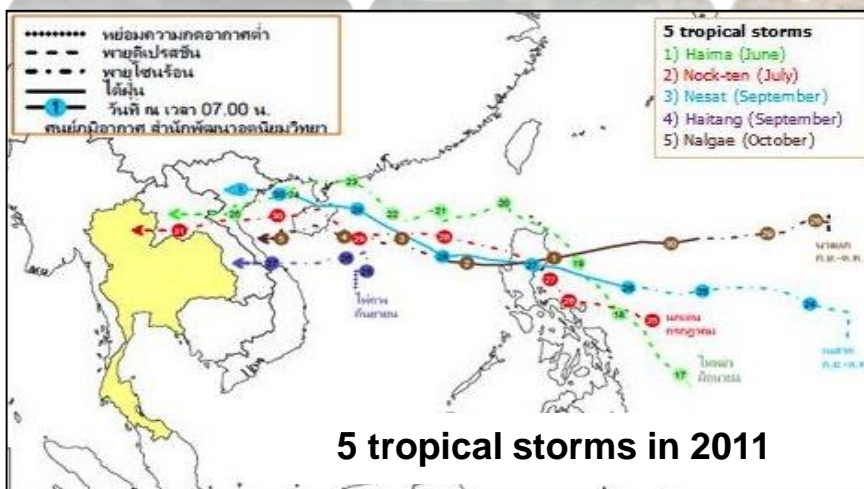
Networking
& cluster

Flash flood &
landslide warning

Reservoir
networking

Data
warehouse

Integration of technology for data analysis and flood management



Thailand's severe droughts in 2015

Severe droughts, particularly in the upper-middle part of the country

Ping River

Phayao Lake

Khwa Noi
Bamrungdan Dam

Ubolratana Dam

Chiang Mai

Phayao

Phitsanulok

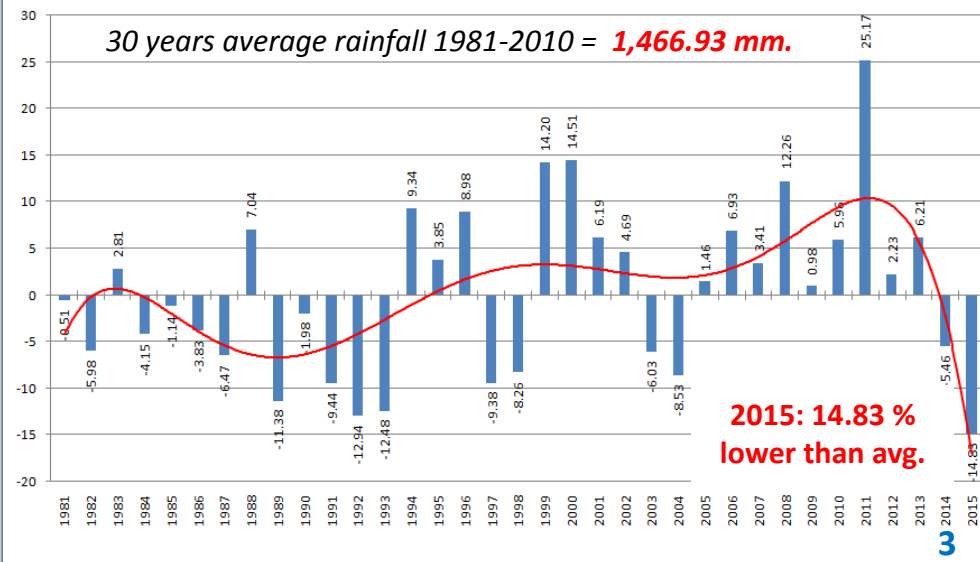
Khon Kaen

Drought Monitoring System

Map Technology for Data Analysis

Percentage of annual rainfall anomalies over Thailand

30 years average rainfall 1981-2010 = **1,466.93 mm.**



*source data from 93 main stations of TMD

PRE-HYDROINFORMATICS

Getting DATA in place and in time, INTEGRATION is key.

TECHNOLOGY

HIGH PERFORMANCE COMPUTING



- ▶ Server farms
- ▶ Clustering
- ▶ GRID
- ▶ Cloud computing

Computational Science

- ▶ Weather Forecast Modeling: WRF, WRF-ROMS
- ▶ Flood Forecast Modeling: MIKE-DSS, FEWS
- ▶ Wave Modeling: SWAN

Data Science

- ▶ Analytics
- ▶ Image processing

Data Services

- ▶ Telemetry / Observation
- ▶ Satellite-radar images/GSMap
- ▶ Data exchange with partners

Technology Services

- ▶ Big Data / Hadoop Clusters
- ▶ Research

AUTOMATED TELEMETRY



Weather Station LAO003
Luang Prabang



Water Level Station CPY004
Wat Thammamool Worawihan

- ▶ 850 stations in operation nationwide
- ▶ Real time weather and water level monitoring
- ▶ Automatic data streaming through cellular network and satellite
- ▶ Live data on www.thaiwater.net

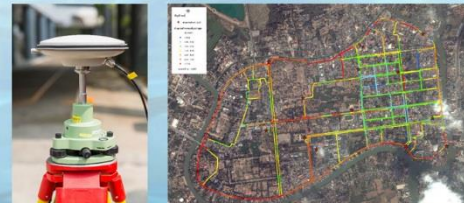
MICROCLIMATE AND POLLUTANTS MONITORING STATION

117 Meter tower, fully automated, for urban climate study

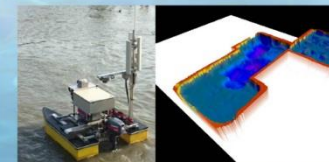


SURVEYING TECHNOLOGY

MOBILE MAPPING SYSTEM (MMS)



AUTOMATIC BOAT



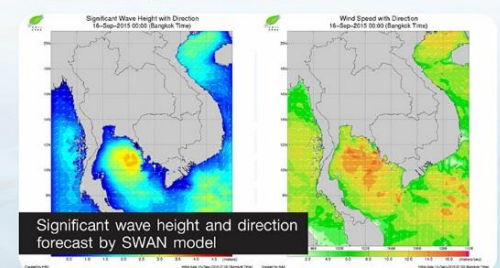
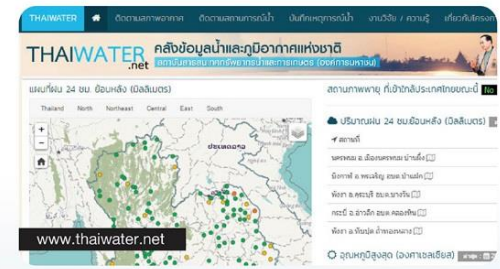
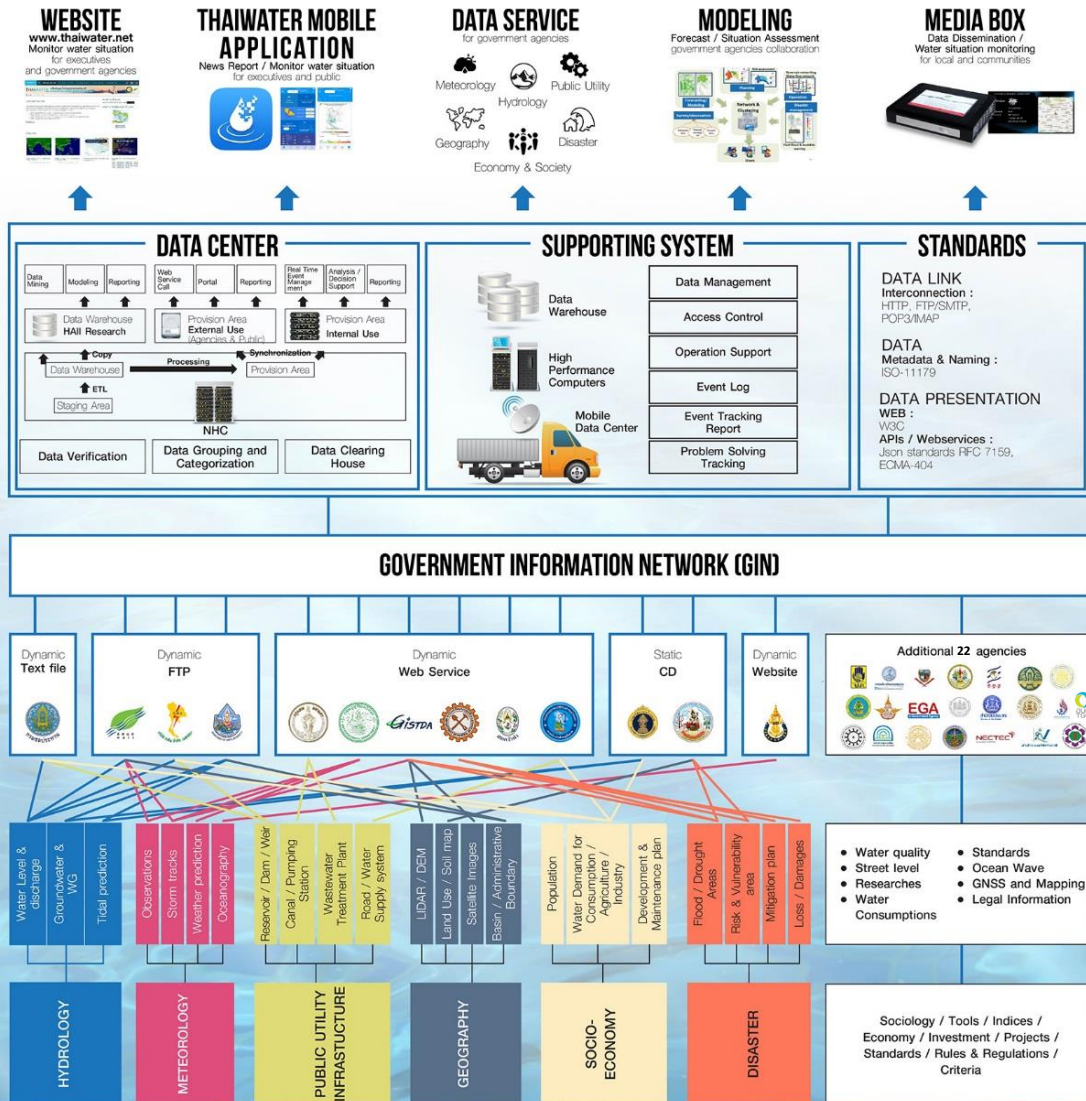
UNMANNED AERIAL VEHICLE



HYDROINFORMATICS

Investing in The Know, organizing the unorganized, strengthening capability.

NATIONAL HYDROINFORMATICS AND CLIMATE DATA CENTER



POST-HYDROINFORMATICS

Getting the most out of Hydroinformatics for the benefits of all.

“9 ASPECTS OF HYDROINFORMATICS” SUPPORTING NATIONAL WATER RESOURCE MANAGEMENT SYSTEM



**NATIONAL HYDROINFORMATICS
AND CLIMATE DATA CENTER**

by **HAIL**



35 GOVERNMENT AGENCIES

Distributed functions, Integrated use



Additional **22** agencies



**Prime Minister Operation
Center (PMOC)**

**National Water Resources
Committee (NWRC)**

**Committee on The Integration of National
Hydroinformatics and Climate Databases**

Chairman: Minister, MOST
Secretariat: HAIL, EGA

9 ASPECTS OF HYDROINFORMATICS

- ▶ Primary Data acquisition
- ▶ Analytical Reports

1

**Short-, Medium- and
Long-Range Weather
Prediction**

TMD DRRAA HAIL HD

2

**Water Management
in Irrigated Area**

RID EGAT

3

**Water Management
in Rainfed Area**

DWR DGR RID MD LDD

4

**Water Management
for Consumption
and Industrial Use**

PWA MWA DLA DGR
MOI EGAT RID DDPM

5

**Ecosystem and Water
Quality Preservation**

PCD DWR RID DDS PWA
MWA MOI HD DMCR

6

**Disaster Warning
and Management**

DDPM NDWC DDS DMR

7

**Water for Electricity
Generation**

RID EGAT

8

**Economic and Social
Development Planning**

NSO BB NESDB DLA
CDD OAE MOI

9

**Infrastructure for
Data Systems**

HAIL EGA DPT GISTDA
NIMT RTSD DOL
NSTDA MD

SINGLE INTEGRATED REPORT

- ▶ Public Announcement
- ▶ Management during Normal situation
- ▶ Management during Crisis situation



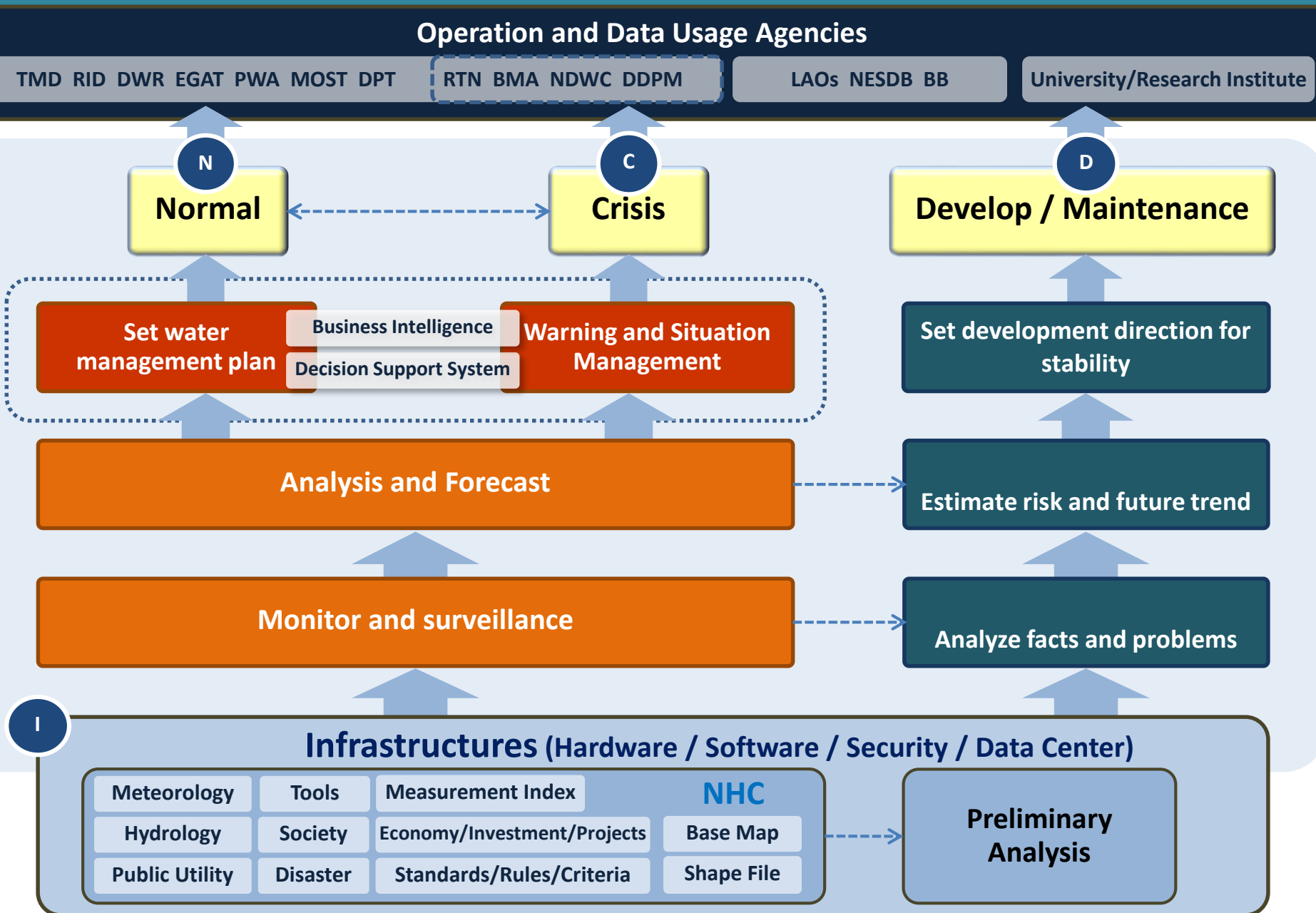
Government

Announcement

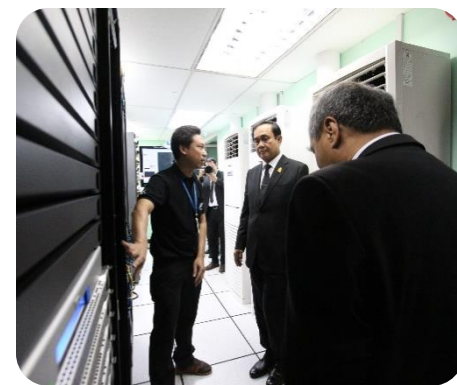
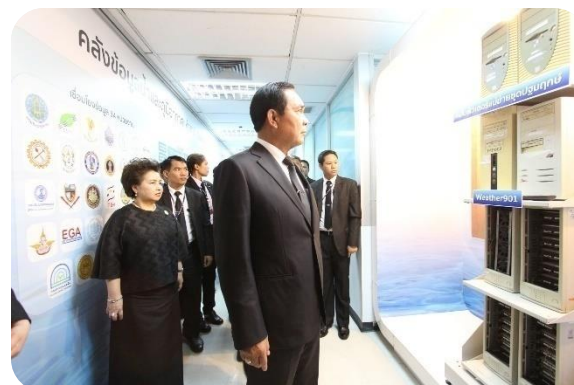


Public / Press

Management Plans during Normal and Crisis Situation



National Hydroinformatics and Climate Data Center (NHC)



3rd February 2017

Prime Minister of Thailand
Visited NHC's War room

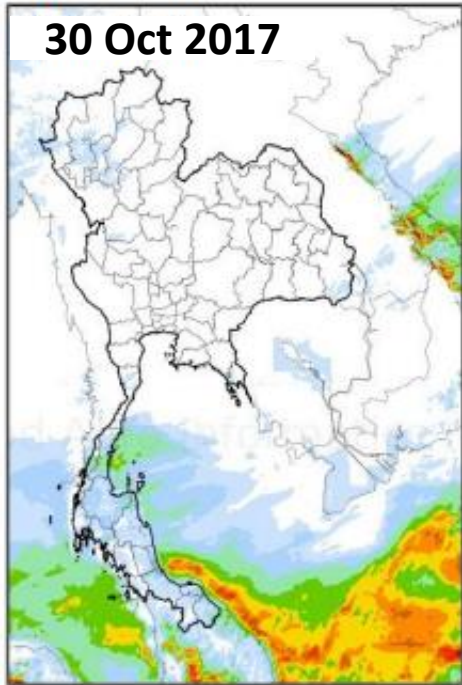


CRISIS OPERATION FOR RISK REDUCTION

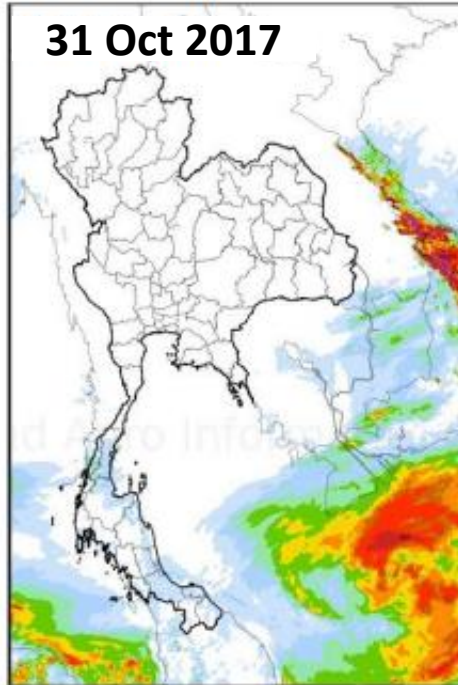
▶ Role of S&T: Accurate Rainfall Forecasting



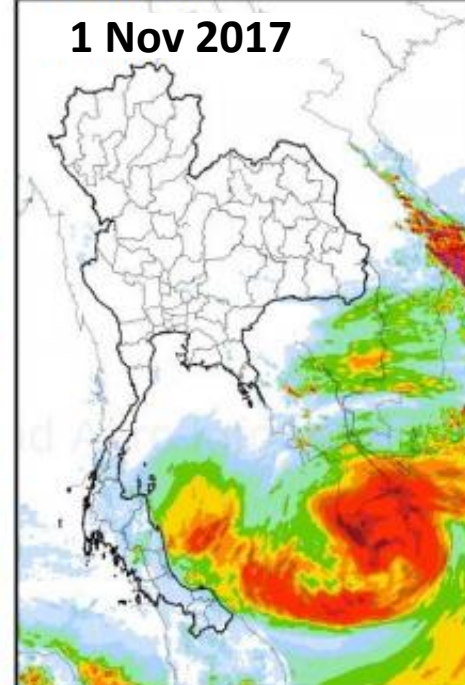
30 Oct 2017



31 Oct 2017



1 Nov 2017



24 Oct 2017

- Detect the formation of low pressure

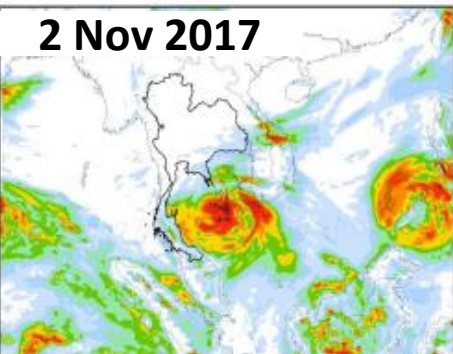
30 Oct 2017

- Confirm the developing of Depression

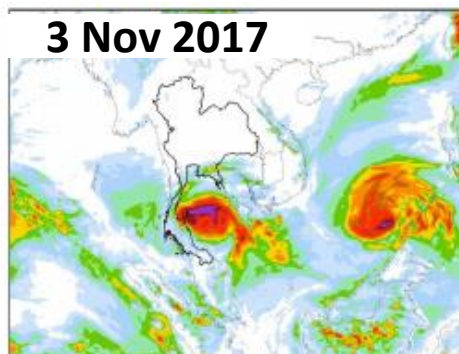
3 Nov 2017

- Depression hit the Southern part of Thailand

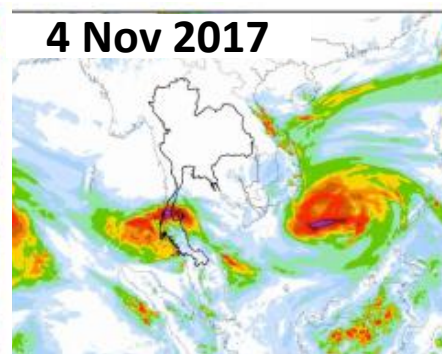
2 Nov 2017



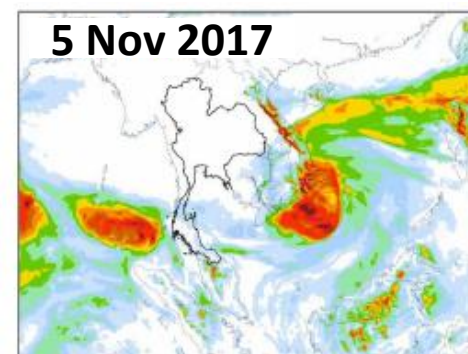
3 Nov 2017



4 Nov 2017



5 Nov 2017



Comparison of Rainfall in Southern Thailand

December

January

Average rainfall 30 years
(208 mm.)

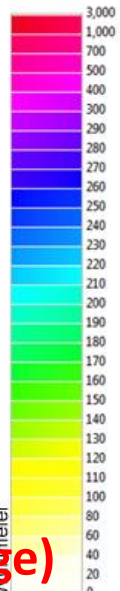
Average rainfall 30 years
(54 mm.)

December 2016

445 mm

January 2017

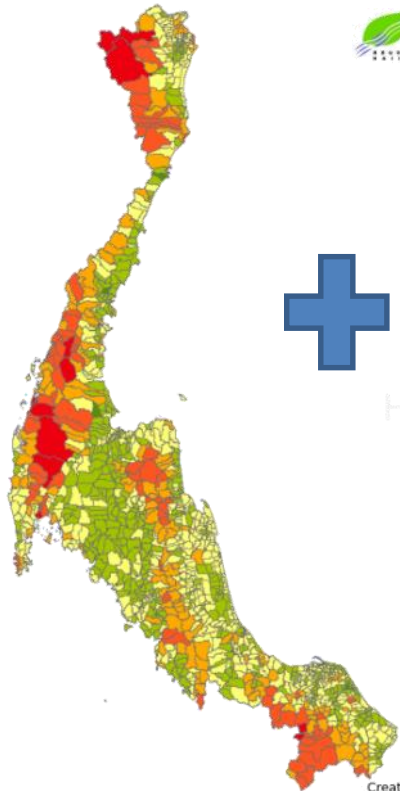
559 mm (10 times higher than average)



Role of S&T: Flashflood Forecasting



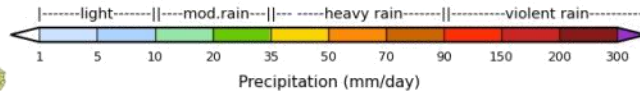
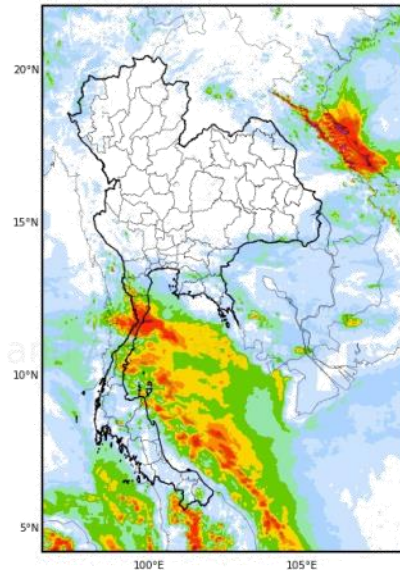
Slope & Soil saturation



Rainfall forecast

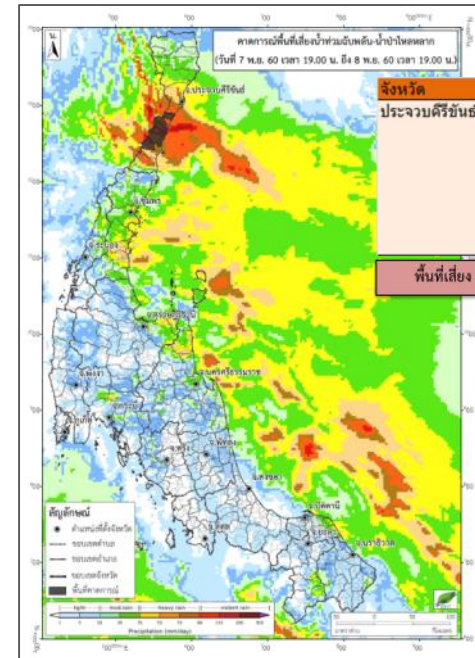


WRF-ROMS (ThaiGeo), 24-Hour Precipitation, Thailand Model (3x3 km)
07-Nov-2017 19:00 to 08-Nov-2017 19:00 (Bangkok Time)



initial date 07-Nov-2017 19:00 (Bangkok Time)

Flashflood potential index (FFPI)



จังหวัด	อำเภอ	ตำบล
ประจวบคีรีขันธ์	ทับสะแก	เขาล้าน นาหูกวาง พวยยาง อ่างทอง
	นางสะพาน	ชัยเกษม ธงชัย ร่อนทอง
พื้นที่เสี่ยง : 1 จังหวัด 2 อำเภอ 7 ตำบล		

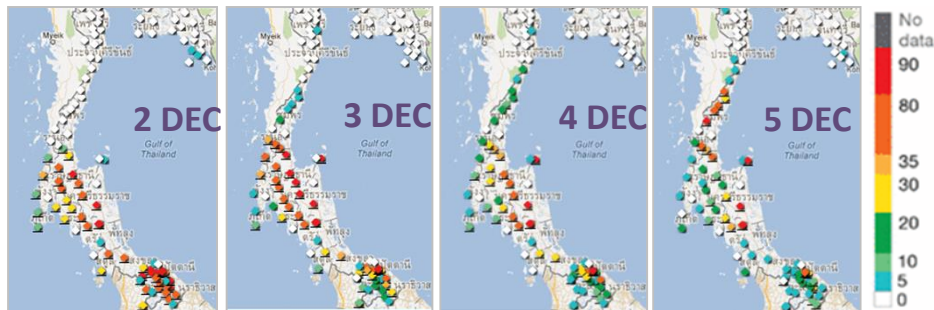


**8 November 2017 – Morning
Flashflood at Bang Saphan district**

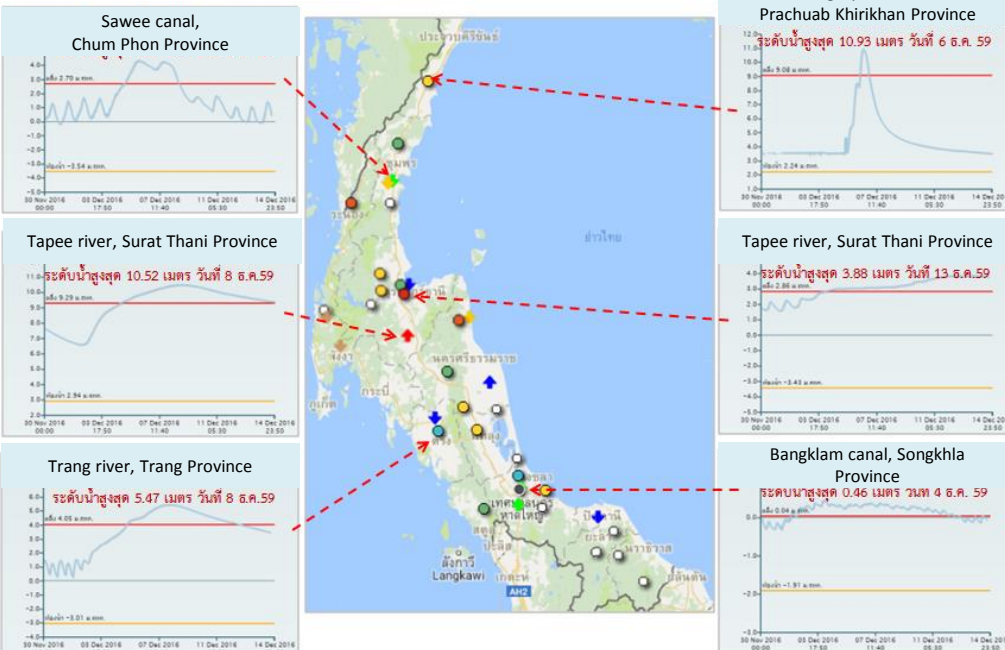
Role of S&T: Precise monitoring and warning of Disaster Severity



Situation Monitoring Reports



Water Level



Flooded Area Reports



▶ Role of S&T: Prompt & effective actions



Set up Local Monitoring System



Meeting & Teleconference with Authorized National and Local Government Agency



Prime Minister visit to the emergency operation center



Shared storm information with public through media



Channel 3

ดร.สุทัศน์ วัลกุล

ผู้อำนวยการสถาบันสารสนเทศทรัพยากรน้ำและการเกษตร

Key Learnings from Thailand



- Role of S&T for Disaster Risk Prevention: S&T enable better understanding and management of disaster risk
- Precise monitoring and warning of disaster severity: by utilizing monitoring tools such as online sensors.
- Post-disaster analysis: Retrace the cause of risk from collected information
- Rehabilitate and reconstruction of the bottleneck area to prevent future risk
- Build Back Better: create community resilience to disasters





THANK YOU

Dr. Surajate Boonya-aroonnet
surajate@haii.or.th , iaf@haii.or.th

www.thaiwater.net