



Hydro and Agro Informatics Institute (HAI)

Ministry of Science and Technology

Thailand



The National Hydroinformatics and Climate Data Center (NHC)

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Outline

- HAITI's activities
- Development of NHC
- ASEAN initiative

R&D water management technology and implementation



Data acquisition & integration

Sensing and information

Unified database

Interpretation, analytical, modeling tools

Modelling & simulations

Operational DSS

Visualization, good practices

Knowledge sharing

Capacity building

Training

Technology transfer

Adaptation guidelines

The First Generation of Hydro-informatics in 1998

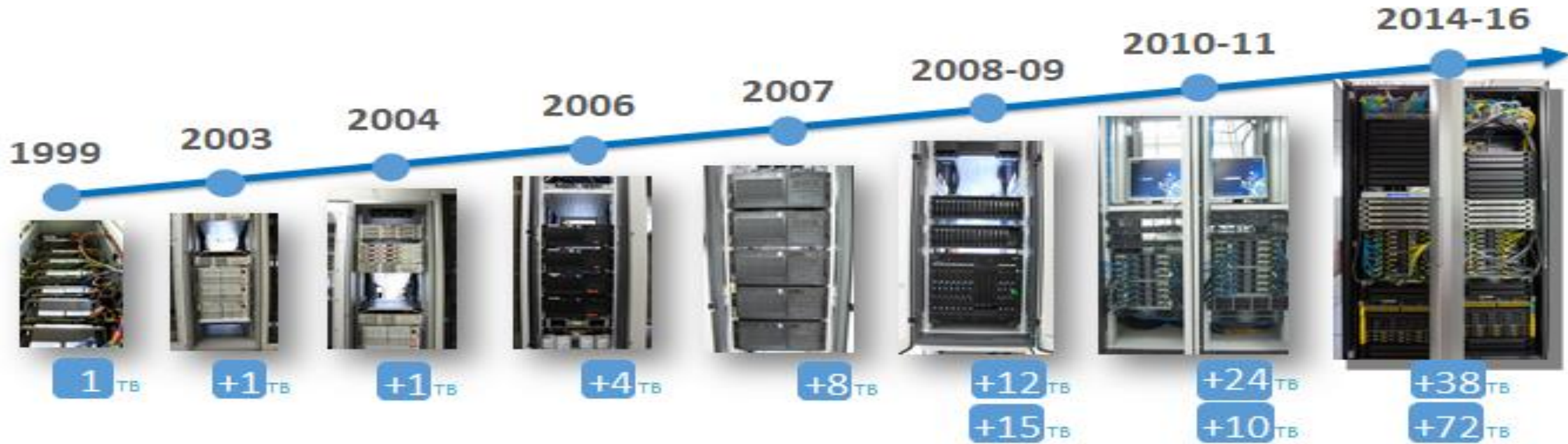


Funded by TRF

Executed by National Electronics and Computer Technology Center (NECTEC)

TRF, RID, EGAT, TMD, BMA

ICT infrastructure improvement 1999-2016



Current Capacity

Over 1000 CPU cores; 2088 GPU cores; 100 VMs; 300 TB storage
Server farms, clustering-GRID environment

Data:

- Telemetry
- Satellite/radar images
- Internal/External Research
- Data exchange with partners

Services:

- Data warehouse
- Modeling (WRF, WRF-ROMs)
- Image Processing
- Public websites

Thailand 2011 Flood Leads to the Establishment of NHC



Early warning and real time decision making

Flood sensorweb

Forecast & modeling

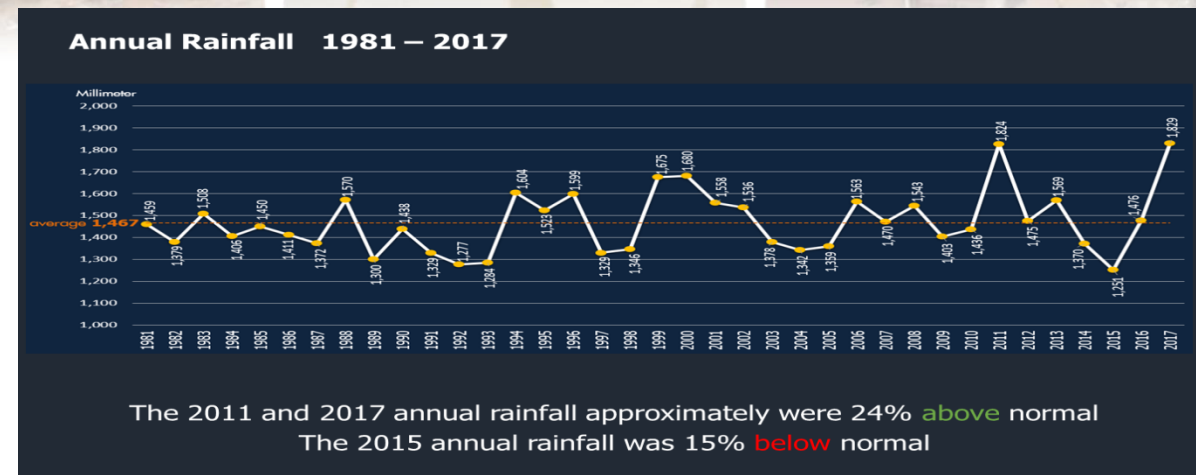
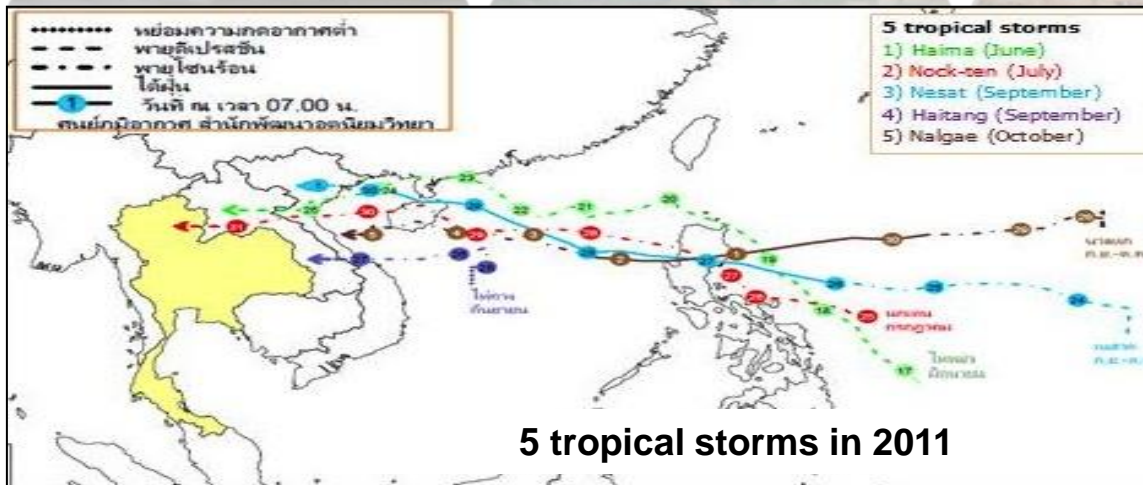
Networking & cluster

Flash flood & landslide warning

Reservoir networking

Data warehouse

Integration of technology for data analysis and flood management



National Hydroinformatics and Climate Data Center (NHC)



WEBSITE

Monitor water situation
Executives and Government Agencies



NHC Mobile Application

News Report / Monitor water situation
For Executives and Public



DATA SERVICE

For Government Agencies



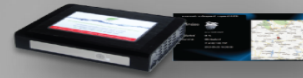
MODELING

Forecast / Situation Assessment
Government Agencies Collaboration

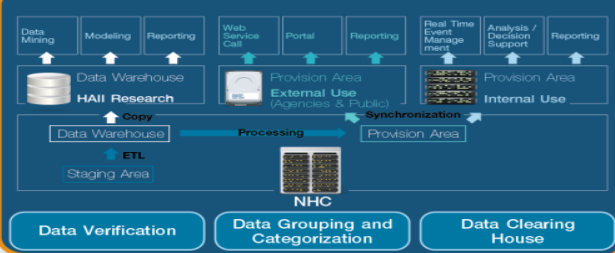


MEDIA BOX

Data Dissemination /
Monitor water situation
For Local and Communities



DATA CENTER



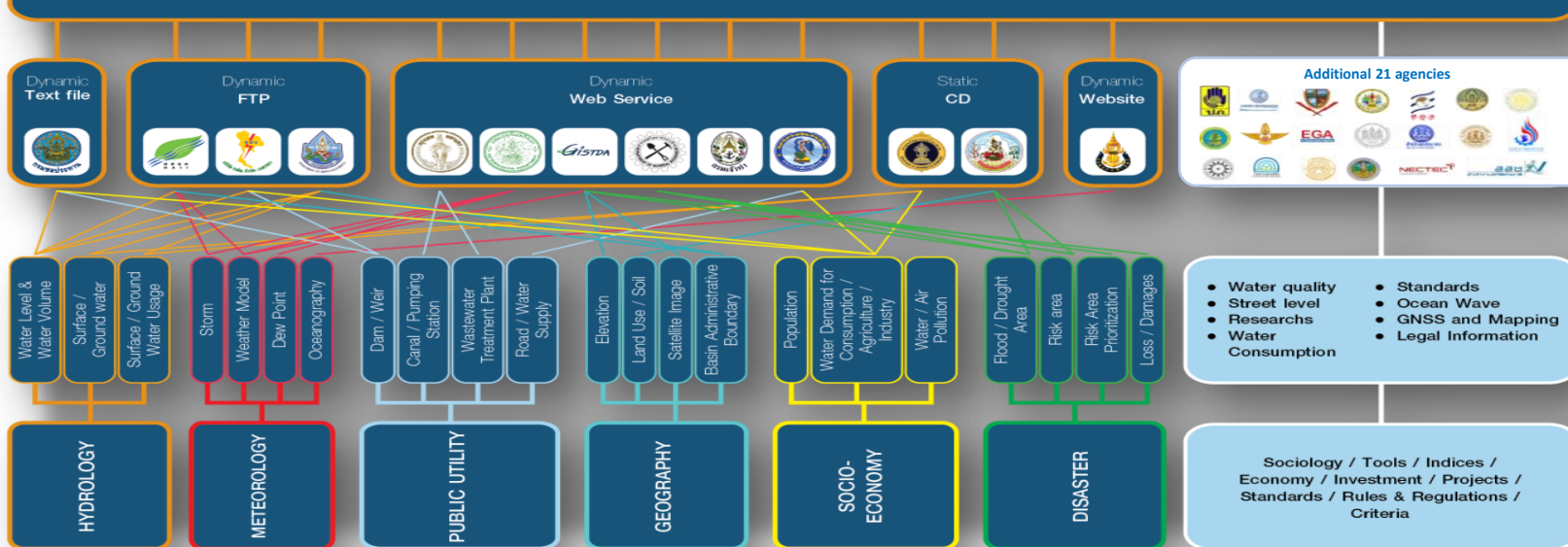
SUPPORTING SYSTEM



STANDARDS



Government Information Network



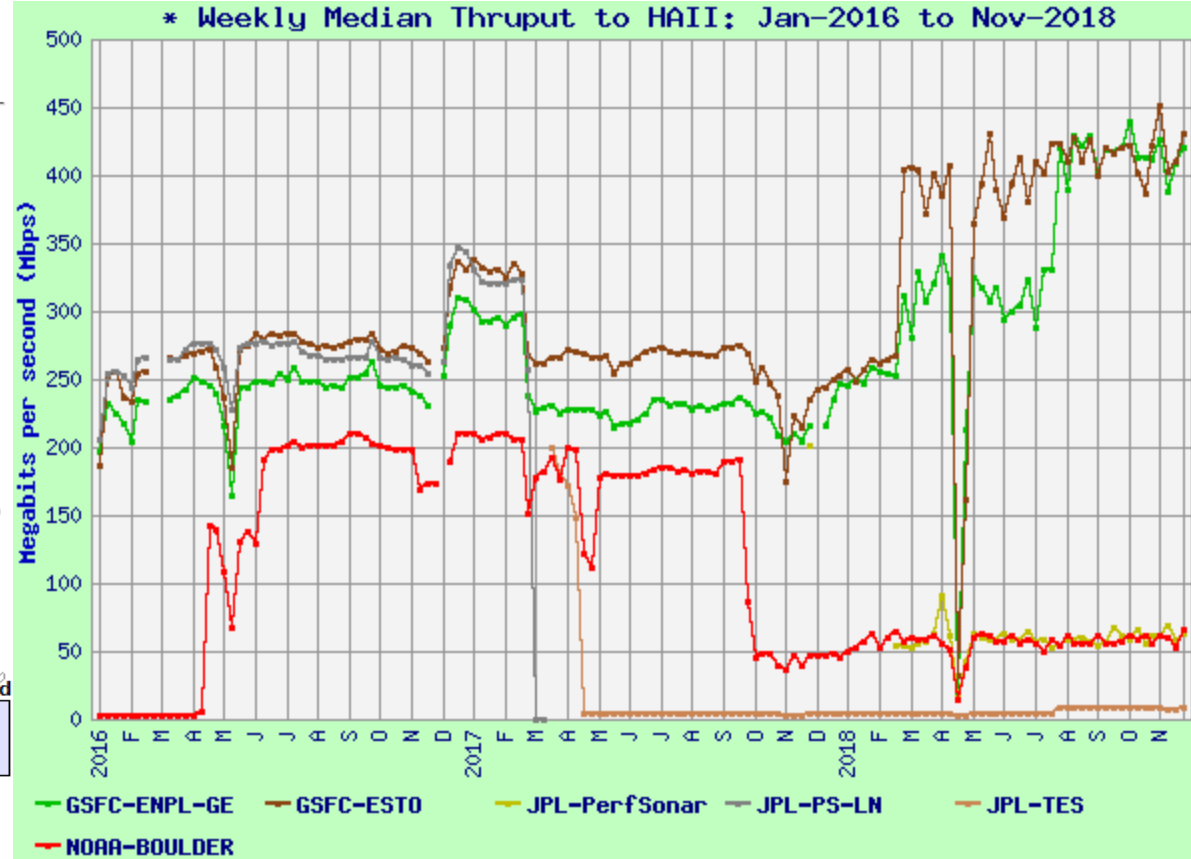
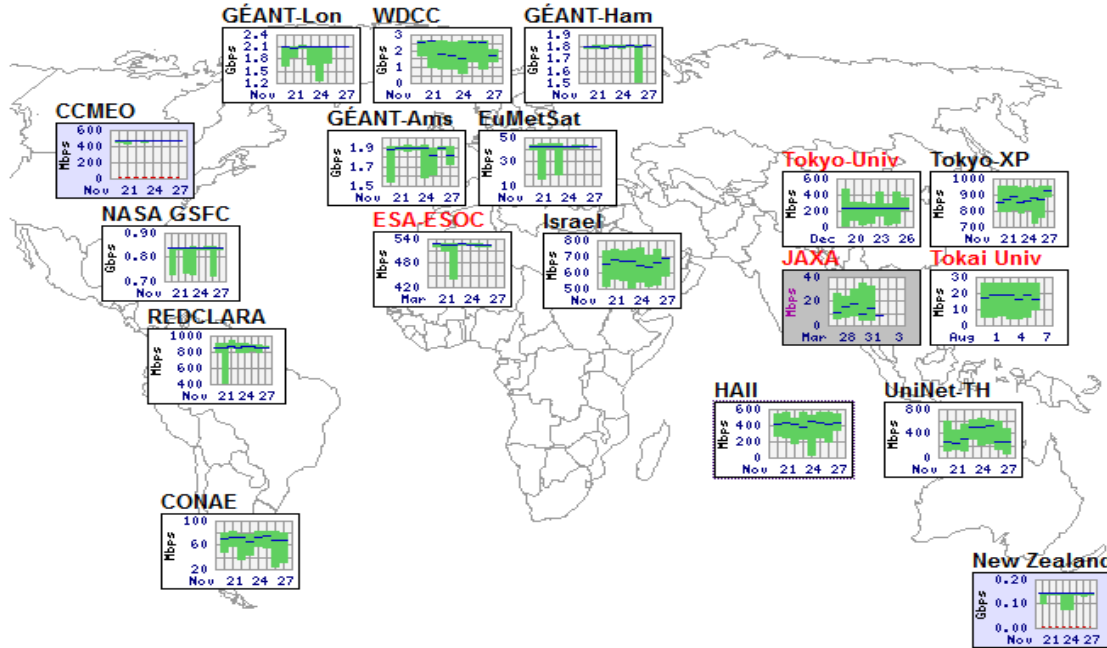
- Decision Support Information System
- Processing and analysis of water management information
- Data integration and exchange among water related agencies
- De Facto Standard flexible data format for monitoring, analysis and forecast of water situation
- Unified water management system for both normal and crisis situation
- Houses 400 data items 37 agencies

EOS Active Network Testing, CEOS Destination: HAI



EOS Networks Active Testing CEOS & International Destinations

The sites below are participants in CEOS, and are tested under the ENSIGHT Active Network Testing Program. The graph for each site shows the minimum, maximum, and median thrupt for the past week along with the requirement. Selecting any of these graphs will link to a page with detailed testing results for that site.



- Argentina: [CONAE](#)
- Canada: [CCMEQ](#)
- England: [GEANT-London](#)
- Germany: [ESA-ESOC](#)
- [EuMetSat](#)
- [GEANT-Frankfurt](#)
- [GEANT-Hamburg](#)
- [WDC](#)
- Israel: [Tel Aviv U](#)
- Japan: [JAXA](#)
- [Tokai Univ](#)
- [Tokyo Univ](#)
- [Tokyo - XP](#)
- Netherlands: [GEANT-Amsterdam](#)
- New Zealand: [REANNZ Auckland](#)
- Thailand: [UniNet](#)
- [HAII](#)
- USA: [NASA GSFC ENPL](#)
- [NASA GSFC EBnet](#)
- [REDCLARA Gateway](#)

[Return to the ENSIGHT Home Page](#)

Responsible National Aeronautics & Space Administration (NASA) Official: [Jeanne Behnke](#)
For questions regarding web content or Active Testing, please contact: [Andy Germain](#), ASRC Inc.



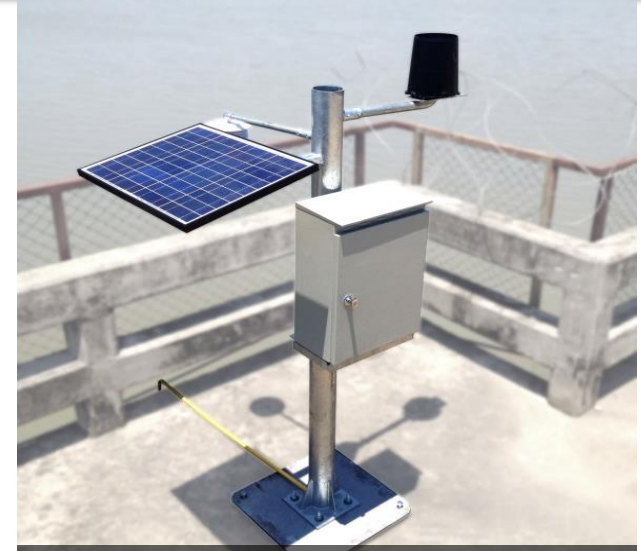
International network for data access for weather & ocean prediction models

HAI's Telemetry System

installed at 935 stations nationwide



Weather + Water Level Telemetry Station



Water Quality Telemetry Station

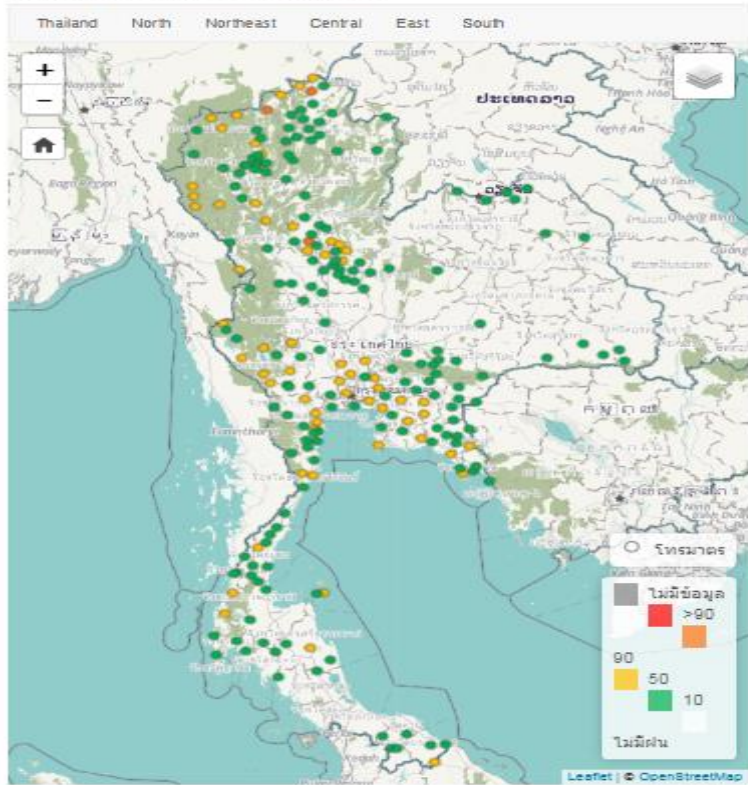


Weather Telemetry Station

Monitoring System: www.thaiwater.net

THAIWATER.net คลังข้อมูลน้ำและภูมิอากาศแห่งชาติ
 สถาบันสารสนเทศทรัพยากรน้ำและการเกษตร (องค์การมหาชน)

แผนที่ฝน 24 ชม. ย้อนหลัง (มิลลิเมตร)



ติดตามสถานการณ์น้ำ
ลุ่มน้ำเจ้าพระยา

24 ตุลาคม 2560 23 ตุลาคม 2560 22 ตุลาคม 2560 21 ตุลาคม 2560 20 ตุลาคม 2560 19 ตุลาคม 2560

สถานภาพพายุที่เข้าใกล้ประเทศไทยขณะนี้: **No Storm**

ปริมาณฝน 24 ชม.ย้อนหลัง(มิลลิเมตร)
 ล่าสุด : 2017-10-24

สถานี	เวลา	มม.
เชียงใหม่ อ.ไชยปราการ ทด.ไชยปราการ	15:00	81.4
สุโขทัย อ.เมืองสุโขทัย อมด.ปากแคว	15:00	
เชียงราย อ.แม่จัน ทด.แม่จัน	15:00	
เชียงราย อ.แม่สาย ทด.เวียงพางคำ	15:00	
ราชบุรี อ.โพธาราม เขาช่องพาน	15:00	



อุณหภูมิล่าสุด (องศาเซลเซียส)
 ล่าสุด : 2017-10-24

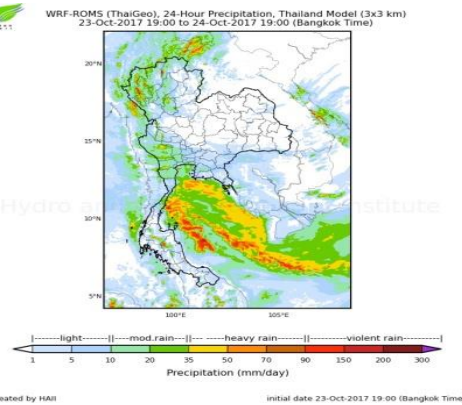
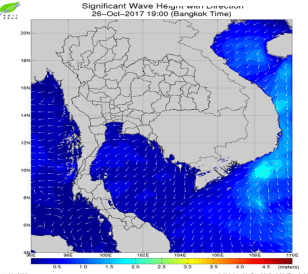
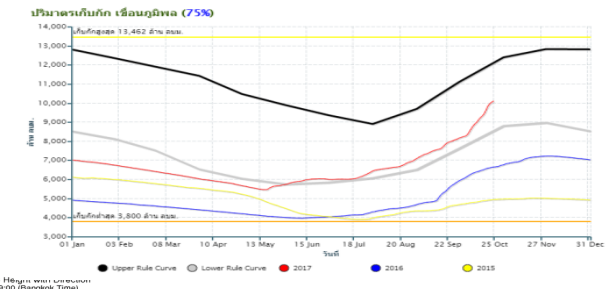
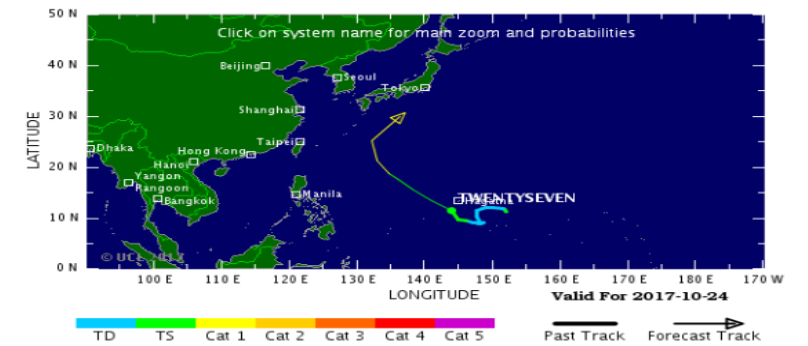
สถานี	เวลา	มม.
เชียงราย อ.แม่จัน ทด.แม่จัน	15:00	23.5
เชียงราย อ.แม่ฟ้าหลวง อมด.เทอดไทย	15:00	24.0
เชียงใหม่ อ.อมก๋อย อมด.อมก๋อย	15:00	24.5
เชียงราย อ.พาน สุสานศรีเดือน	15:00	24.5
เชียงราย อ.เมืองเชียงราย อมด.รอบเวียง	15:00	25.0

ข้อมูลน้ำในเขื่อน (ล้าน ลบ.ม.)
 ล่าสุด : 2017-10-24

เขื่อน	ปริมาณน้ำในอ่างฯ (%รณค.)
เขื่อนภูมิพล	10,117 (75.15%)
เขื่อนสิริกิติ์	8,255 (86.81%)
เขื่อนแควน้อย	978 (104.13%)
เขื่อนป่าสักฯ	943 (98.18%)
รวมน้ำใช้การของ 4 เขื่อนหลัก (ลุ่มน้ำเจ้าพระยา)	20,292 (67%) (ล้าน.ลบ.ม.)



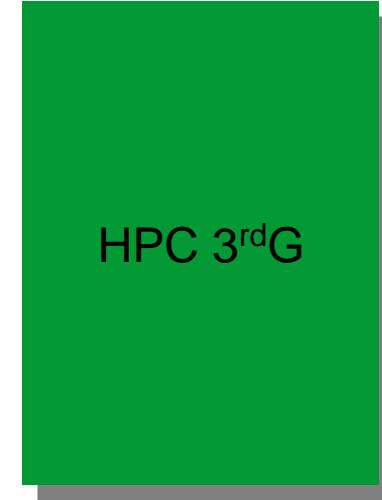
เส้นทางเส้นทางน้ำในเขื่อนขนาดใหญ่ทั่วประเทศ
 %รณค. <=80 น้ำเขตรักษา >80-90 น้ำเขตรักษา >90-95 น้ำเขตรักษา >95-100 น้ำเขตรักษา >100 เก็บความจุน้ำ



2011

2015

2018



HPC Capacity:

- Compute CPU 384 Cores
- Storage 59 TB

Modeling:

- WRF
- RAMS

HPC Capacity:

- Compute CPU 512 Cores
- Storage 48 TB

Modeling:

- WRF-ROMS (COAWST)
- SWAN

HPC Capacity Future:

- Compute CPU 512 Cores
- Storage 60 TB

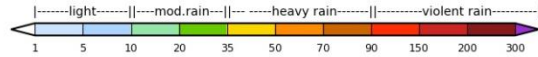
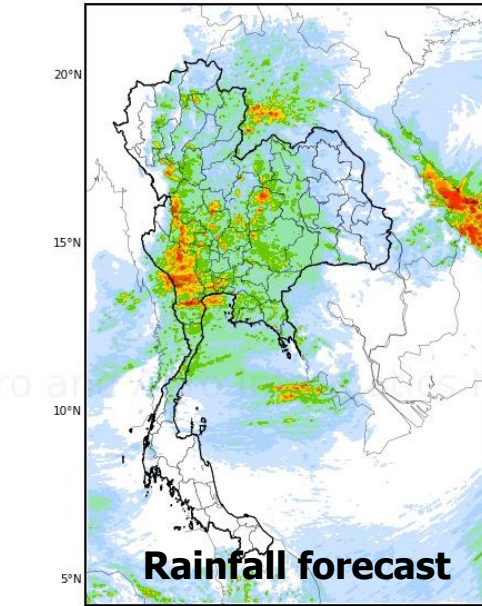
Modeling:

- WRF-ROMS (Micro Climate)
- WRF (Micro Climate)
- SWAN
- IAP_AGCM

Coupled Model (WRF-ROMS)



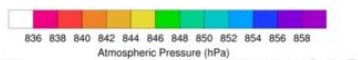
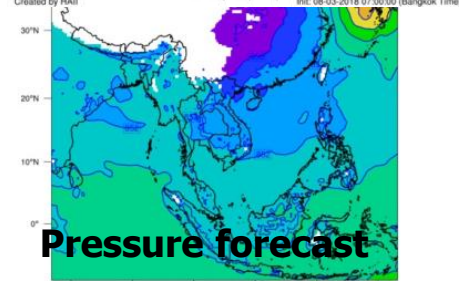
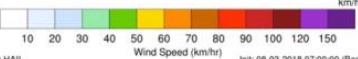
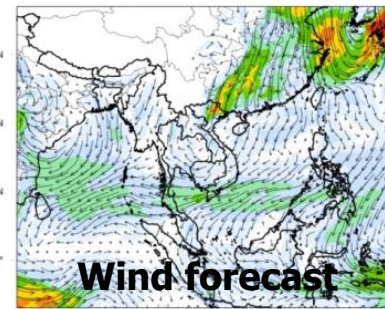
WRF-ROMS (ThaiGeo), 24-Hour Precipitation, Thailand Model (3x3 km
08-Mar-2018 07:00 to 09-Mar-2018 07:00 (Bangkok Time)



http://thaiwater.net/v3/wrfroms/rain_forecast_pre/tab1/image1



WRF-ROMS, Wind Speed and Direction at 1.5 km. above Sea Level
Valid: 08-03-2018 07:00:00 (Bangkok Time)

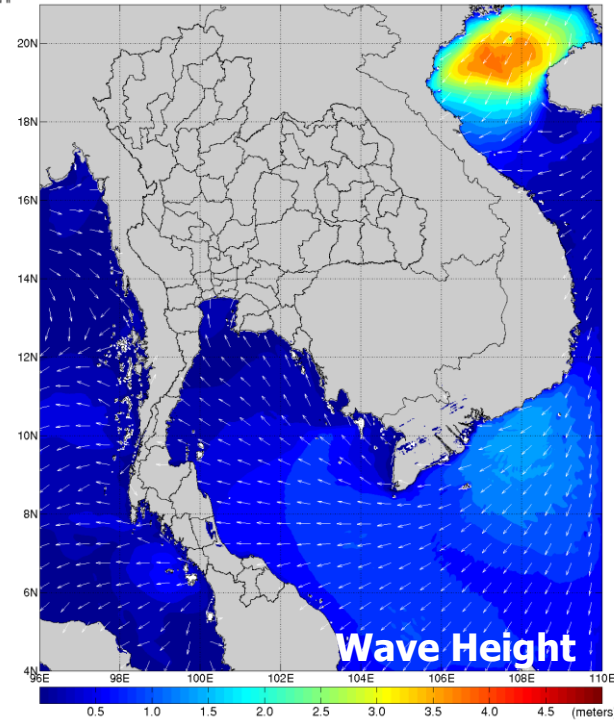


Created by HAII

SWAN



Significant Wave Height with Direction
08-Mar-2018 06:00 (Bangkok Time)



<http://thaiwater.net/v3/wrf/swan>

WRF: Weather Research and Forecasting
ROMS: Regional Ocean Modeling System

SWAN: Simulating WAve
Near shore

Decision support system for flood forecasting and water management

Decision Support System for Flood Forecasting and Water Management

ระบบสนับสนุนการตัดสินใจเพื่อคาดการณ์น้ำท่วมและบริหารจัดการน้ำ

ระบบสนับสนุนการตัดสินใจเพื่อคาดการณ์น้ำท่วมและบริหารจัดการน้ำ

Decision Support System for Flood Forecasting and Water Management in Chao Phraya River Basin

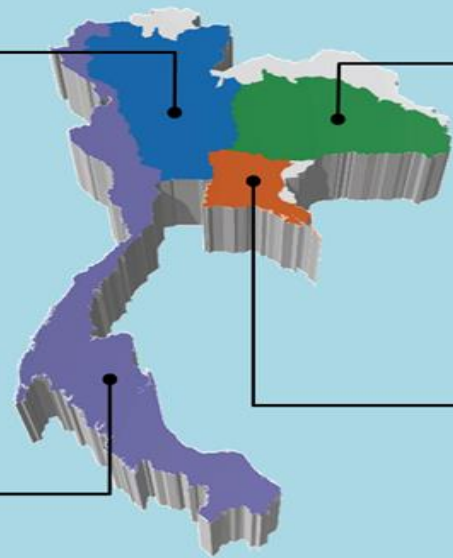
สถานี/ชื่อ	22/2	23/2	24/2	25/2	26/2	27/2	28/2	1/3
CHM001	↑	↑	↑	↑	↑	↑	↑	↑
PHW03	↑	↑	↑	↑	↑	↑	↑	↑
PHW04	↑	↑	↑	↑	↑	↑	↑	↑
YAM001	↑	↑	↑	↑	↑	↑	↑	↑
YAM004	↑	↑	↑	↑	↑	↑	↑	↑
YOM004	↑	↑	↑	↑	↑	↑	↑	↑
YOM006	↑	↑	↑	↑	↑	↑	↑	↑
YOM008	↑	↑	↑	↑	↑	↑	↑	↑
NAW003	↑	↑	↑	↑	↑	↑	↑	↑
NAW004	↑	↑	↑	↑	↑	↑	↑	↑
NAW007	↑	↑	↑	↑	↑	↑	↑	↑

Chao-phraya basin (2012)

Chi-Mun basins (2014)

Western-Southern part (2016)

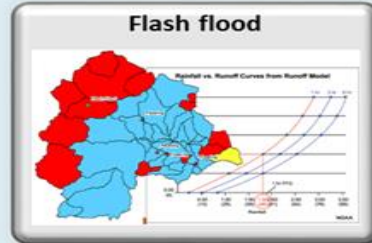
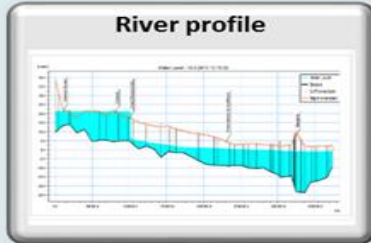
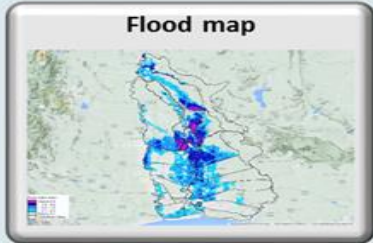
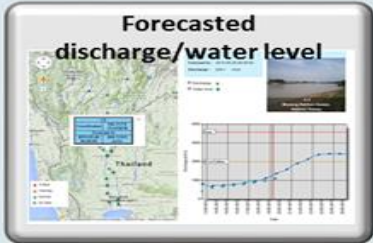
Eastern part (2015)



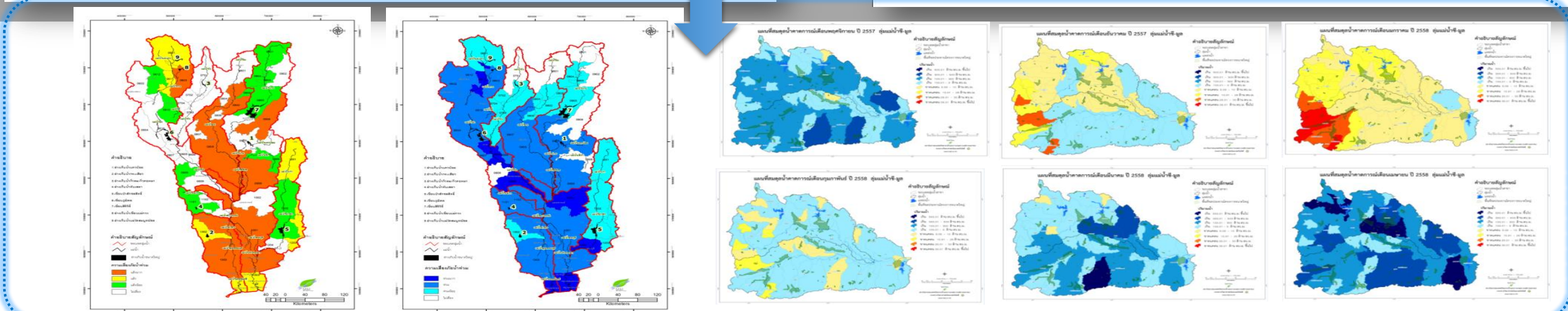
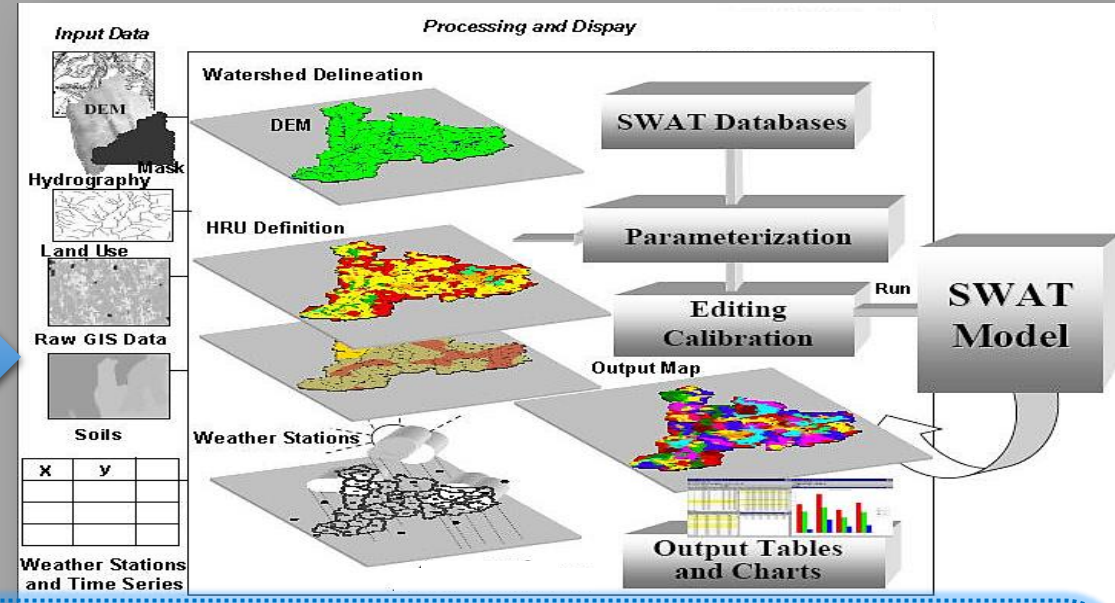
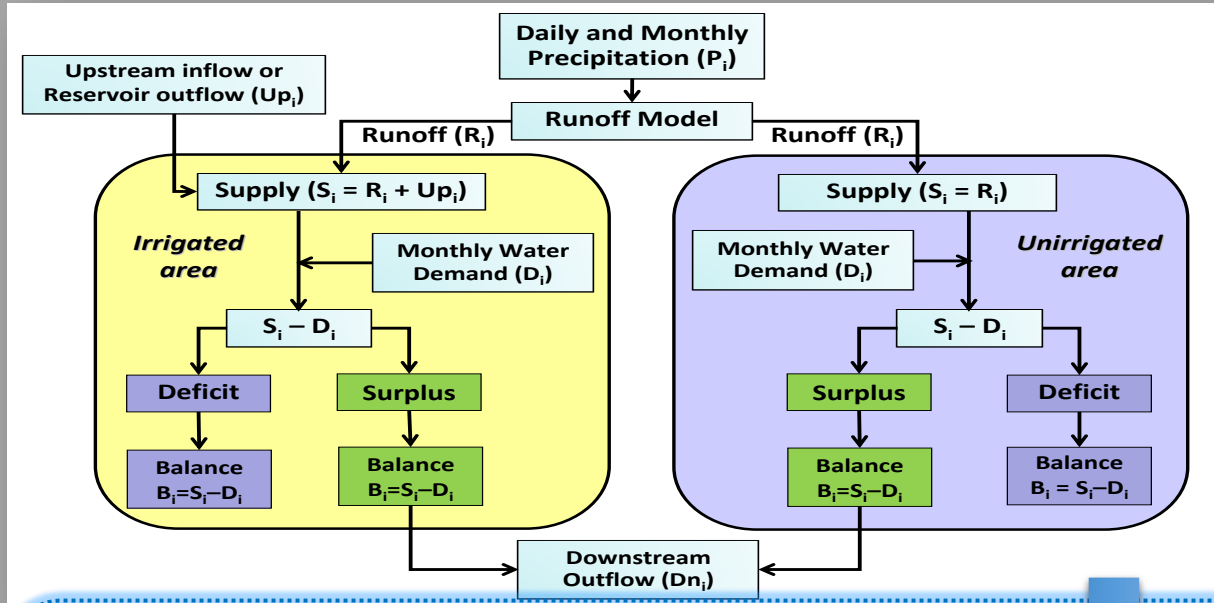
Integrate observed/forecasted data

Forecasting model

Support decision making



Water Balance Model



Flood Forecasting Model

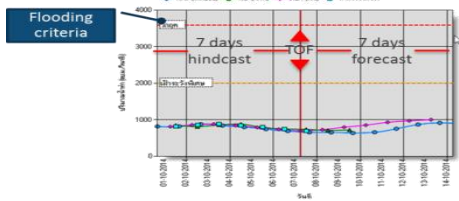
Basin Scale

- Hydrological Model
- 1D&2D Flood Model

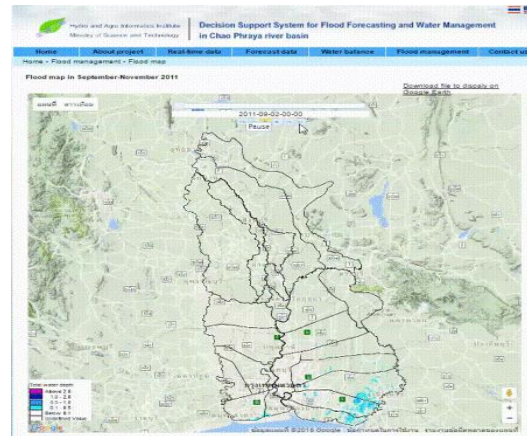


Forecast discharge
Station C.2
Nakhon Sawan

สถานี C.2	
ตำแหน่ง	100.113°E 15.6708°N
คาดการณ์ถึง	2013-09-17 1609.13
06:00:00	ลบ.ม./วินาที



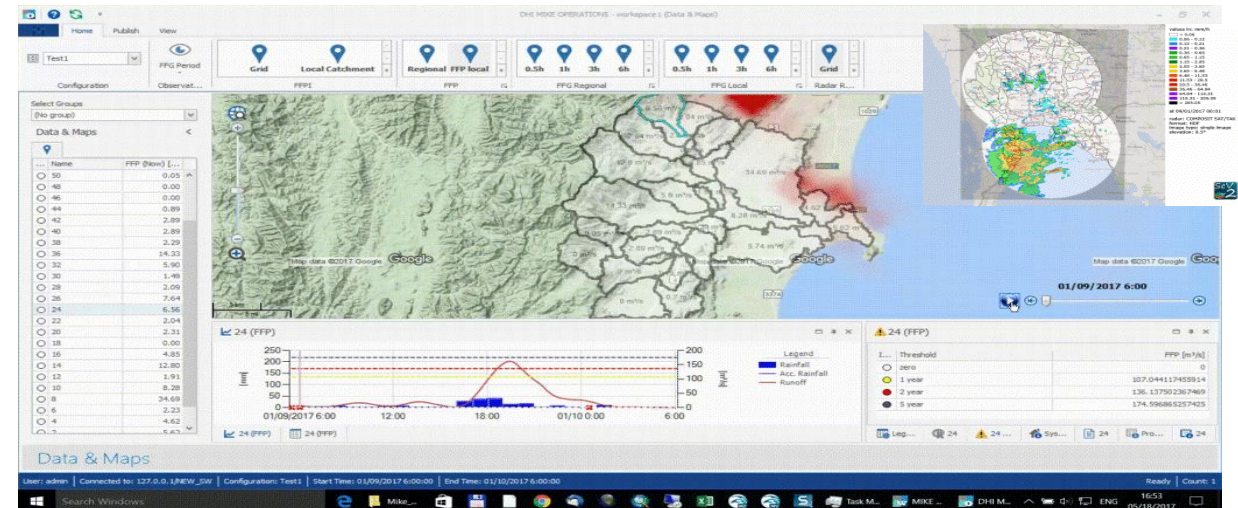
1D forecasting (river model)



2D forecasting (floodplain model)

Local Scale

- Flash Flood Model
 - Flash Flood Potential Index (FFPI)
 - Flash flood Guidance (FFG)
 - Flash flood Prediction (FFP)
- Flood Guidance (FG) or Flood Index
- Urban Flood Model



Bangsaphan Basin (521 sq.km)

Project area covers the entire Chao Phraya river basin

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



NHC and other operation centers



Prime Minister Operation Center (PMOC)

Committee on The Integration of National Hydroinformatics and Climate Databases

Chairman: Minister, MOST
Secretariat: HAUI, EGA

- Primary Data Acquisition and Analytical Reports
- Report 9 Aspects of Hydroinformatics for Water Resource Management

National Water Resources Committee

Office of the National Water Resources Single Integrated Report

- Public Announcement
- Normal and Crisis Operation

Water Resource Management Center



**Regional Level
Provincial Level**

On process

Smart Water Operation Center (RID)

Pollution Control Department Operation Center

- Use data/model from NHC to develop waste water model

Water related Disasters Data Operation Center (DDPM)

- Preparing data to be linked to Water-related disaster and E-stock management to NHC

Future Operation Centers

35 Government Agencies

Distributed functions, Integrated use

NHC

Data Warehouse

Data Exchange and Improvement

Develop and Utilize modelling

Data in Irrigation Area

Water Quality Data Discharge Data

Hydrodynamic model

Reservoir data

Improve reservoir inflow forecasting model

Rainfall data from Radar

Visualize spatial distribution and forecasting of rainfall

Electricity Generating Authority of Thailand (EGAT)

- Improve reservoir inflow and release forecasting

Department Operation Center, Royal Rainmaking Department (DOC)

ASEAN Hydroinformatics Data Centre (AHC) COST-SCMIT



AHC

is an **ASEAN Centre** of hydroinformatics and related technologies for water, weather and disaster risk management.

Purposes

- Acting as the **ASEAN Centre of water, climate and disaster risk data** by implementation of science and Technologies;
- **Strengthening ASEAN capacity** on water, weather and disaster risk management for climate change adaptation and **sustainability**
- **Sharing** and broaden country's learnings, experiences and good practices through active networking and collaboration

Potential Partners

- Government and private sectors
- Academia
- Research agencies related to water, weather and disaster risk management

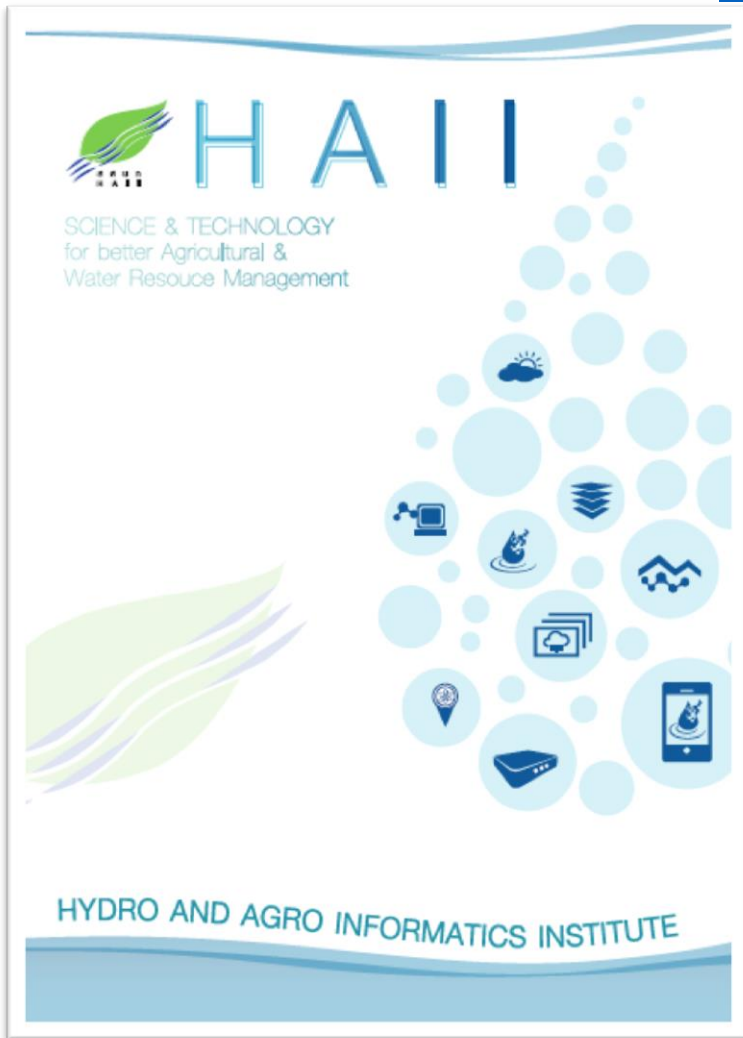
URL

www.aseanwater.net



THANK YOU

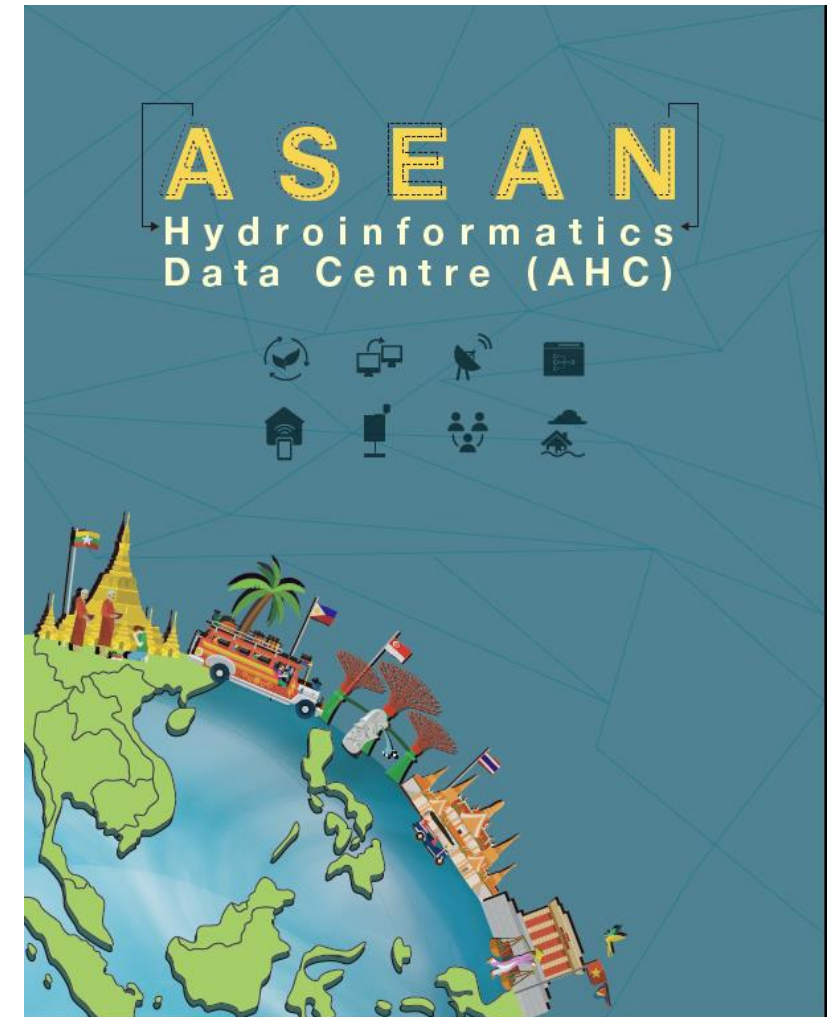
surajate@hii.or.th , iaf@hii.or.th



<https://www.hii.or.th/hii/?p=3367>



<https://www.hii.or.th/hii/?p=4358>



<https://www.hii.or.th/hii/?p=4841>