Flood Safety & Reservoir Operation in Thailand

Patsorn Rakcheep

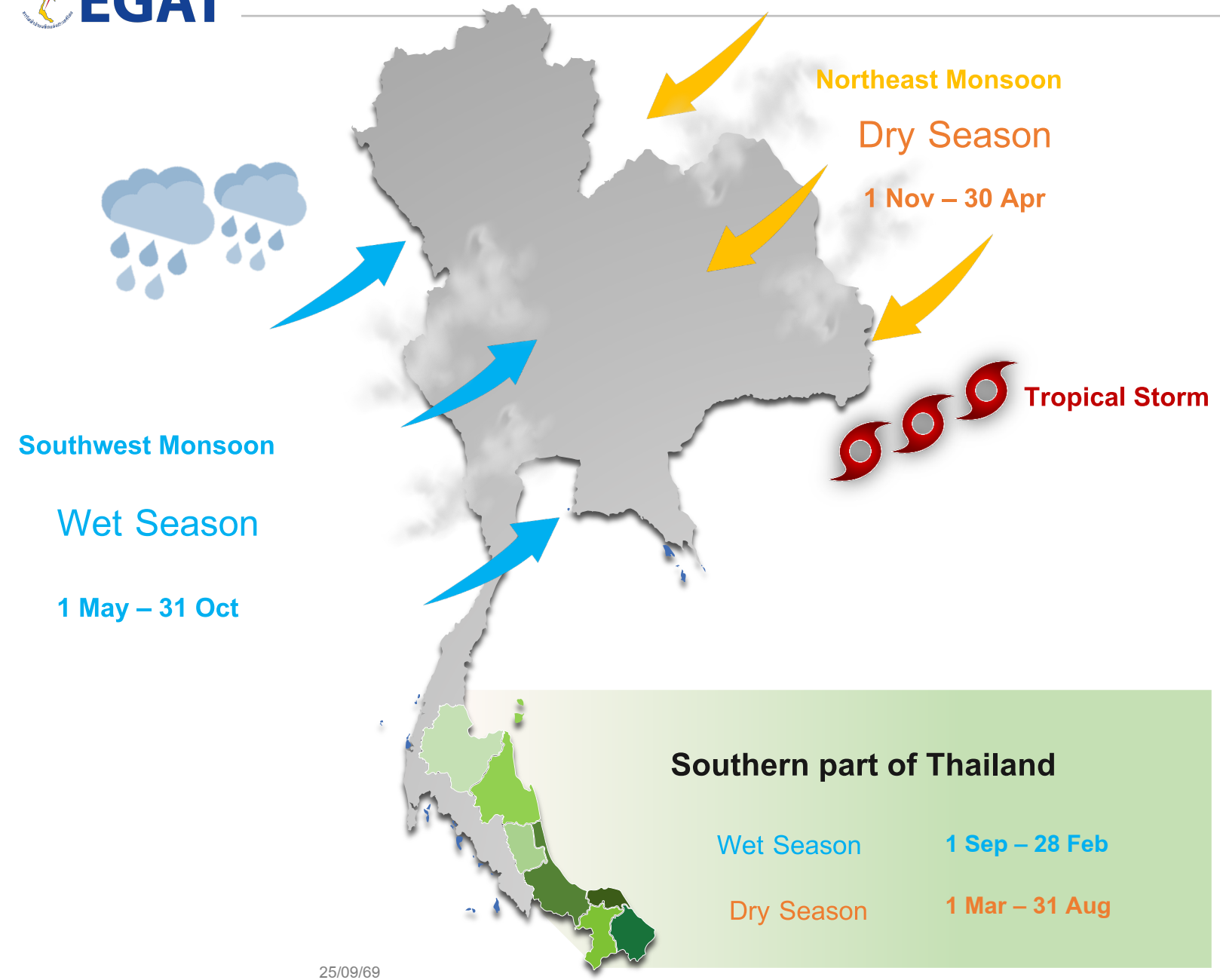
Engineering Level 9

Dam Safety Department

Civil Maintenance Division

3 December 2025

Season in Thailand



Thailand has three seasons:

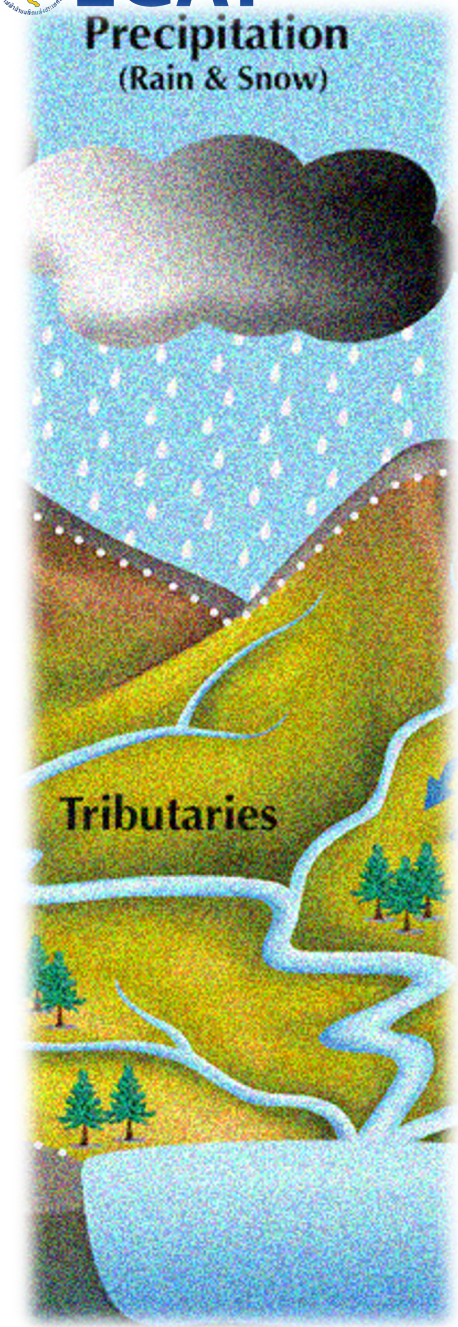
•The rainy or southwest monsoon season (mid-May to mid-October) prevails over most of the country. Moist air moves from the Indian Ocean to Thailand, causing abundant rain over most of the country. In addition to rainfall caused by the southwest monsoon, the Intertropical Convergence Zone (ITCZ) and tropical storm also contribute to producing heavy rainfall during the rainy season.

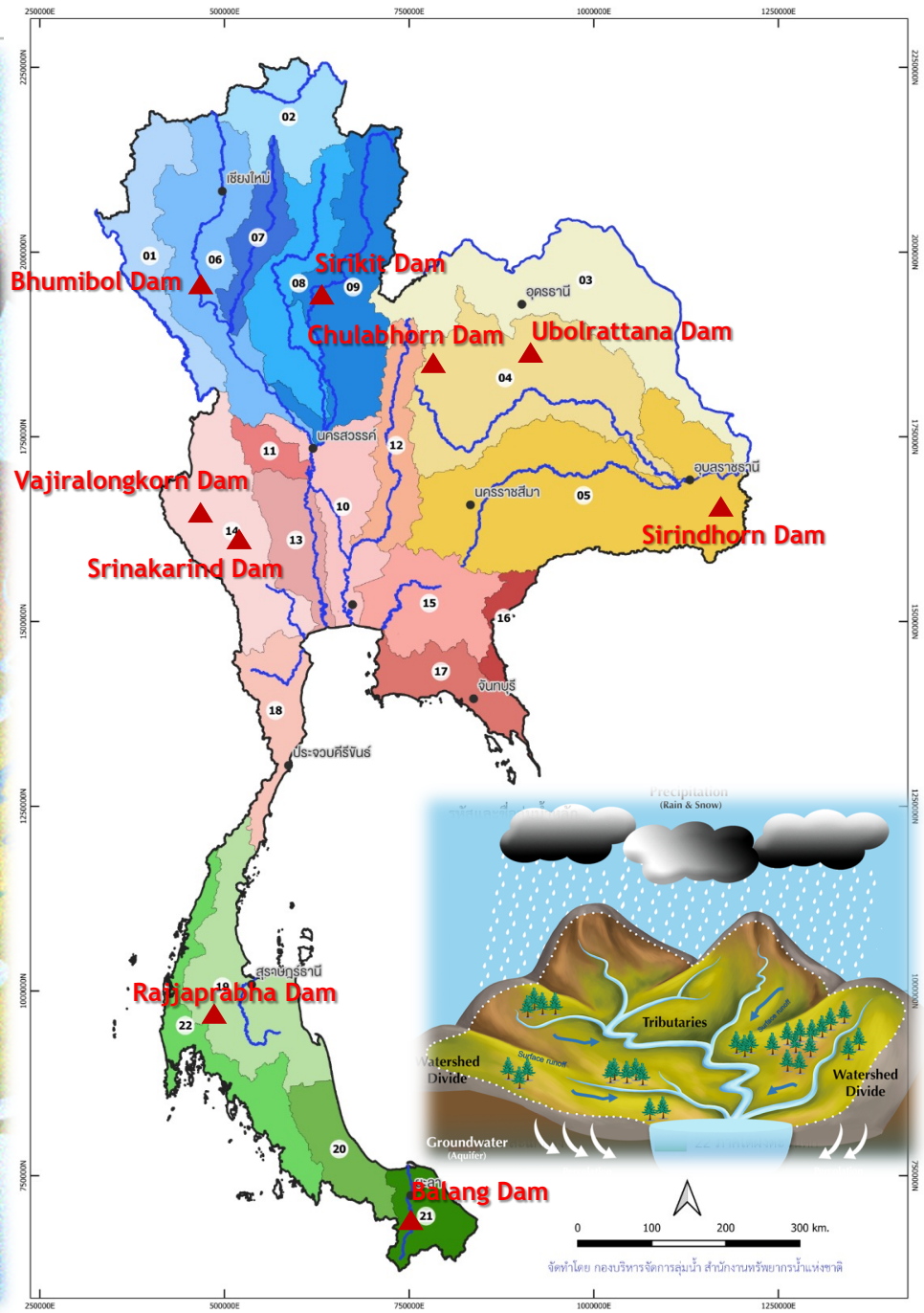
•Cold or northeast monsoon, active from October till February, brings cold and dry air from China over most of Thailand. In southern Thailand, the northeast monsoon brings mild weather and abundant rainfall on the eastern coast of that region. However most of Thailand experiences dry weather and mild temperatures during this season. An exception is the southern part of Thailand which receives abundant rainfall, particularly during October to November.

•Summer, or the pre–monsoon season, runs from mid-February until mid-May and brings warmer weather.

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EGAT





River Basin in Thailand (22 Basins)

The Northern (6)

Ping Wang Yom Nan Salawin

The Central (9)

Pasak Thachin Bangpakong ChaoPraYa Maeklong

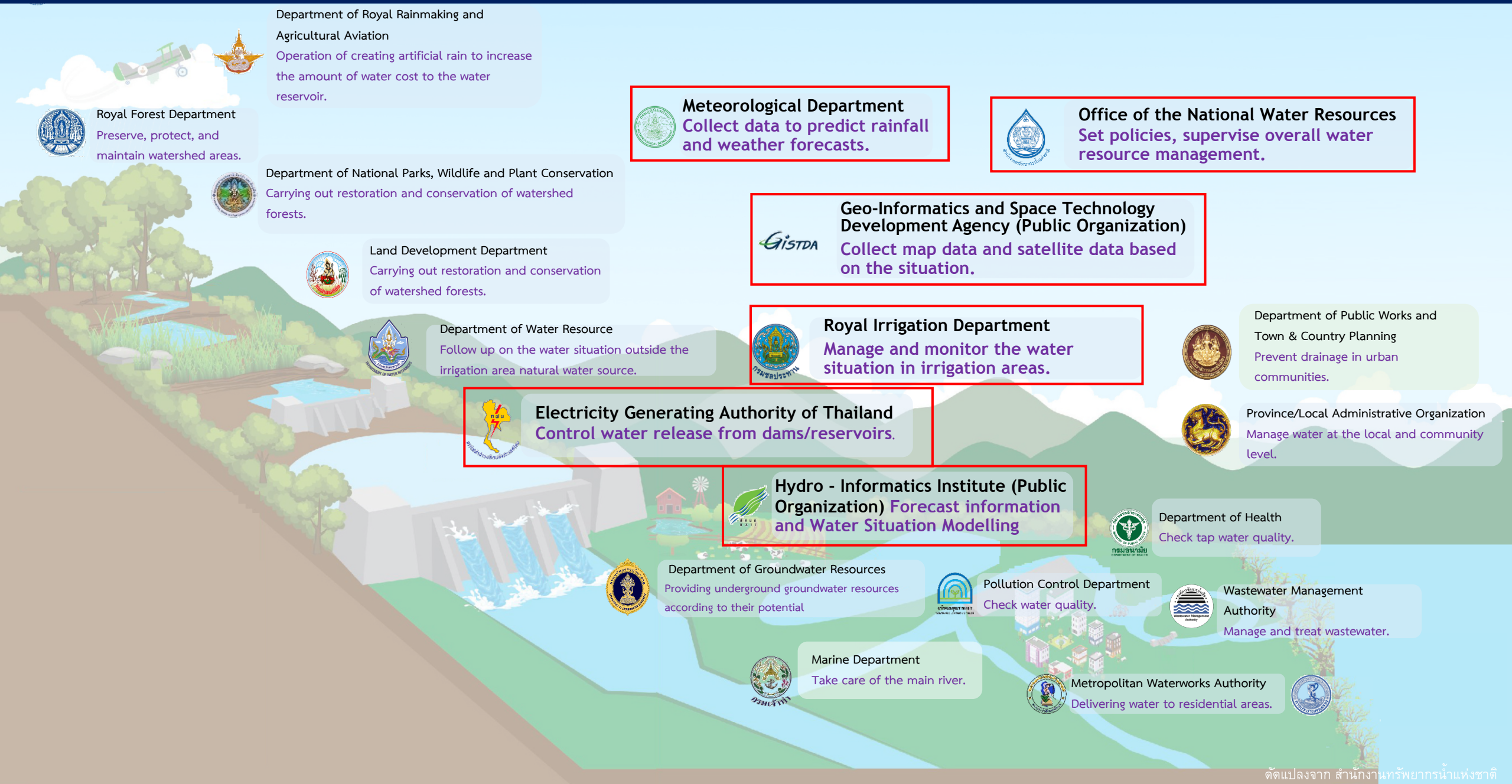
The North Eastern (3)

Khong Chi Mun

The Southern (4)

East of Southern (upper), East of Southern (Lower) West of Southern

Integrated Water resource management with Relevant Agency



Department of Royal Rainmaking and Agricultural Aviation
Operation of creating artificial rain to increase the amount of water cost to the water reservoir.

Royal Forest Department
Preserve, protect, and maintain watershed areas.

Department of National Parks, Wildlife and Plant Conservation
Carrying out restoration and conservation of watershed forests.

Land Development Department
Carrying out restoration and conservation of watershed forests.

Department of Water Resource
Follow up on the water situation outside the irrigation area natural water source.

Meteorological Department
Collect data to predict rainfall and weather forecasts.

Office of the National Water Resources
Set policies, supervise overall water resource management.

Geo-Informatics and Space Technology Development Agency (Public Organization)
Collect map data and satellite data based on the situation.

Royal Irrigation Department
Manage and monitor the water situation in irrigation areas.

Department of Public Works and Town & Country Planning
Prevent drainage in urban communities.

Province/Local Administrative Organization
Manage water at the local and community level.

Electricity Generating Authority of Thailand
Control water release from dams/reservoirs.

Hydro - Informatics Institute (Public Organization) Forecast information and Water Situation Modelling

Department of Health
Check tap water quality.

Department of Groundwater Resources
Providing underground groundwater resources according to their potential

Pollution Control Department
Check water quality.

Wastewater Management Authority
Manage and treat wastewater.

Marine Department
Take care of the main river.

Metropolitan Waterworks Authority
Delivering water to residential areas.

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Purpose of Water Management in EGAT's Dam



The prioritization of water management

- Flood protection and relief
- Water consumption
- Ecological preservation
- Agricultural and fisheries support
- Industrial needs
- Other uses

EGAT releases water from the dam through generators to generate electricity for public consumption.



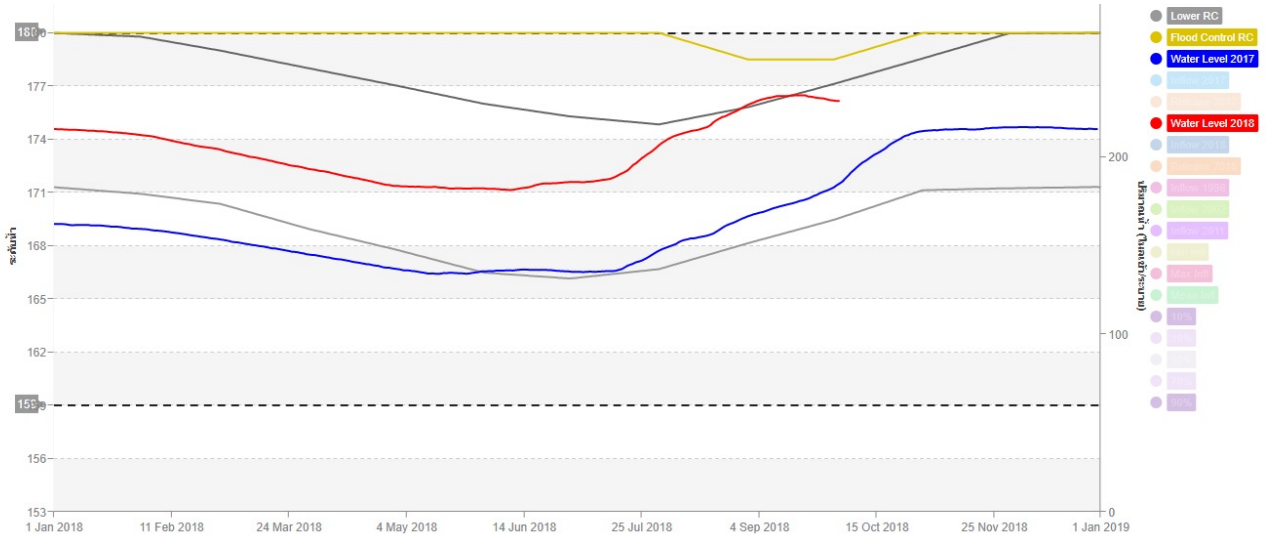






Reservoir Operation in EGAT's Dam

Operating Rule Curve



- **Lower Rule Curve** : the lower water level control threshold to mitigate the risk of future shortages
- **Upper Rule Curve** : the URC is used to indicate the upper water level utilized to mitigate the risk of insufficient reservoir capacity during floods, to avoid the need for large-scale drainage.
- **Flood Control Rule Curve** : reduces the risk of inadequate reservoir volume during significant floods. In the event of severe flooding, the spillway gate may need to be opened to discharge floodwater, preventing dam overtopping.

EGAT's water management

Restrictions of water management during flood situation

- The accuracy Annual inflow forecasts are impacted by weather uncertainties.
- Downstream river capacity is constrained.
- Releasing water through the spillway during downstream flooding may not be possible.
- In cases where reservoirs reach full capacity, local communities residing around the reservoir may be affected.

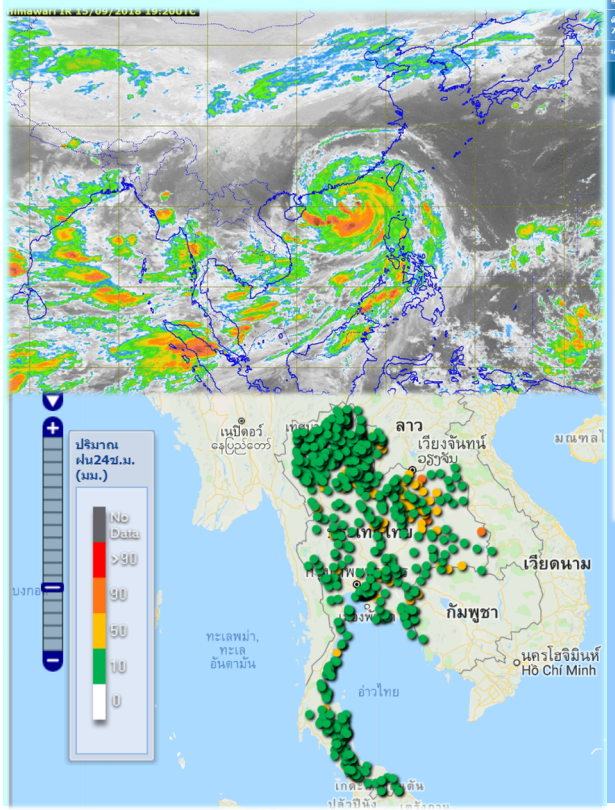




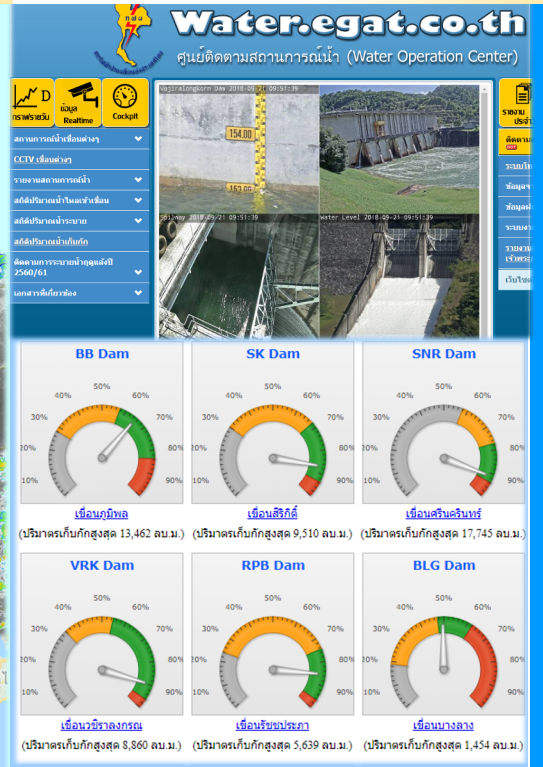
Water Management Tools

Upstream

Monitoring the weather for inflow forecasting



At The Dam

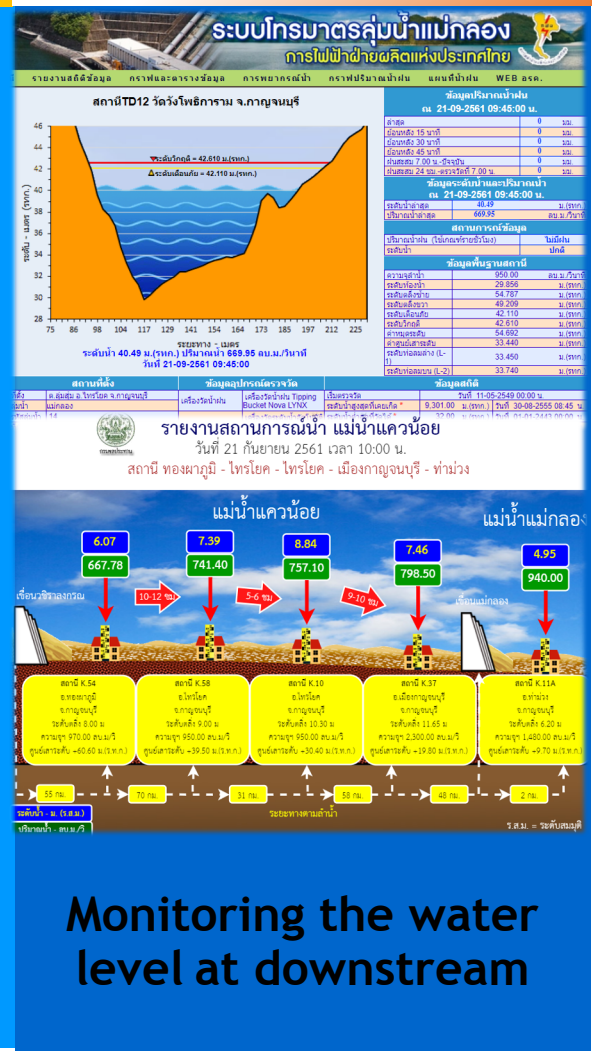


Monitoring and evaluation the water situation in reservoirs

Dam Safety Monitoring



Downstream



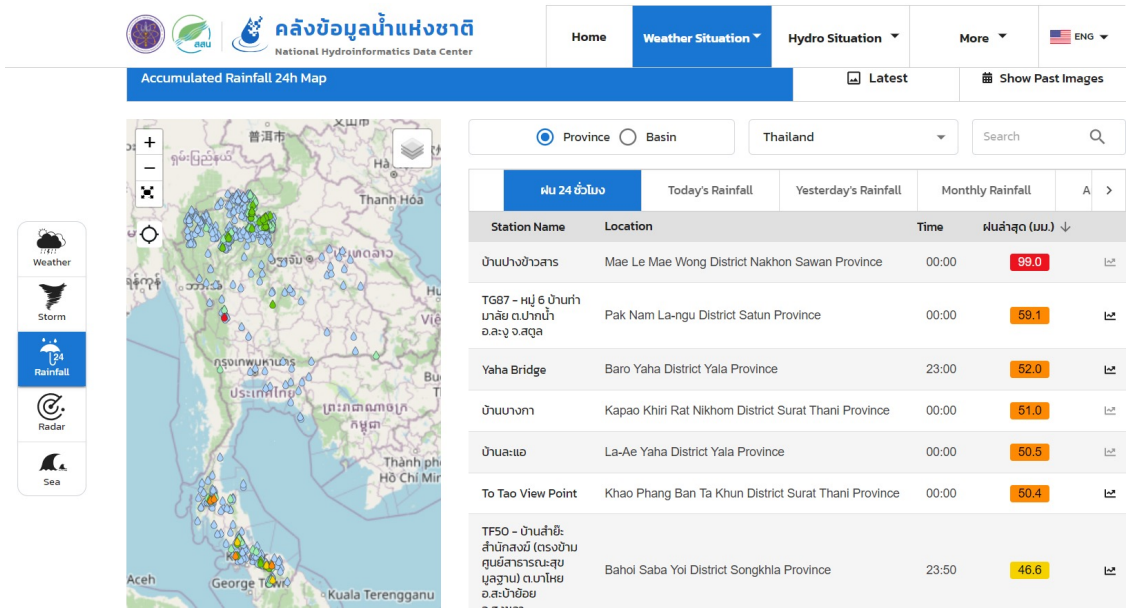
Monitoring the water level at downstream

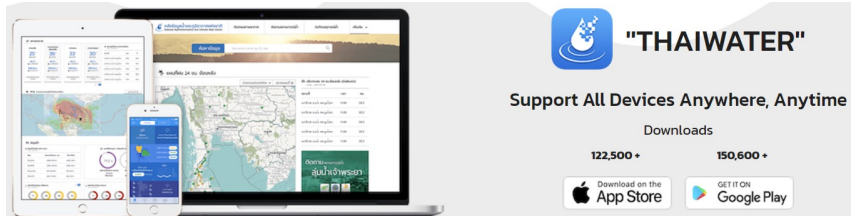
Water Management Tools

Upstream

National Hydroinformatics Data Center

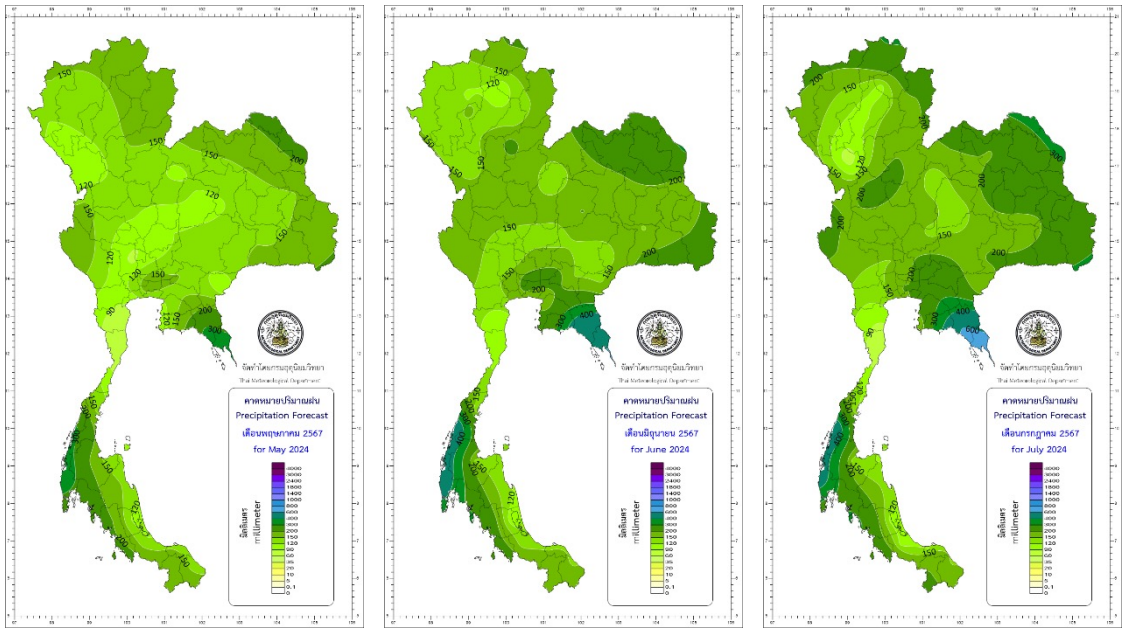
https://www.thaiwater.net





Precipitation Forecast

https://www.tmd.go.th

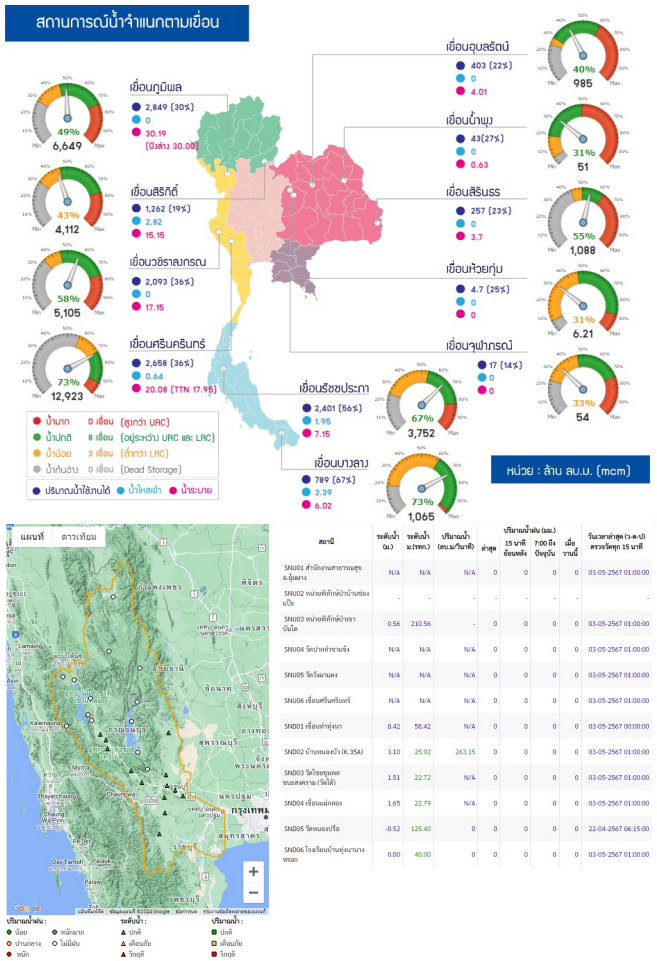


These platforms provide information on 24-hour rainfall, weather forecasts, and storms, allowing for continuous monitoring.

At the dam

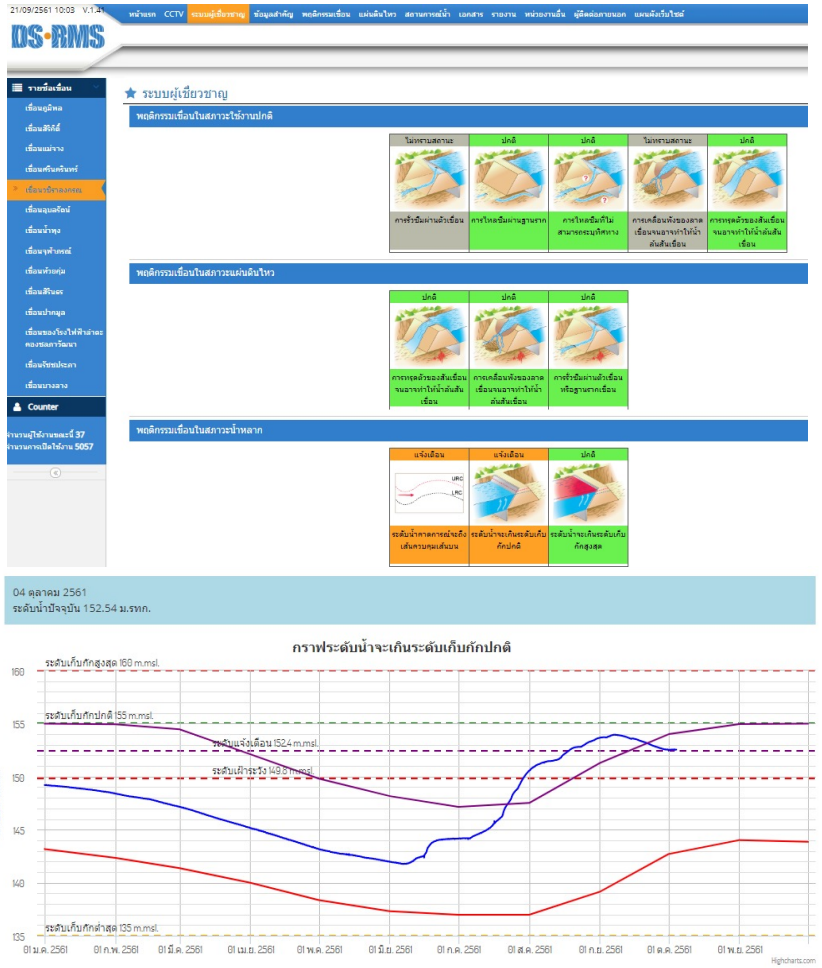
EGAT Water Intelligent Center

https://water.egat.co.th



EGAT Water Intelligent Center, developed by EGAT, serves as a comprehensive tool for monitoring and assessing reservoir water conditions. It comprises upstream rain gauge stations and downstream water level measurement stations, along with rainfall-runoff forecasting capabilities.

Dam Safety Remote Monitoring System

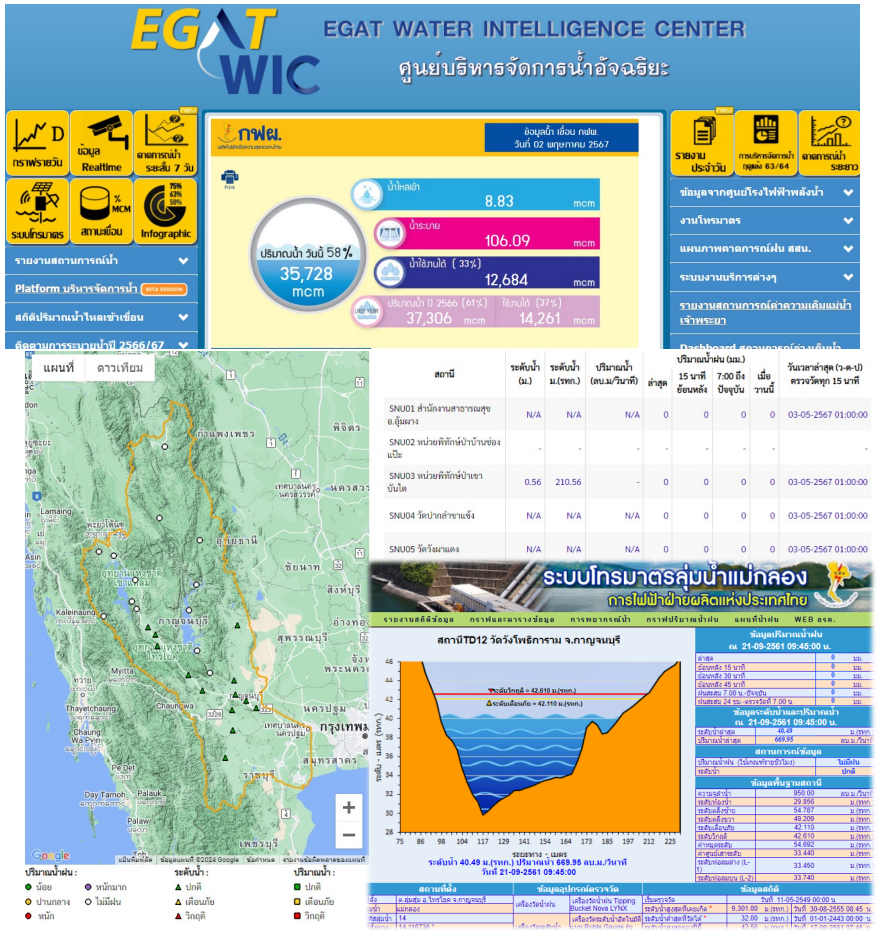


The Dam Safety Remote Monitoring System, a collaboration between NECTEC and EGAT, is designed for monitoring dam safety. This system enables real-time of water levels, dam behavior, and seismic activity, ensuring comprehensive safety assessment.

Downstream

EGAT Water Intelligent Center

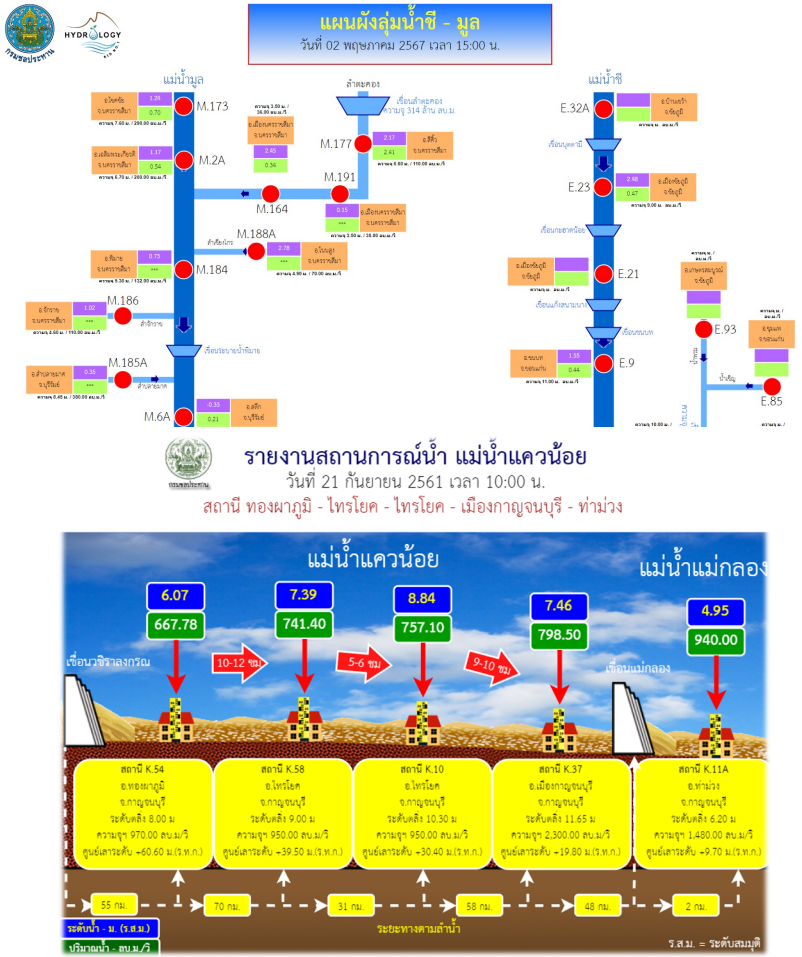
https://water.egat.co.th



The equipment to measure water levels in the downstream area. This device serves to alert downstream areas when water levels approach a critical threshold.

Royal Irrigation Depart

https://www.rid.go.th



the Royal Irrigation Department's website to evaluate the water situation. This information is presented diagram, depicting the direction of water flow both upstream and downstream. We can monitor the water situation in real-time.

Flood Situation in Thailand, 2025

STORM



Chao Phraya River Basin

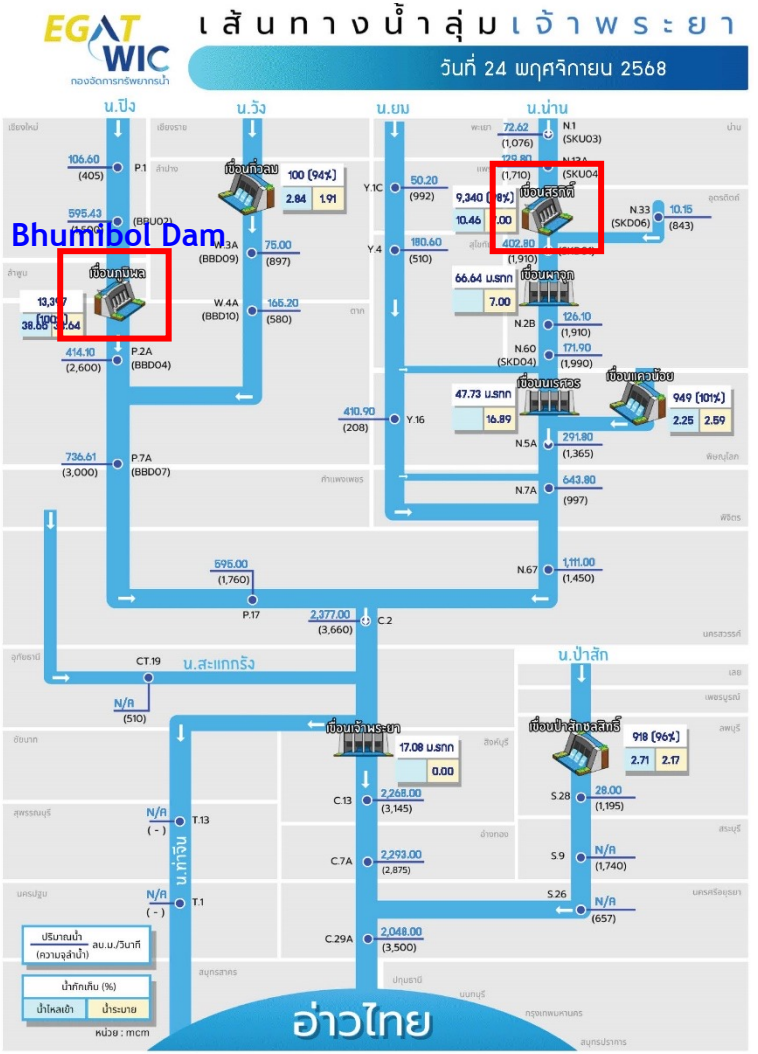


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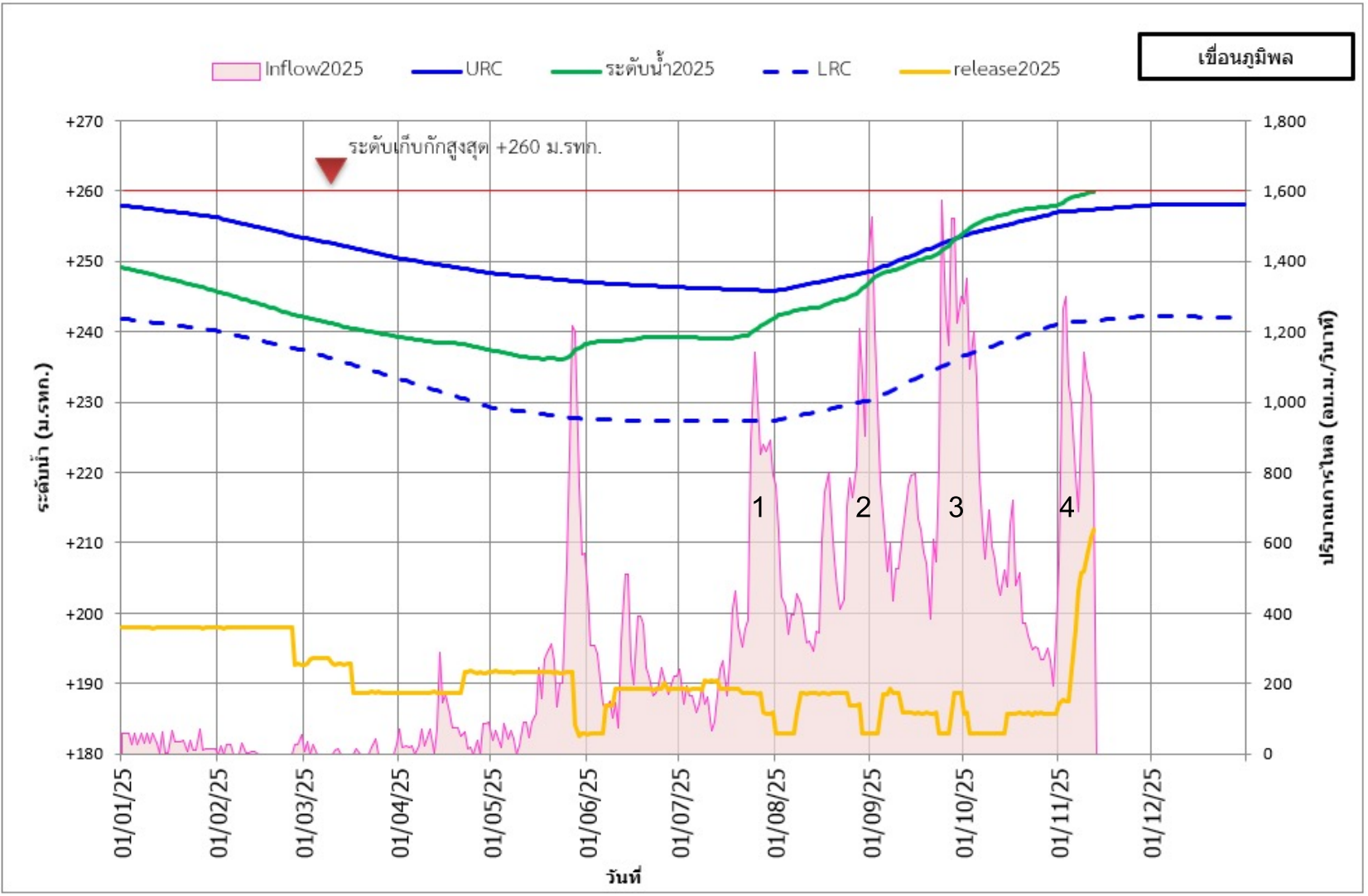
Bhumibol Dam

- Max.WL 260 m.Msl.
- Capacity 13,462 MCM

Water Charge



Inflow of Bhumibol Dam in 2025



No.	Storm	Inflow (MCM)
1	WIPHA	889
2	KAJIGI/NONGFHA	1,187
3	RAGASA/BUALOI	1,686
4	KALMAEGI	996

Inflow from 1 JUL - 13 NOV 2025

Total Inflow 7,439 MCM

Total Release 1,767 MCM

Bhumibol Dam, 2025

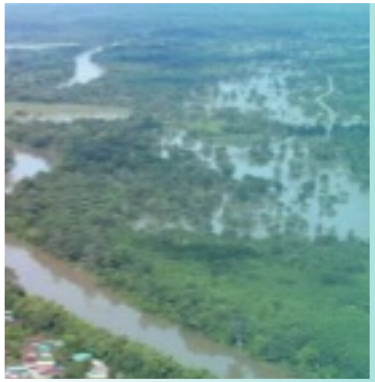






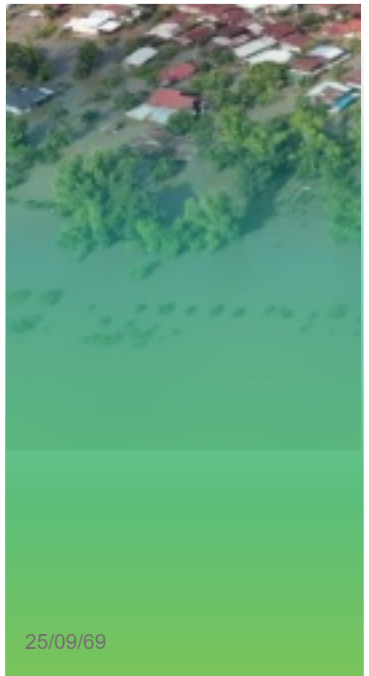
Why Do We Need to Create an EAP?

EMERGENCY ACTION PLAN



EAP is a formal document that outlines the actions to be taken in case of a dam emergency. Its main purpose is to prevent loss of life and minimize property damage.









Analyzing dam breaks and Creating an EAP are the importance

Risk Identification: Dam break analysis helps identify potential risks and vulnerabilities, allowing for proactive measures to prevent disasters.

Preparedness: An EAP ensures that there are clear procedures in place for immediate response, which can save lives and reduce damage.

Regulatory Compliance: Many regions require dam operators to have an EAP to comply with safety regulations.

Public Confidence: Effective planning and preparedness help maintain public confidence in the safety of the infrastructure.





Cause & Consequence of Dam Break



A dam break refers to the failure of a dam, resulting in the uncontrolled release of the water stored behind it. This can cause significant downstream flooding and damage.

Cause of dam break

1. **Natural Causes:** Heavy rainfall, earthquakes, landslides
2. **Human-Induced Causes:** Poor construction, lack of maintenance, operational errors

Consequence of a dam break

1. **Environmentally,** it can disrupt ecosystems and contaminate water supplies.
2. **Economically,** it can cause extensive property damage and infrastructure loss.
3. **Socially,** it can lead to the loss of lives and displacement of communities.

Key Components of an EAP

Failure Mode

Non-Breach Case, Breach Case,

Emergency Classification

Inundation Map

Downstream Impact,

Evacuation Route, Loss of Life





Coordination

Notification Flowchart,

Responsibility, Notification Level

Evacuation

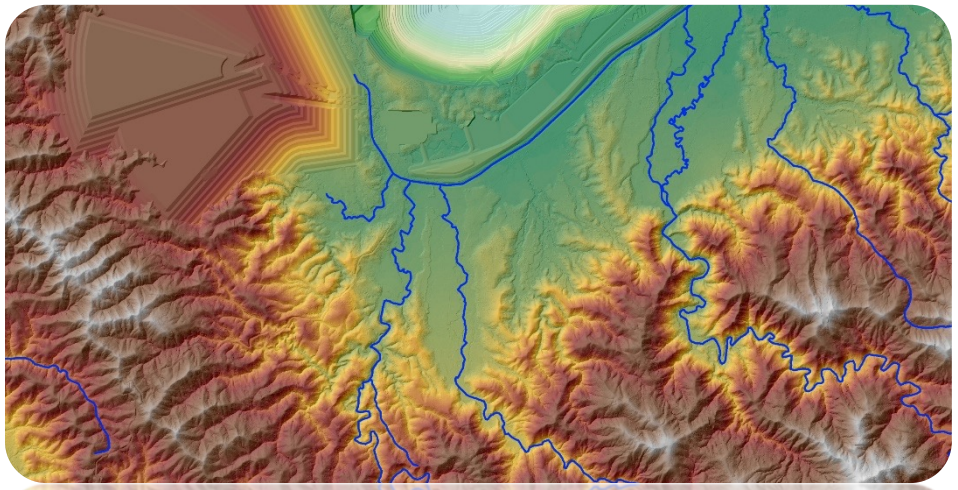
Warning System, Duration,

Evacuation Center

Maintaining and EAP

Exercising and Updating

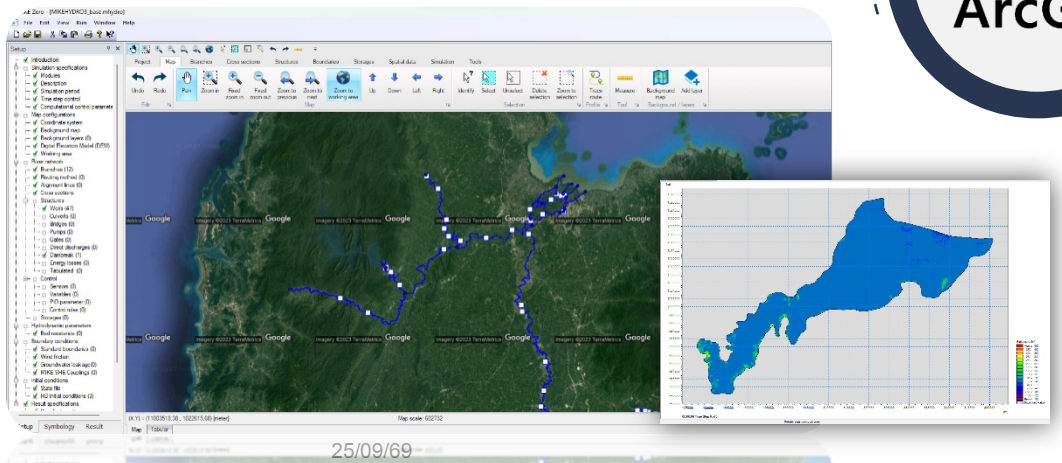
How to Do Dam Break Analysis?



ArcGIS

GIS and Mapping Software

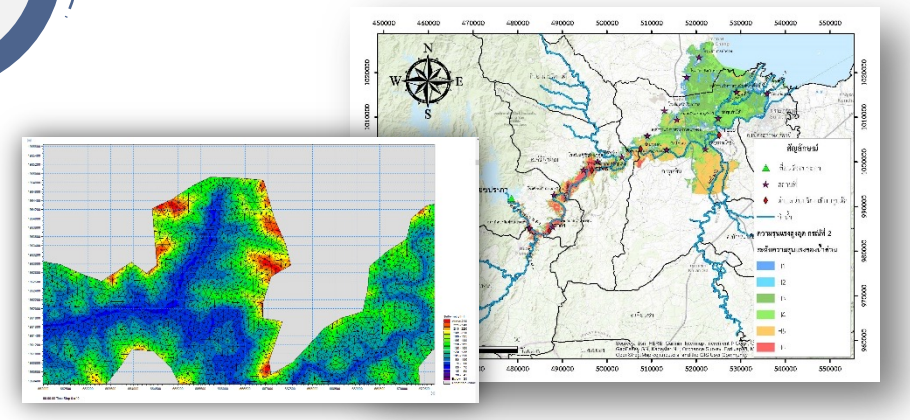
Inundation Map



Data Collecting

Mike by DHI

Hydrology Simulation Software
Dambreak Analysis



Inundation Map

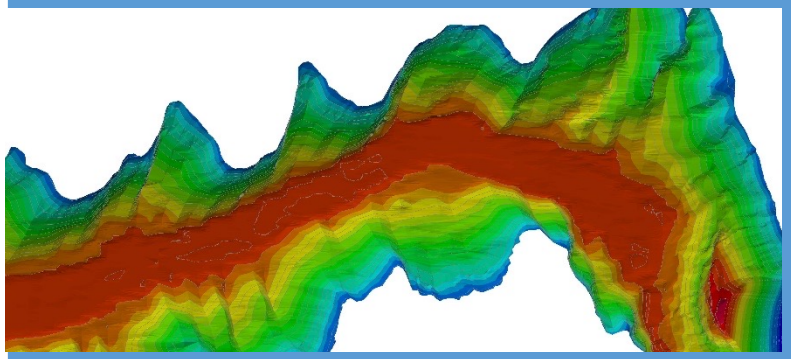
Water Depth, Time Travel, Duration, Evacuation Route and etc.

Surveying Data

Unmanned Survey Vessel (USV)

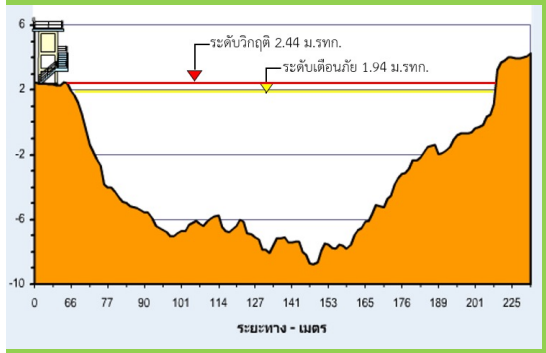
USV is a remotely operated boat equipped with survey equipment. It use echo sounders to provide detailed maps for bathymetric surveys and volumetric calculations





The bottom level of the reservoir

- Analyze the capacity of the reservoir.
- Prepare the contour of the reservoir bottom level.
- Assess the amount of sediment deposition in the reservoir.



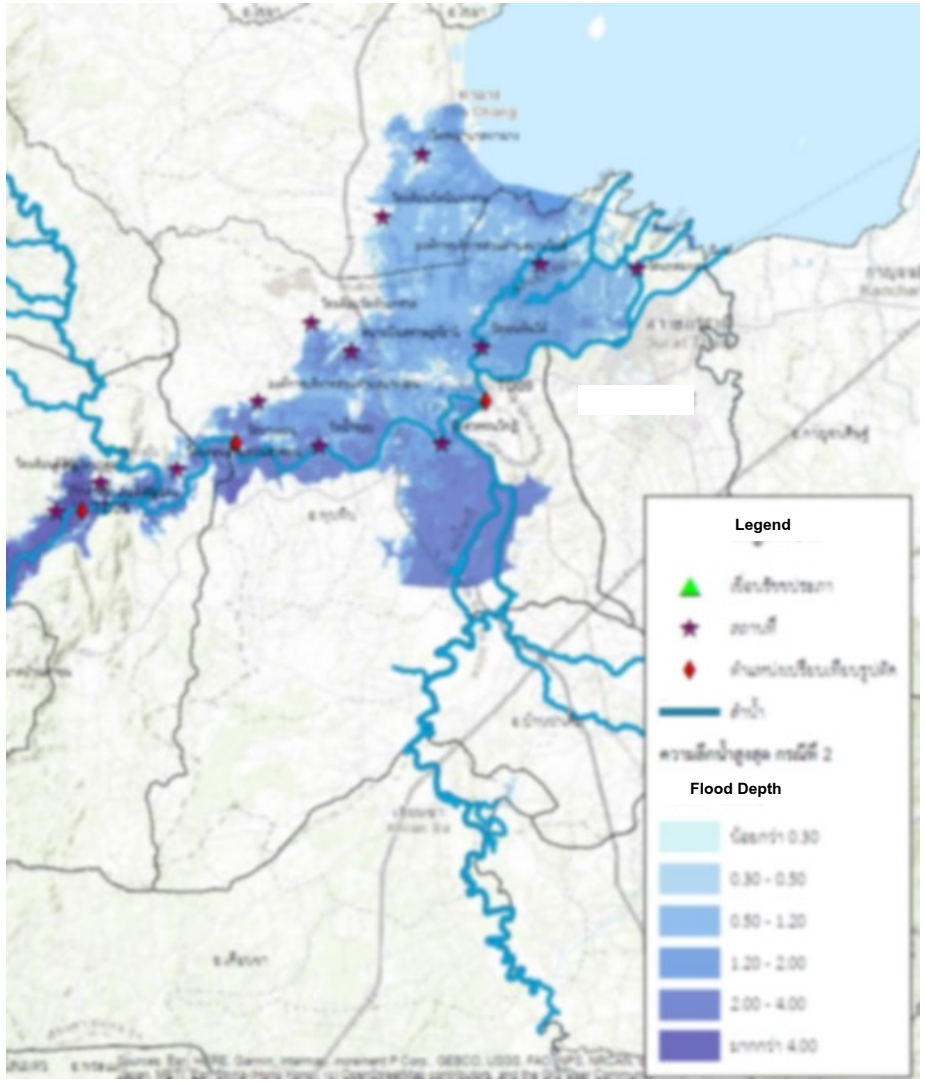
River Cross-Section

River sections are used to simulate flow and water level in the downstream.

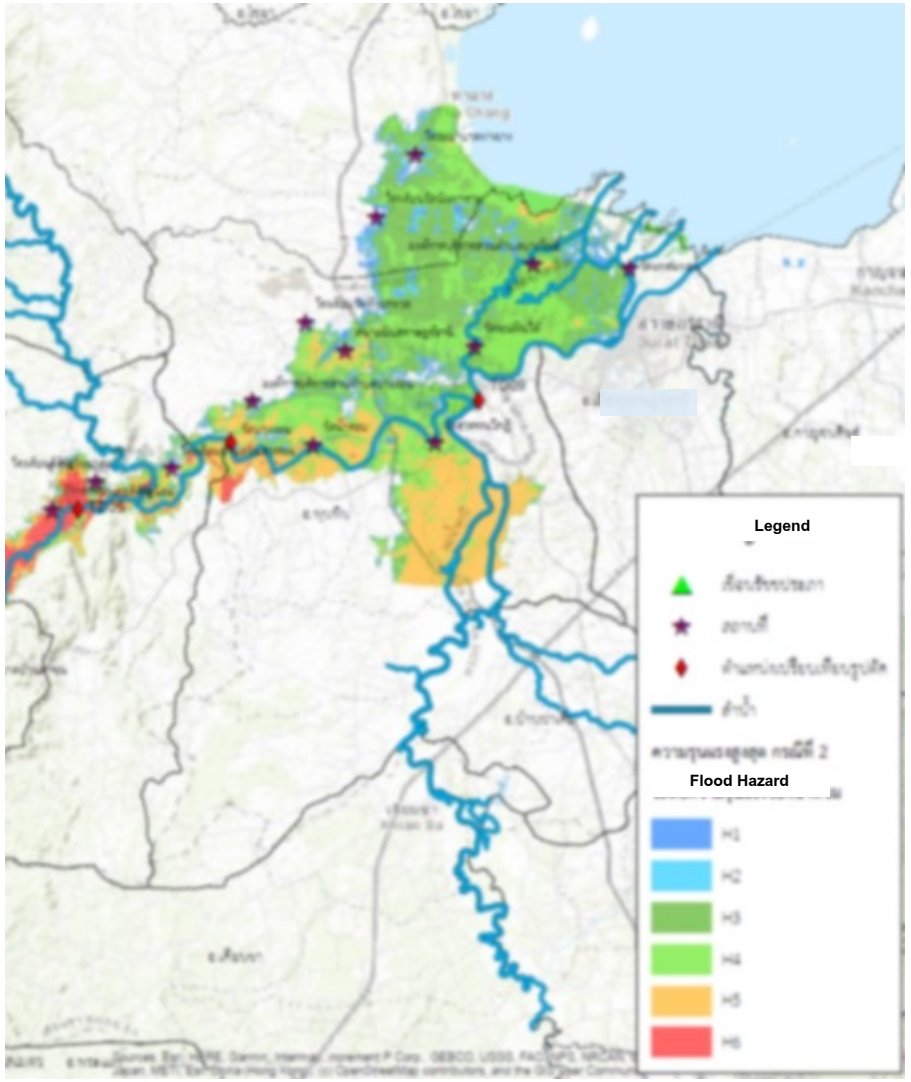
H Y D R O G R A P H I C S U R V E Y

Inundation Mapping

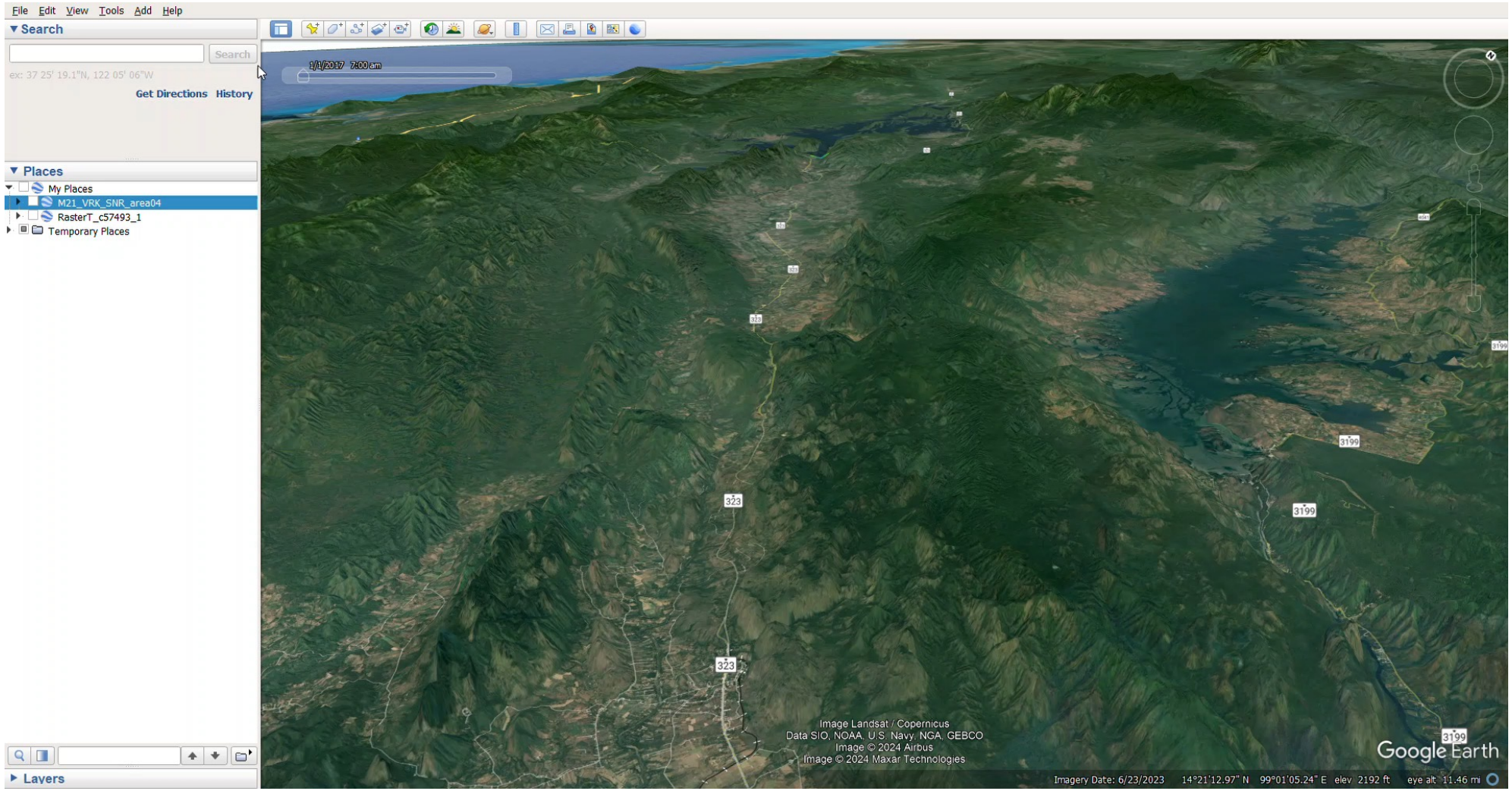
Flood Depth



Flood Hazard



Inundation Map with Google Earth



SUMMARY



- **Many lives could be saved with adequate disaster preparedness.**

Dam breaks can have severe and far-reaching impacts. However, an effective **Emergency Action Plan** is crucial for mitigating these impacts. Regular training and updates to the **EAP** ensure its effectiveness in an emergency.



EGAT