Multi-site Visualization System for Decision Support System

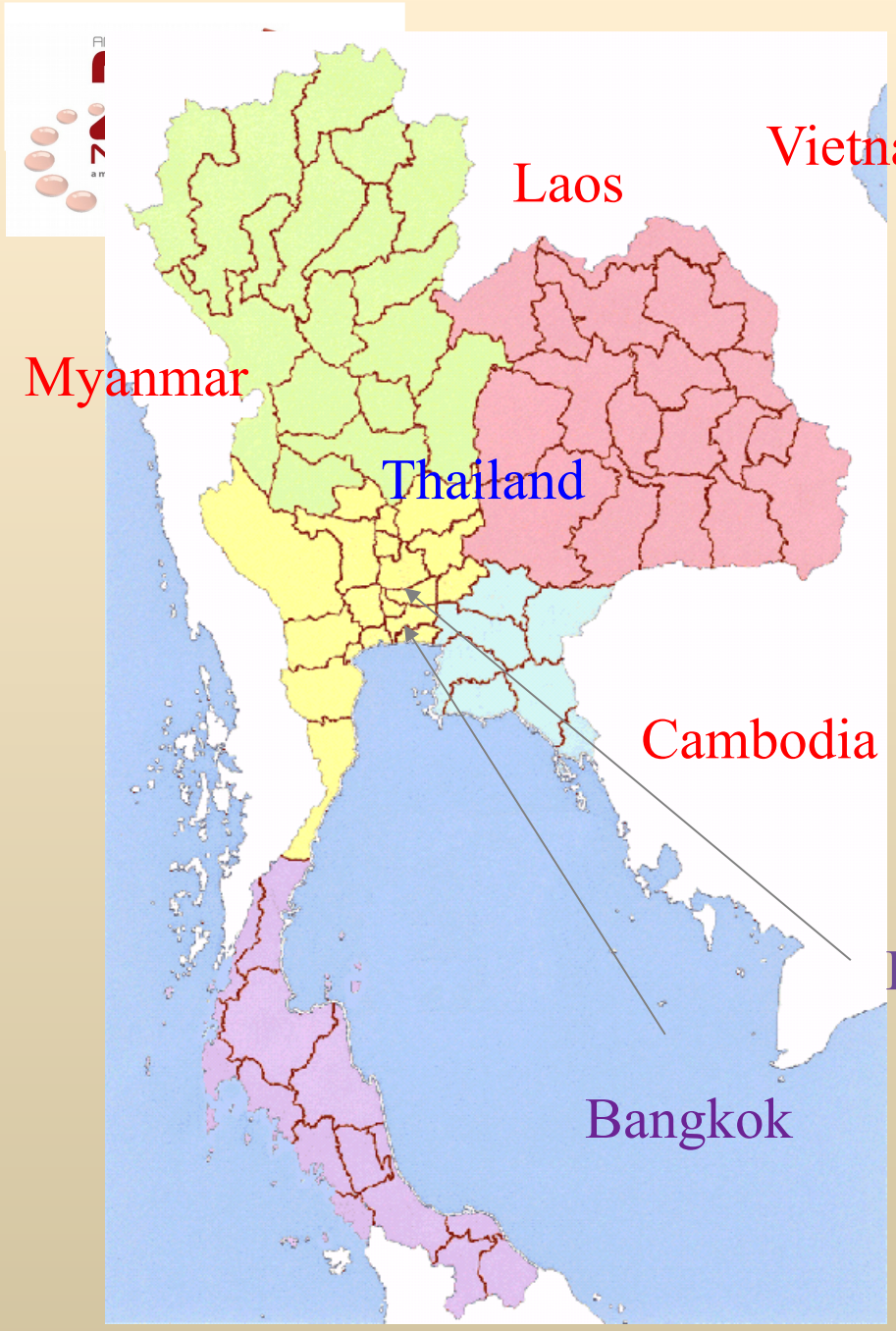
Kanokvate Tungpimolrut

Ministry of Science and Technology, Thailand

National Electronics and Computer Technology Center (NECTEC)

Outline

- Brief introduction of NECTEC
- ICT based real time Dam Safety monitoring system with EGAT
- Necessity of Decision Support System


Vietnam
Laos
Myanmar
Thailand
Cambodia
Pathumthani
Bangkok

NECTEC Vision and Mission

Vision

"Being a core organization collaborating with alliances in R&D of electronics and computer technologies for strengthening the sustainability of Thai industries and the sufficiency society."

Mission

- Research, development, design and engineering
- Technology transfer to industries and communities
- Human resource development
- Policy research, industrial intelligence and knowledge infrastructure

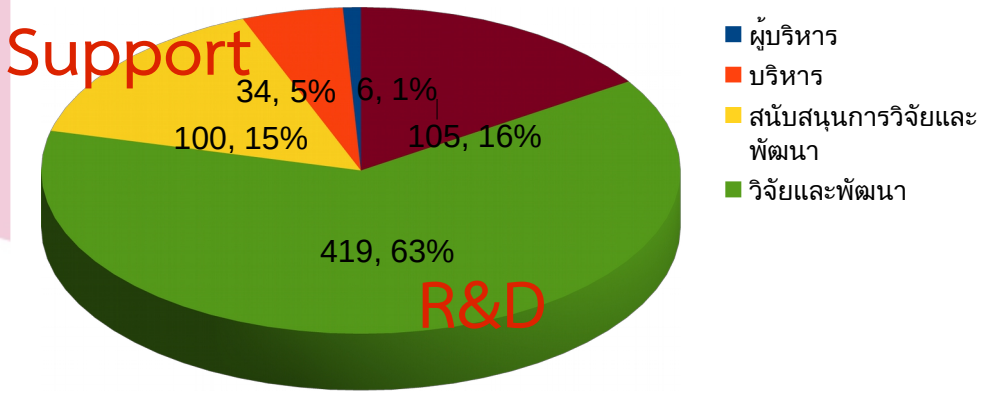
Number of staffs

-- March 2015 --

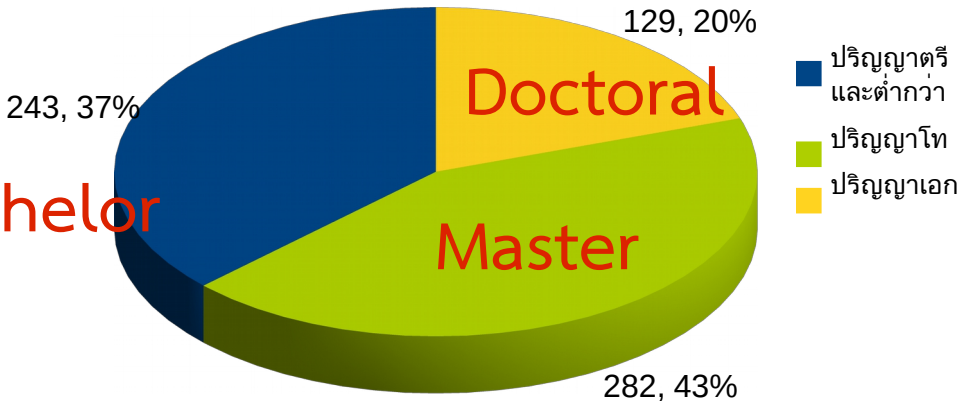
NECTEC
a member of NSTDA

Job function

Total 665 people



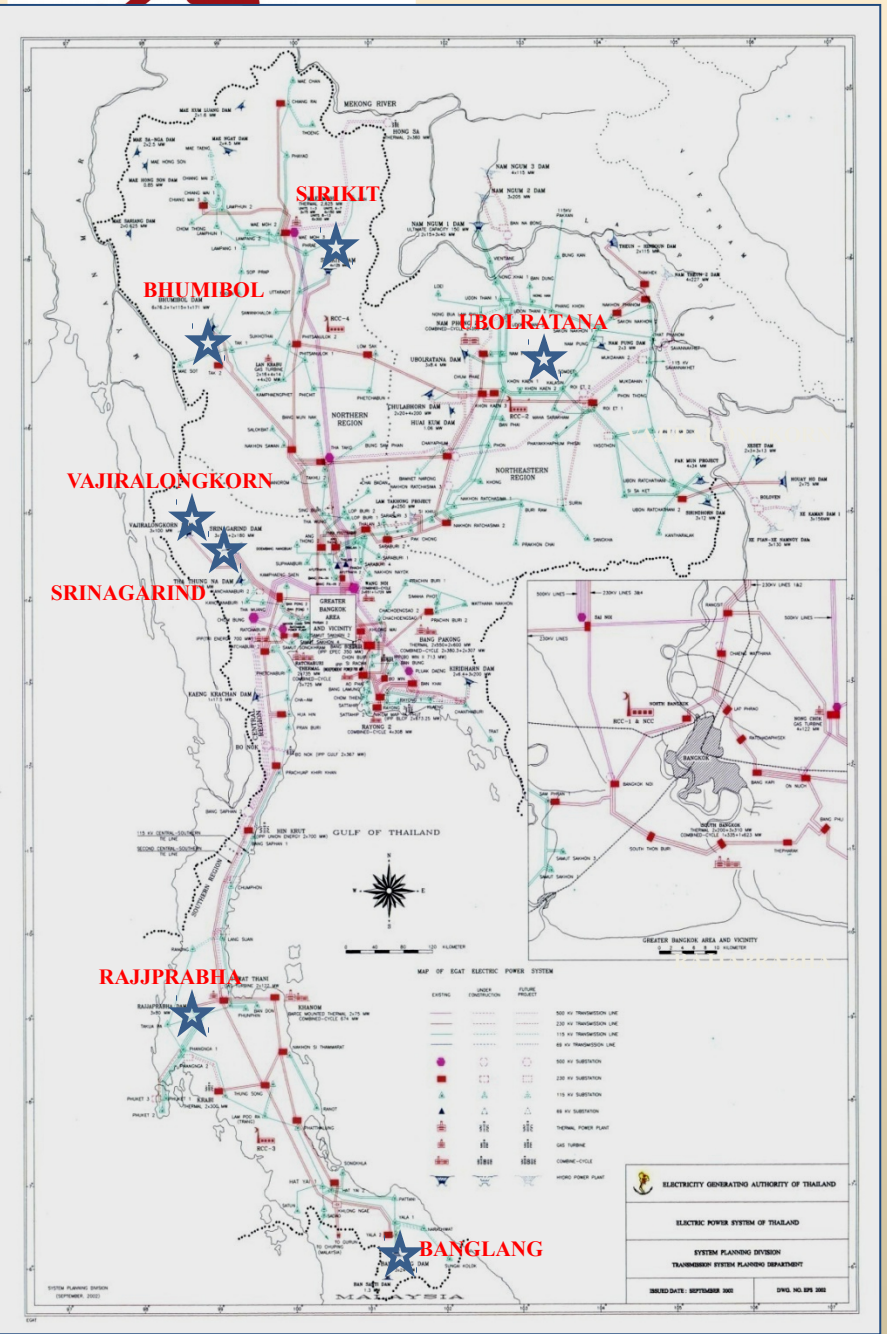
Graduation



NECTEC R&D Units

Institute of Technology for Persons with Disabilities and Elderlies	Intelligent Informatics Research Unit	Thai Microelectronics Center
Electronics and Computer Equipment Certification Section	Information Communication and Computing Research Unit	Innovation and Engineering Development Unit
Thai Organic and Printed Electronics Innovation Center	Biomedical Electronics and Systems Development Unit	Advanced Automation and Electronics Research Unit
	Wireless Information Security and Eco-Electronics Research Unit	Intelligent Devices and Systems Research Unit

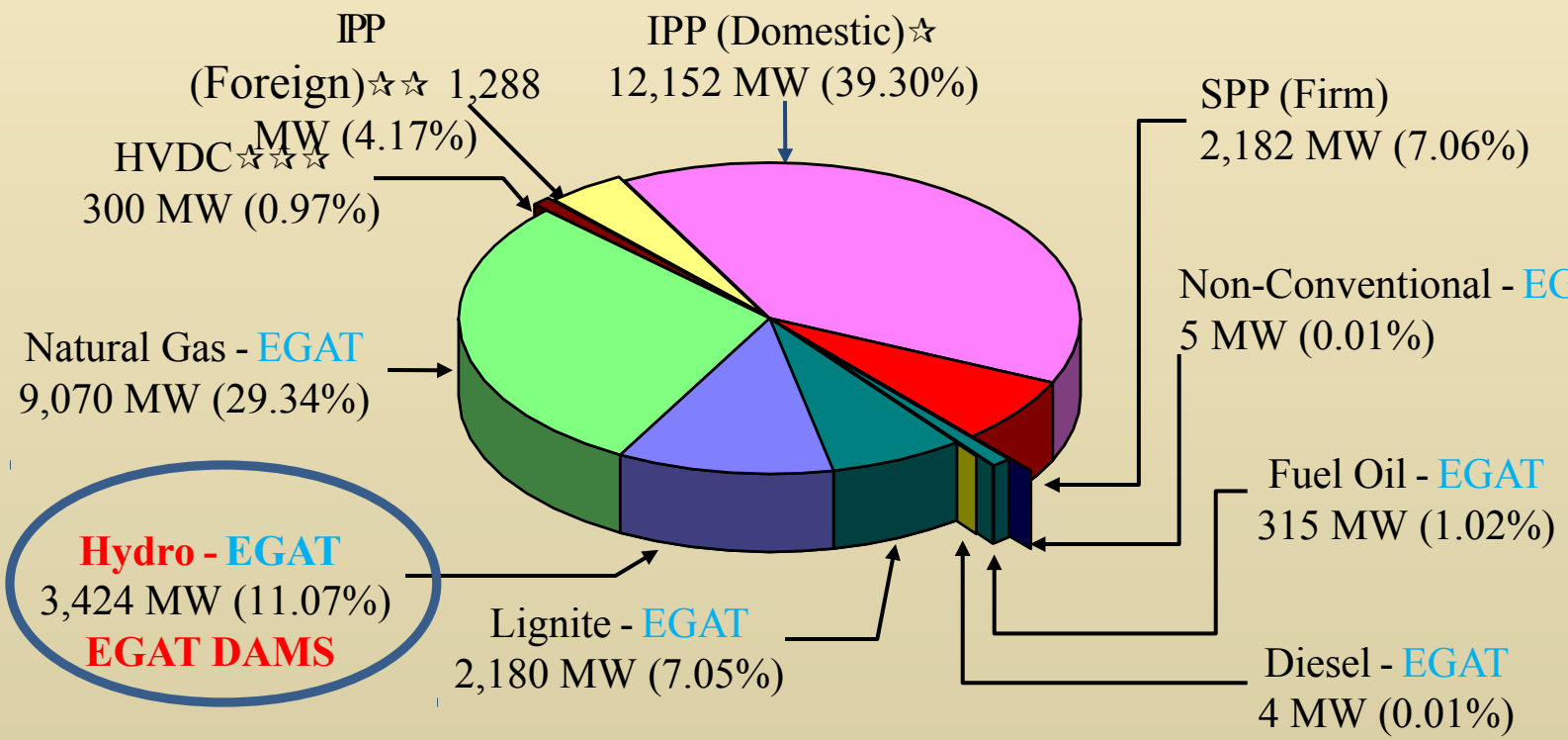
EGAT'S MAIN DAM



large	EGAT	Royal Irrigation Department (RID)
North	3	3
Central region.	-	3
Northeastern.	7	8
East	-	5
West	2	-
South	2	2
Total	**14**	**21**
small & medium		
North	16	51
Central region.	-	9
Northeastern.	1	222
East	-	47
West	2	7 -
South	1	31
Total	**20**	**367**
Total	**34**	**388**

Electricity Generating Authority of Thailand (EGAT)

Contracted Capacity Type of Fuel
Year 2010



Capacity of EGAT = 14,998 MW or 48.50%

Capacity of Independent = 15,922 MW or 51.50%

Total Capacity = 30,920 MW

☆ REGCO, KEGCO, RGCO, IPT, TECO, GLW, EPEC, BLCP, GPG And RPCL

☆☆ THPL, HHPC, NTN-2, and NNG-2

☆☆☆ HVDC (High Voltage Direct Current Transmission) - Thailand - Malaysia

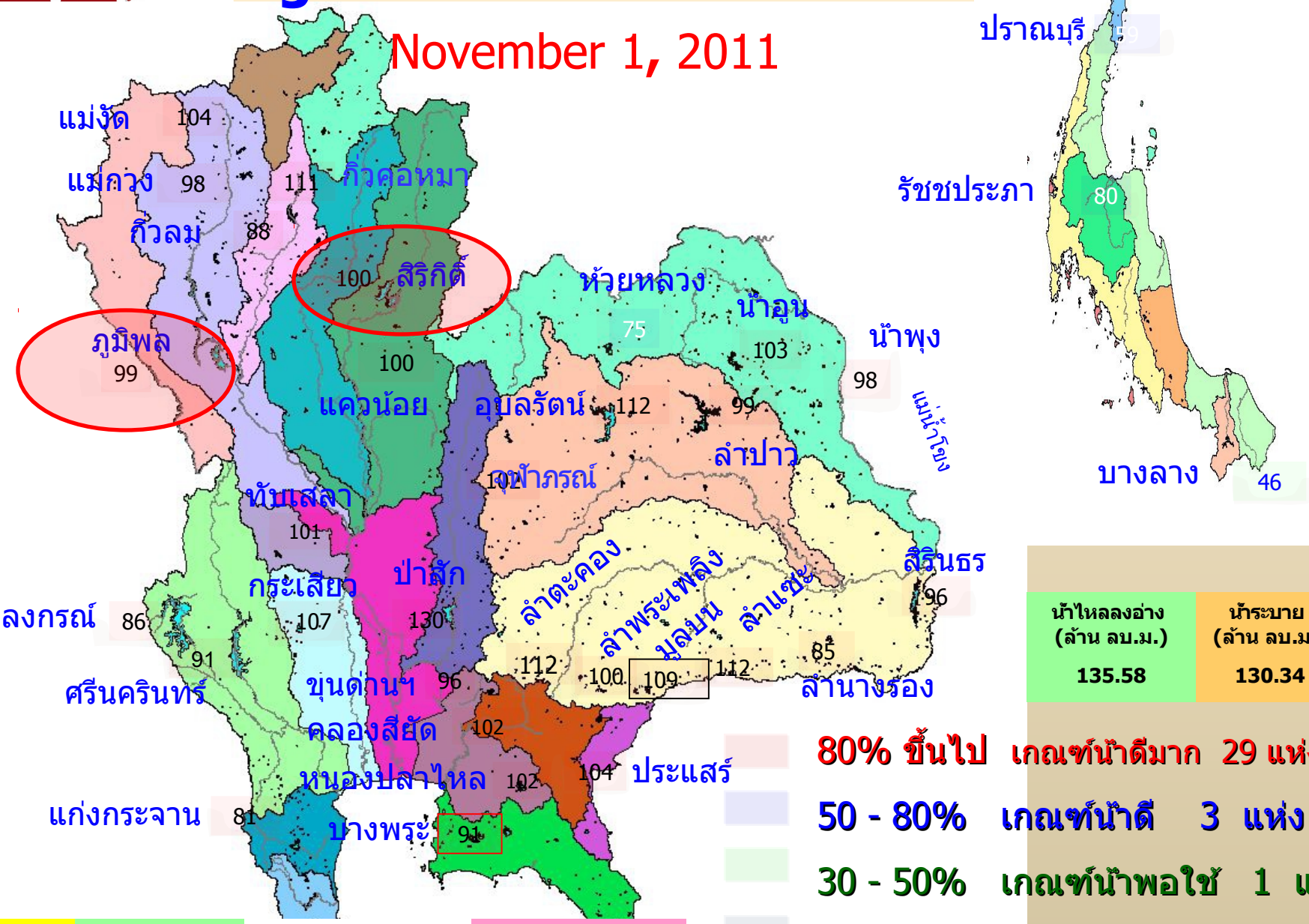
Is this a lake?

Thailand's Worst Disaster in 70 Years…(2011)

Is it a canal?

33 Large Dams and Reservoirs

November 1, 2011



น้ำไหลลงอ่าง (ล้าน ลบ.ม.)	น้ำระบาย (ล้าน ลบ.ม.)
135.58	130.34

80% ขึ้นไป เกณฑ์น้ำดีมาก 29 แห่ง

50 - 80% เกณฑ์น้ำดี 3 แห่ง

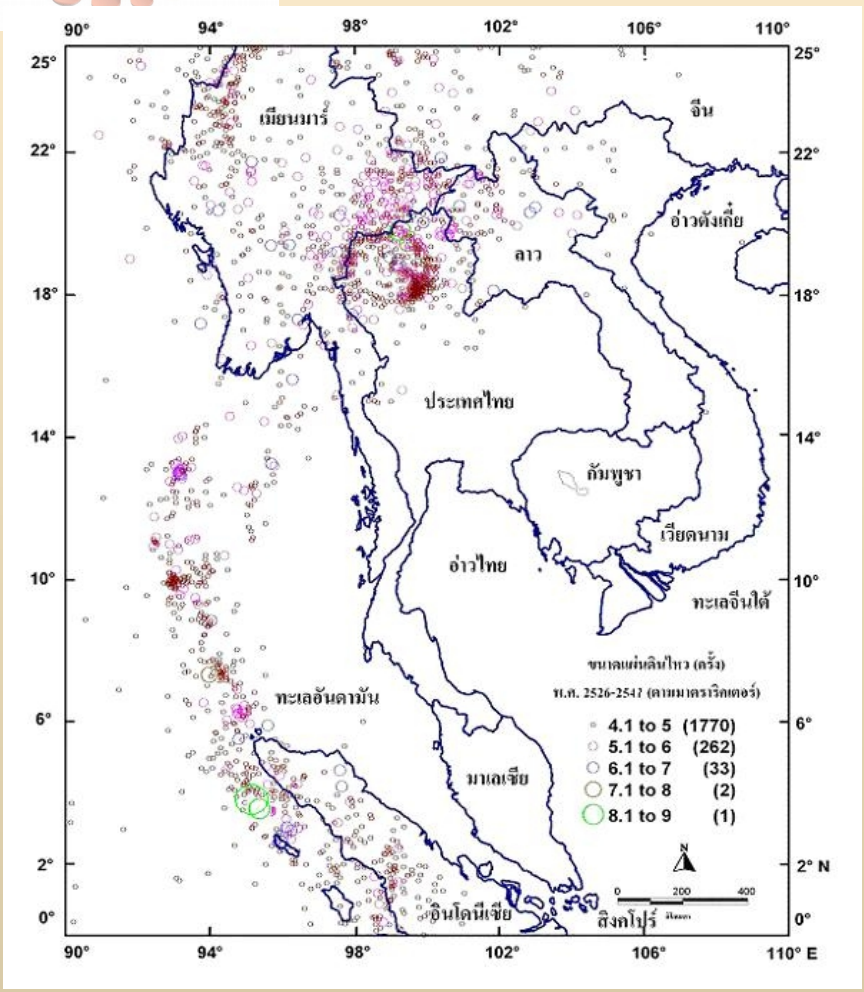
30 - 50% เกณฑ์น้ำพอใช้ 1 แห่ง

≤ 30% เกณฑ์น้ำน้อย - แห่ง

จำนวนอ่าง	ความจุที่ รนก. (ล้าน ลบ.ม.)	ปริมาตรน้ำ (ล้าน ลบ.ม.)	%	น้ำใช้การ (ล้าน ลบ.ม.)	%
33	70,157	65,609	94	41,970	60

หมายเหตุ: เขื่อนแควน้อยเริ่มเก็บกักน้ำปลายฤดูฝนปี 52

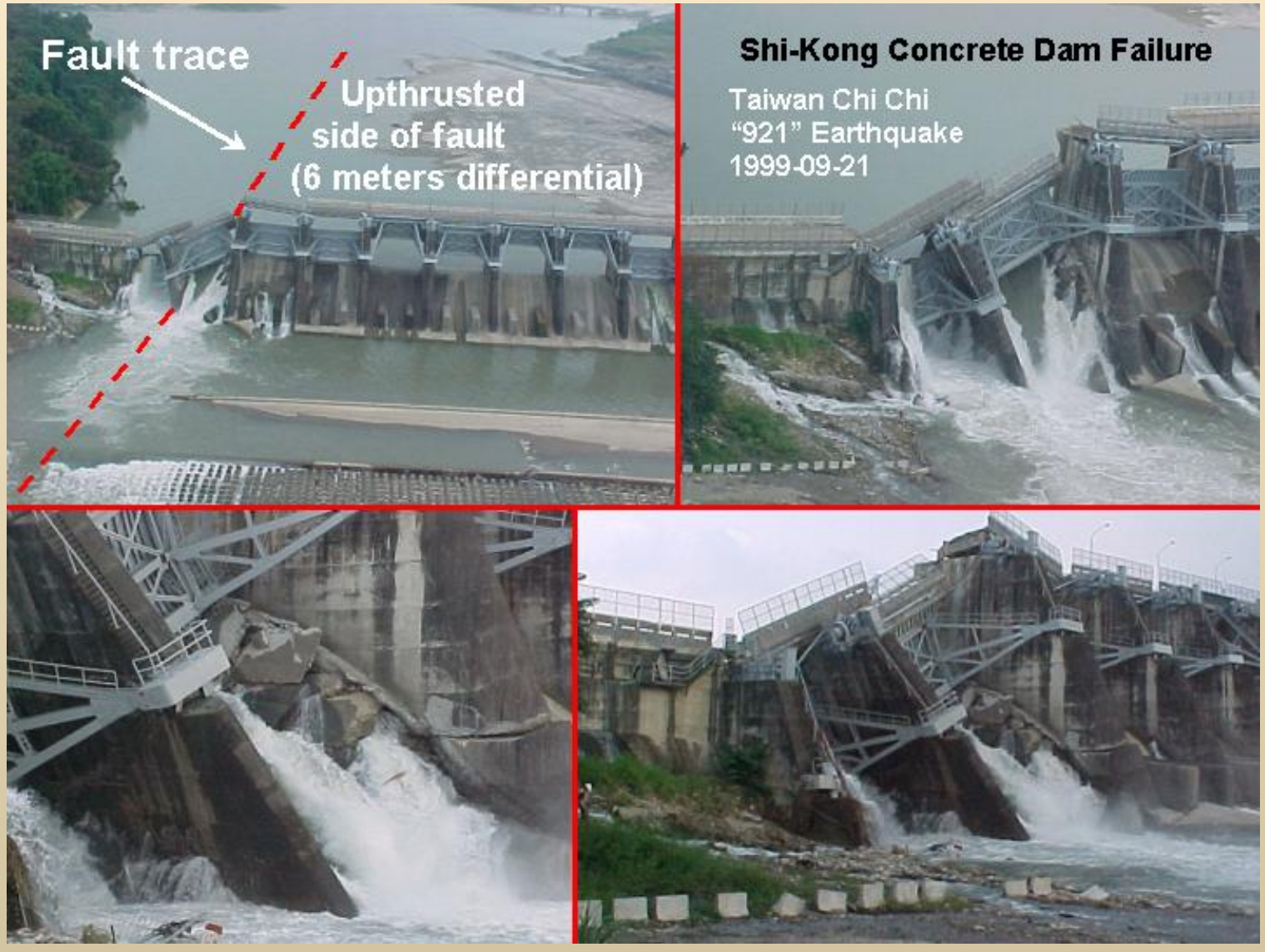
Past earthquake locations in South East Asia



- **Dam failure or levee breeches:**
  - * Hydrological and seismic hazards
  - * Old dams were built with old safety standard
  - * Dam failure is disastrous

- **High possibility of earthquake in this region:**

Chi-Kang Dam, Taiwan
Effect from Chi-Chi Earthquake (Sep 20, 1999)



EGAT DAM SAFETY

Object : to ensure that all EGAT Dam's structure do not create unacceptable risks to public safety and welfare, property, the environment and cultural resources.

Risk	Flood Earthquake Reservoir Operation (Missed Operation)
Dam Monitoring	Dam Behavior => Not Conform with Design Criteria Hydrology & Flood => Over than Design Seismic Force => Over than Design

Degree of Damage → Low → Medium → High

Impact (if Failure)

- Social → High (Low Water Level)
- Generation → High

DAM SAFETY REMOTE MONITORING SYSTEM

EGAT **MOU** NECTEC

EGAT'S DAM SAFETY REMOTE MONITORING SYSTEM

Bhumibol dam	Sirikit dam
Srinagarind dam	Vajiralongkorn dam
Rajjaprabha dam	Bang Lang dam
Ubolratana dam	Sirindhorn dam
Chulabhorn dam	Huai Kum dam
Pak Mun dam	Nam Pung dam
Mae Chang dam	Upper Pond lamtaklong

EGAT
- Civil Maintenance Engineering
- Electricity Maintenance Engineering
- Geology
- Hydrology

NECTEC
- Softwares
- Electronics
- Telecommunication

DAM SAFETY REMOTE MONITORING SYSTEM

Hydro-Meteorological Instruments

- Reservoir Water level
- Tailrace Water level
- Rain
- Evaporation
- Air Temperature
- Humidity

Dam Instruments

- Seepage
- Hydraulic piezometer
- Open standpipe piezometer
- Observation well
- Weir
- Settlement & Displacement

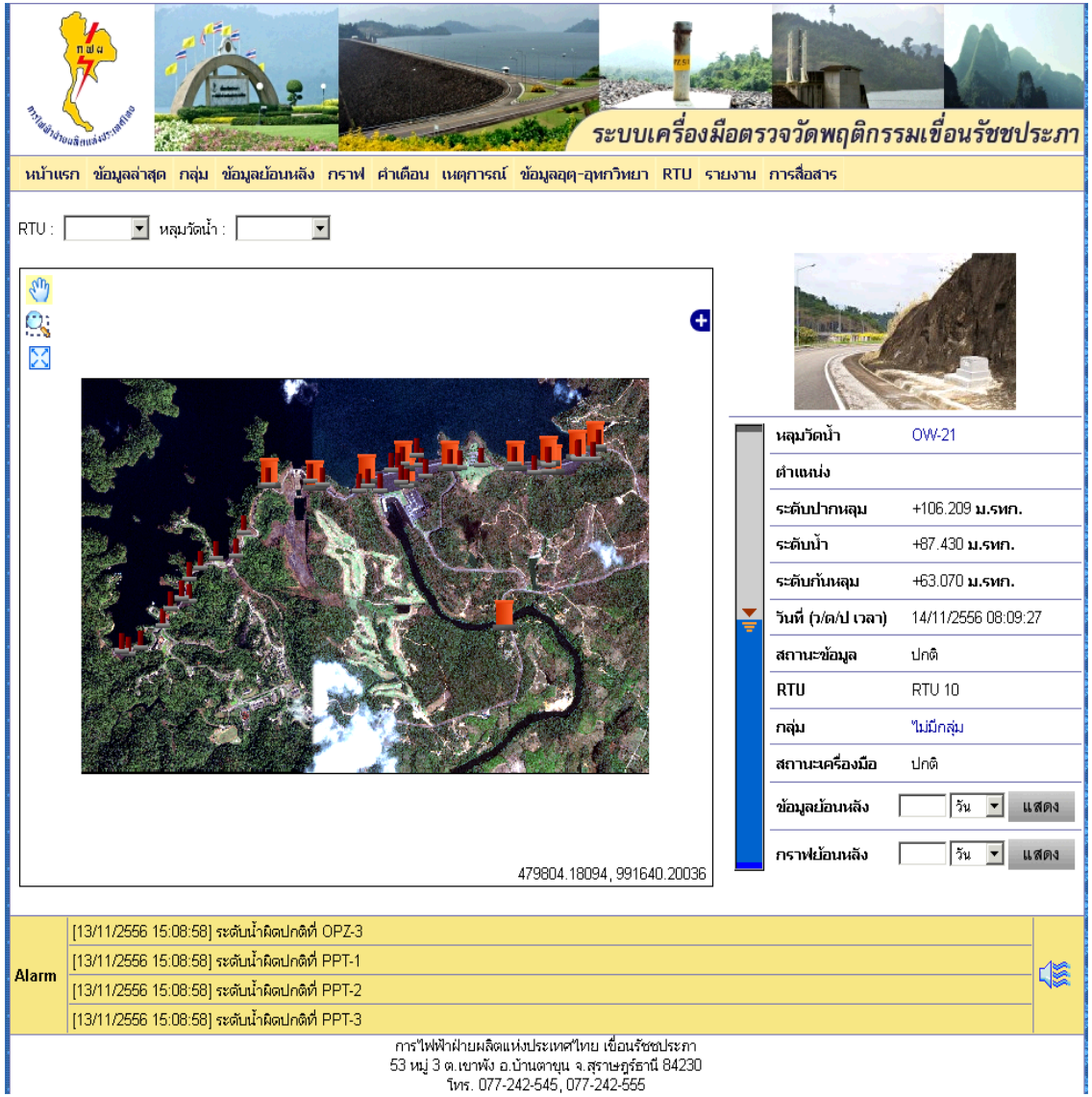
Seismological Instruments

- Seismometer
- Accelerometer

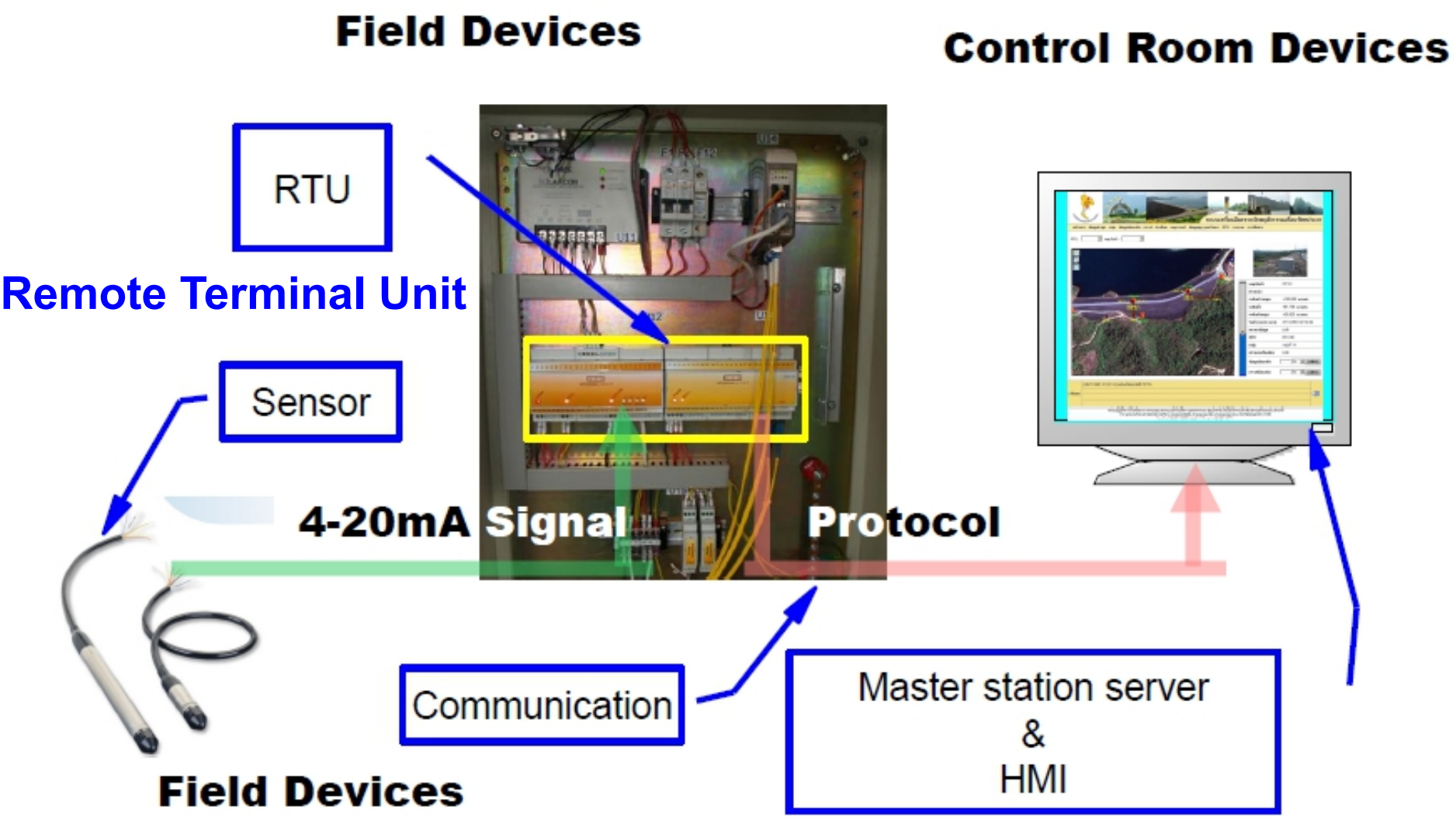
DAM SAFETY REMOTE MONITORING SYSTEM

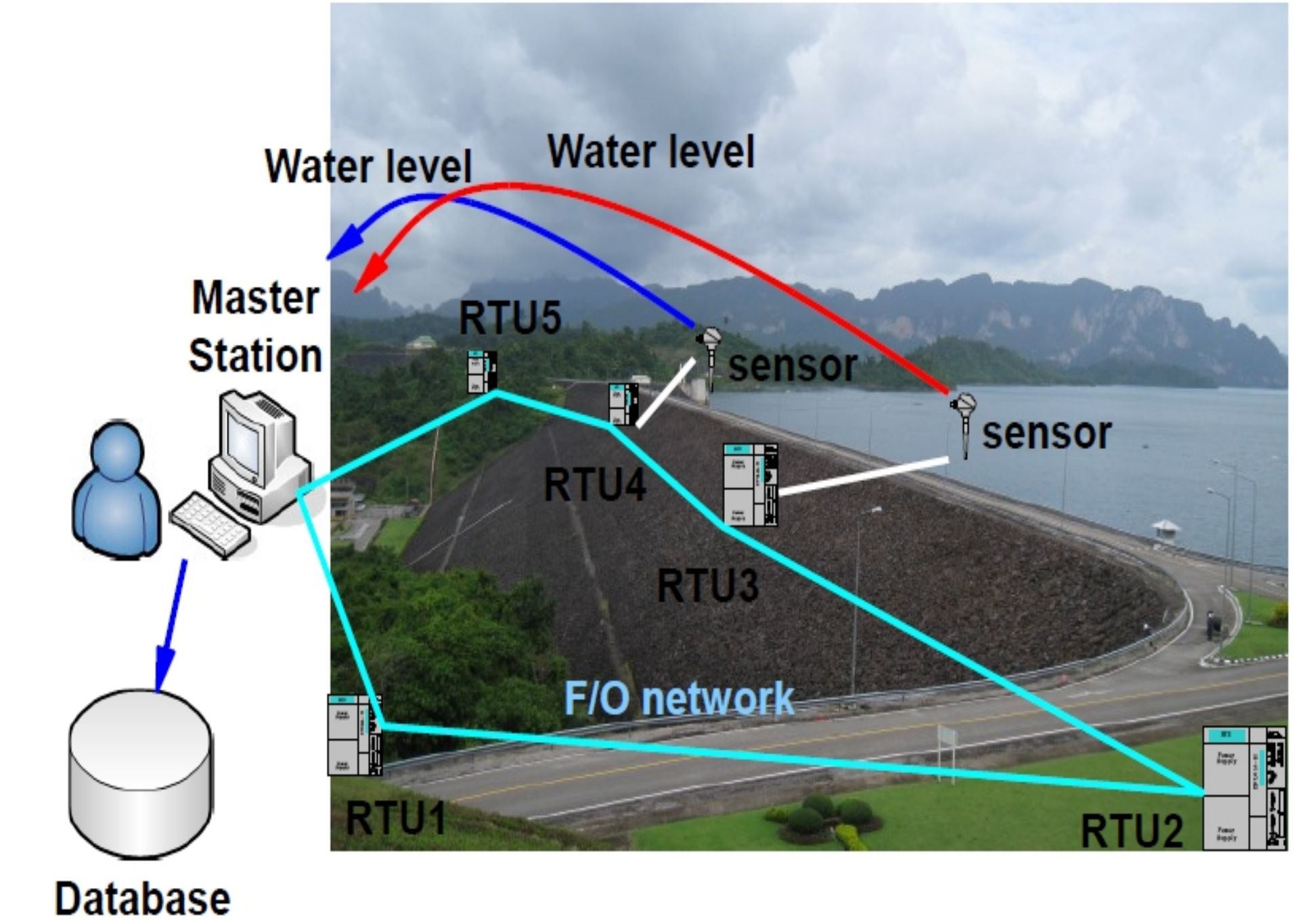
- DAM SAFETY ONLINE MONITOR
- EXPERT SYSTEM
- WAR ROOM

Automatic Dam Behavior Monitoring System, 2007

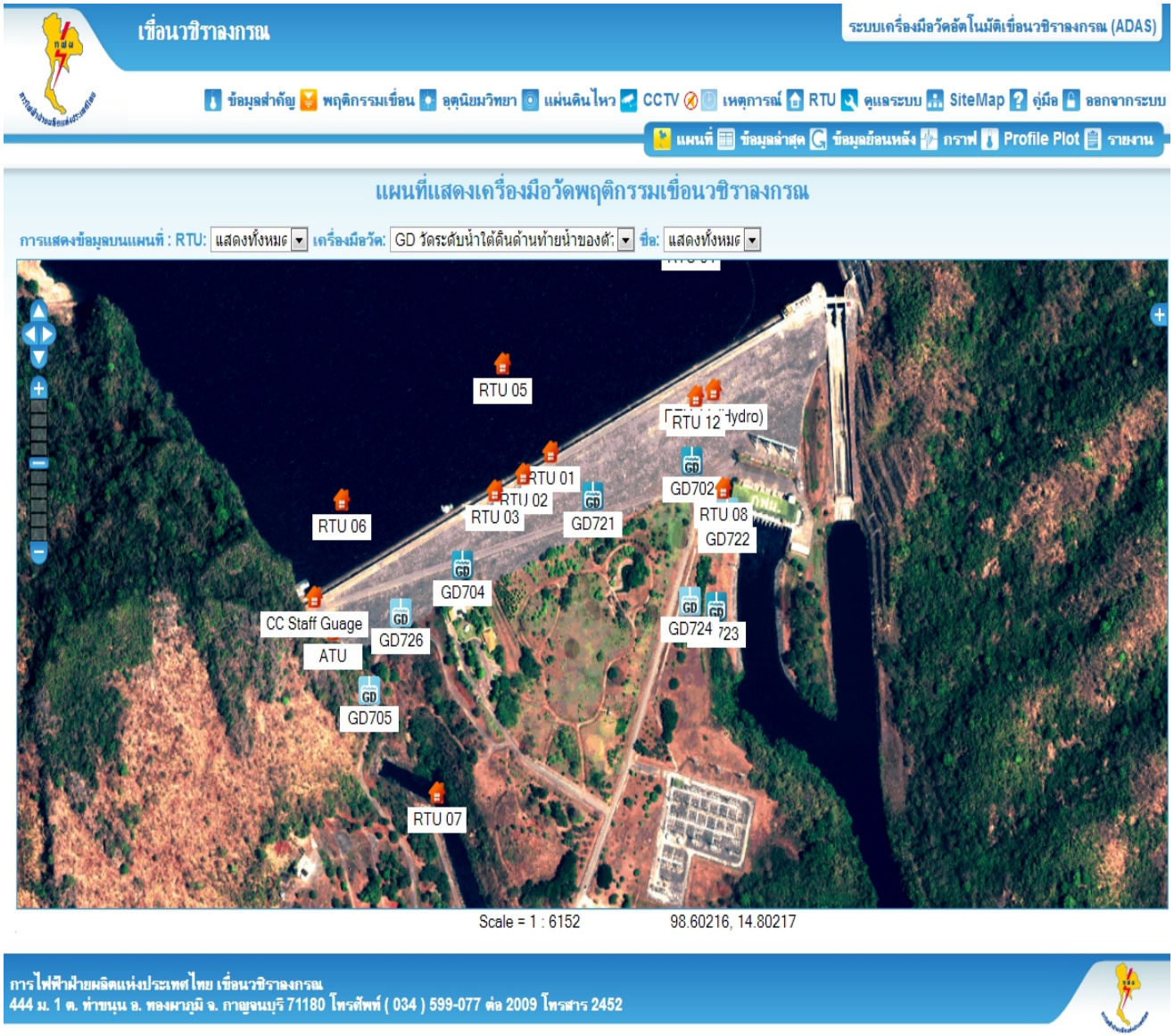


Hydro-Meteorological and Dam Instruments

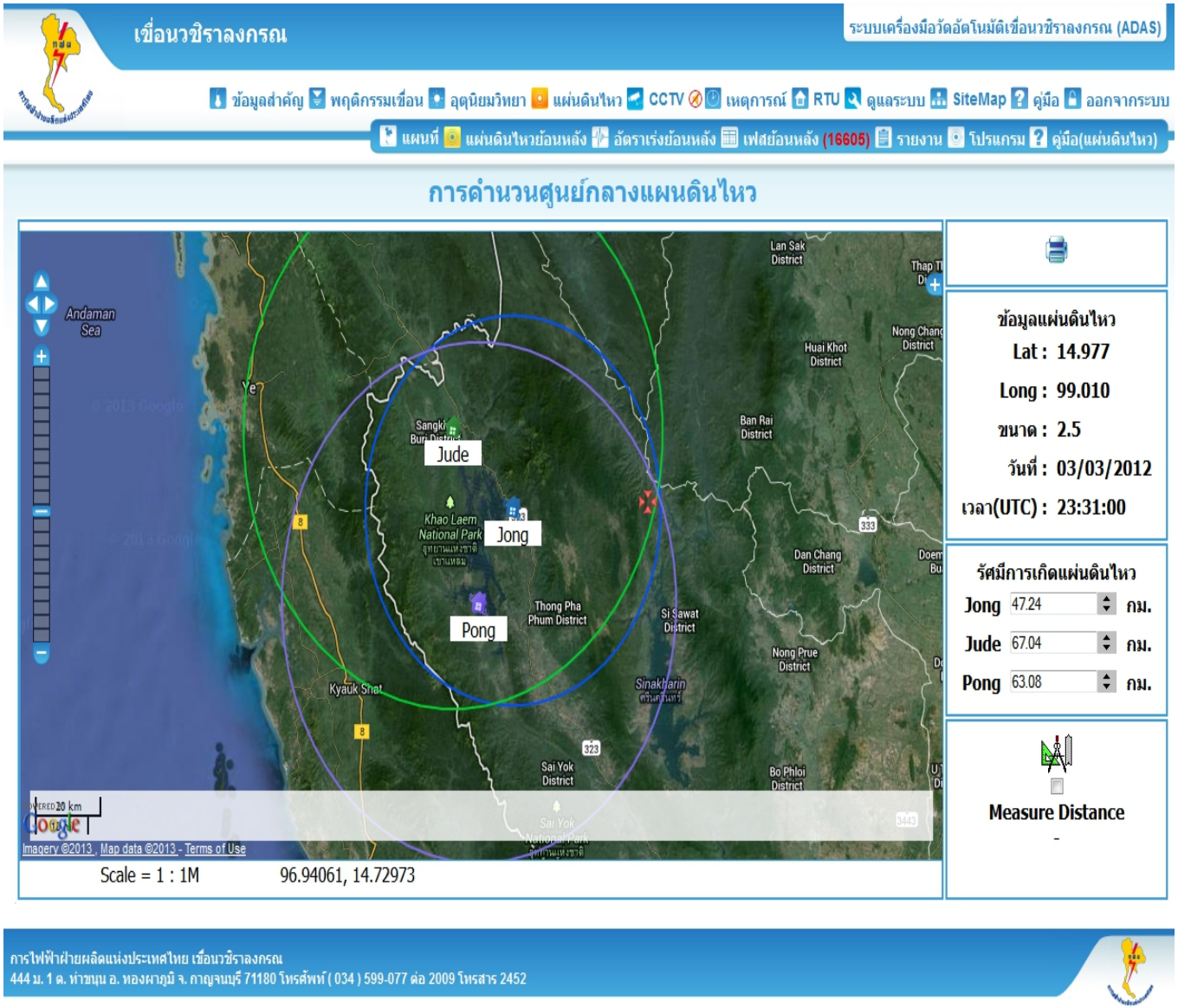



Water level
Water level
Master Station
RTU5
sensor
sensor
RTU4
RTU3
F/O network
RTU1
RTU2
Database

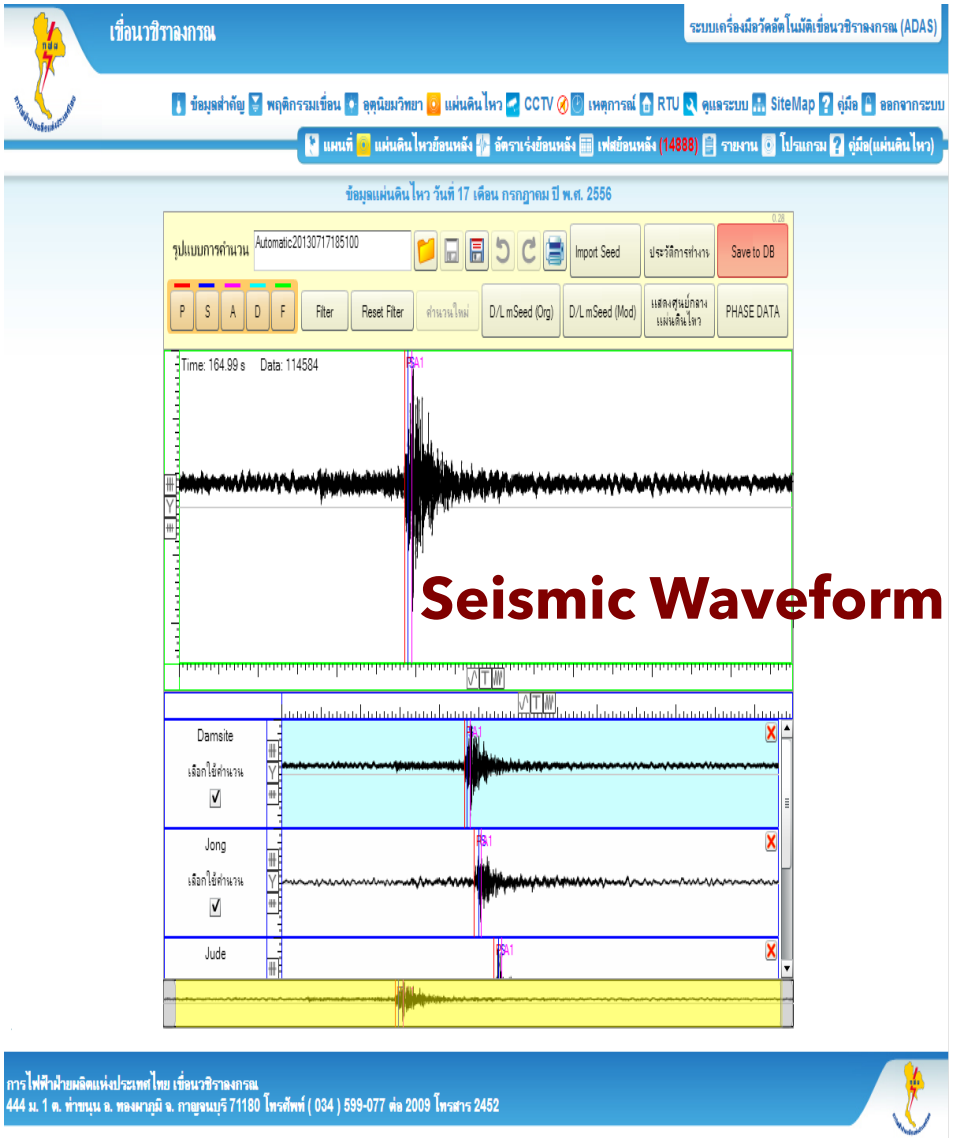
Behavior Inspection System of Dam, 2009-2010



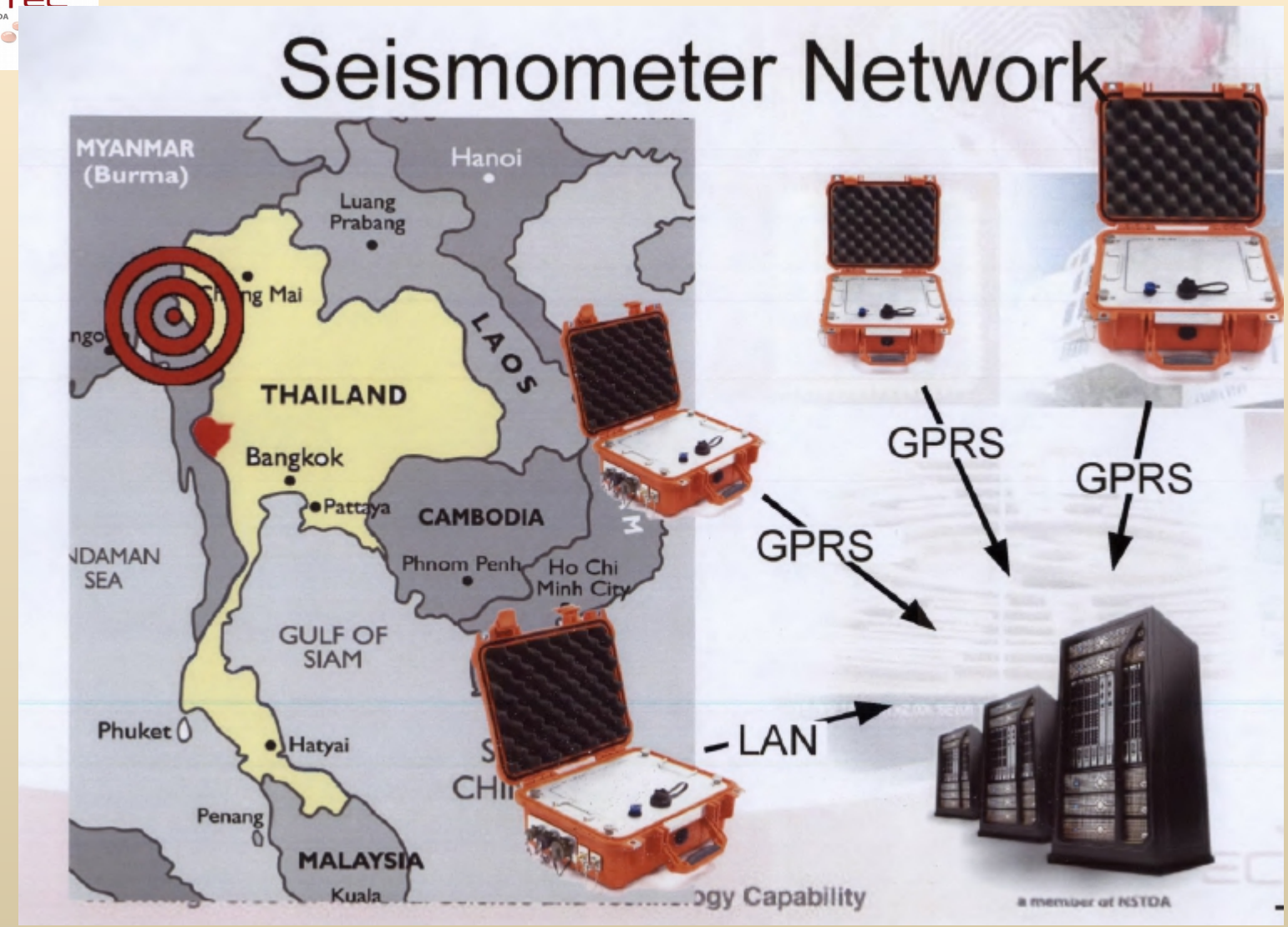
Seismic Monitoring



MEMS based seismometer



Electricity Generating Authority of Thailand (EGAT)


Seismometer Network
MYANMAR
(Burma)
Hanoi
Luang
Prabang
Chiang Mai
LAOS
THAILAND
Bangkok
Pattaya
CAMBODIA
Phnom Penh
Ho Chi
Minh City
GULF OF
SIAM
Phuket
Hatyai
Penang
MALAYSIA
Kuala
GPRS
GPRS
GPRS
LAN

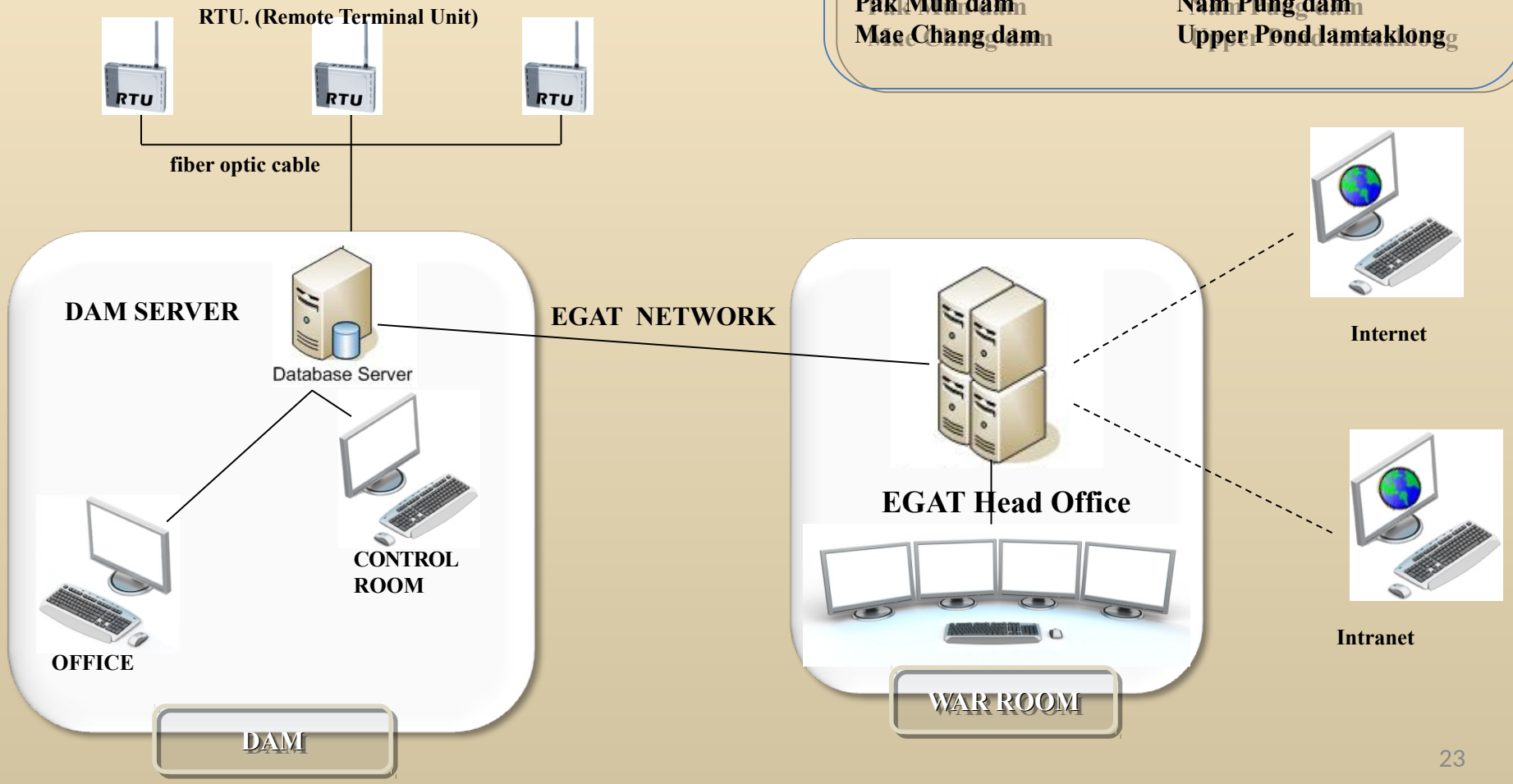
Dam Safety Remote Monitoring System

Implement on 2013-

DAM SAFETY REMOTE MONITORING SYSTEM

- Hydro-Meteorological Instruments
- Dam Instruments
- Seismological Instruments

Bhumibol dam	Sirikit dam
Srinagarind dam	Vajiralongkorn dam
Rajjaprabha dam	Bang Lang dam
Ubolratana dam	Sirindhorn dam
Chulabhorn dam	Huai Kum dam
Pak Mun dam	Nam Pung dam
Mae Chang dam	Upper Pond lamtaklong



Land slide monitoring system

-3 stations in

Mae-Hong-Song

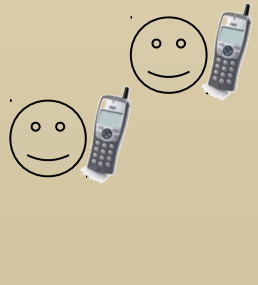
-243 stations in

Chaingmai

Village/

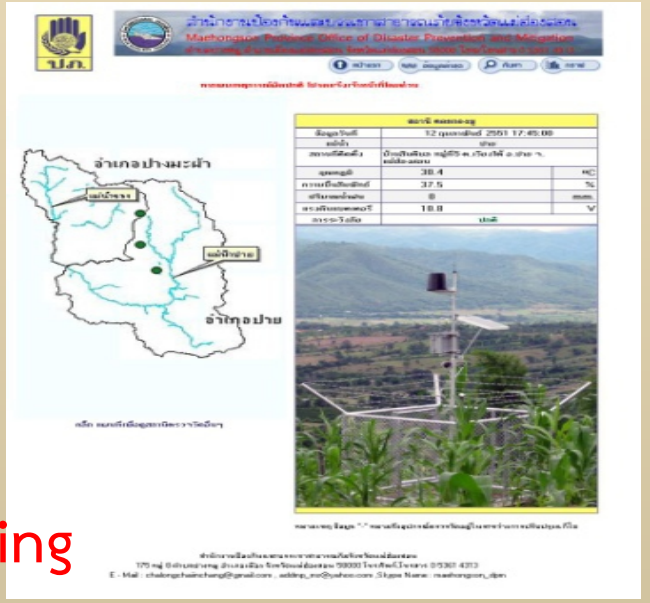
Community

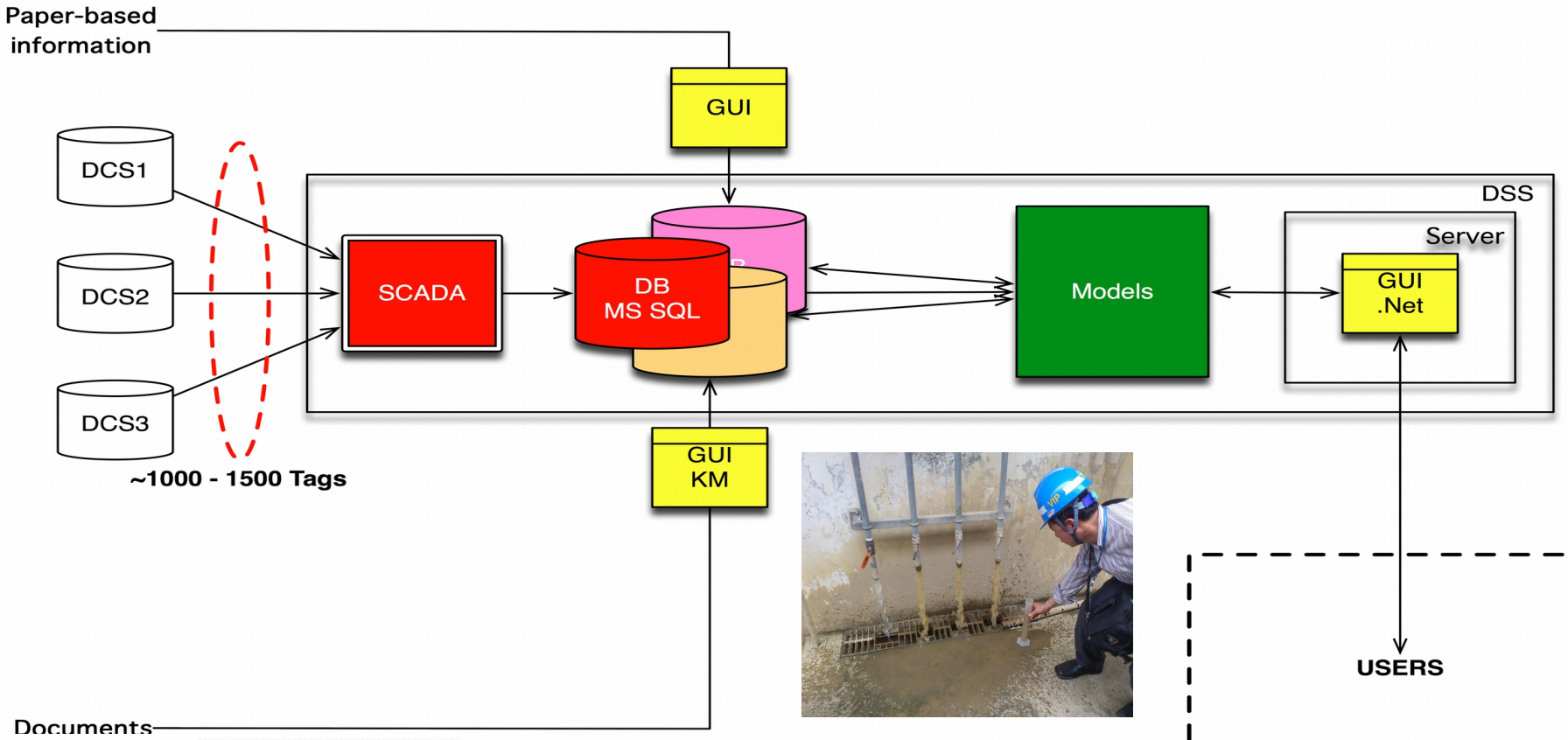
Data center

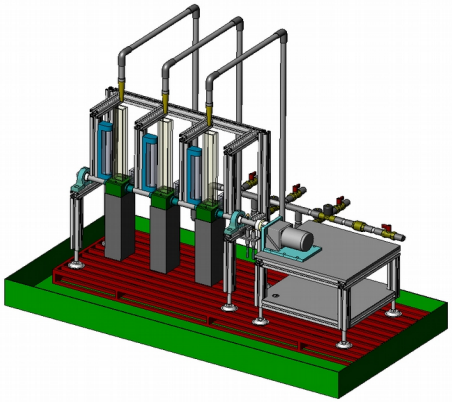


Web site

broadcasting

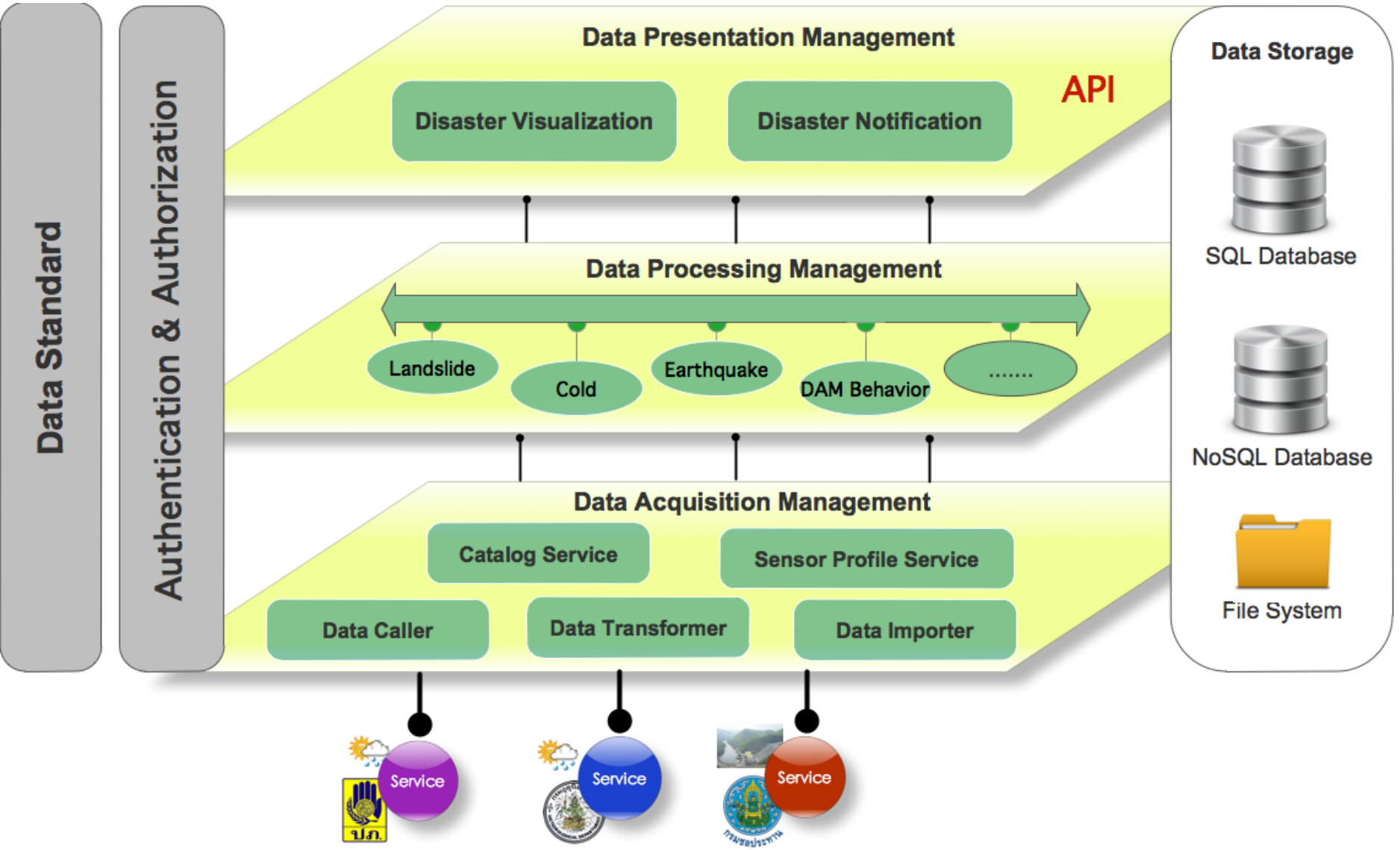


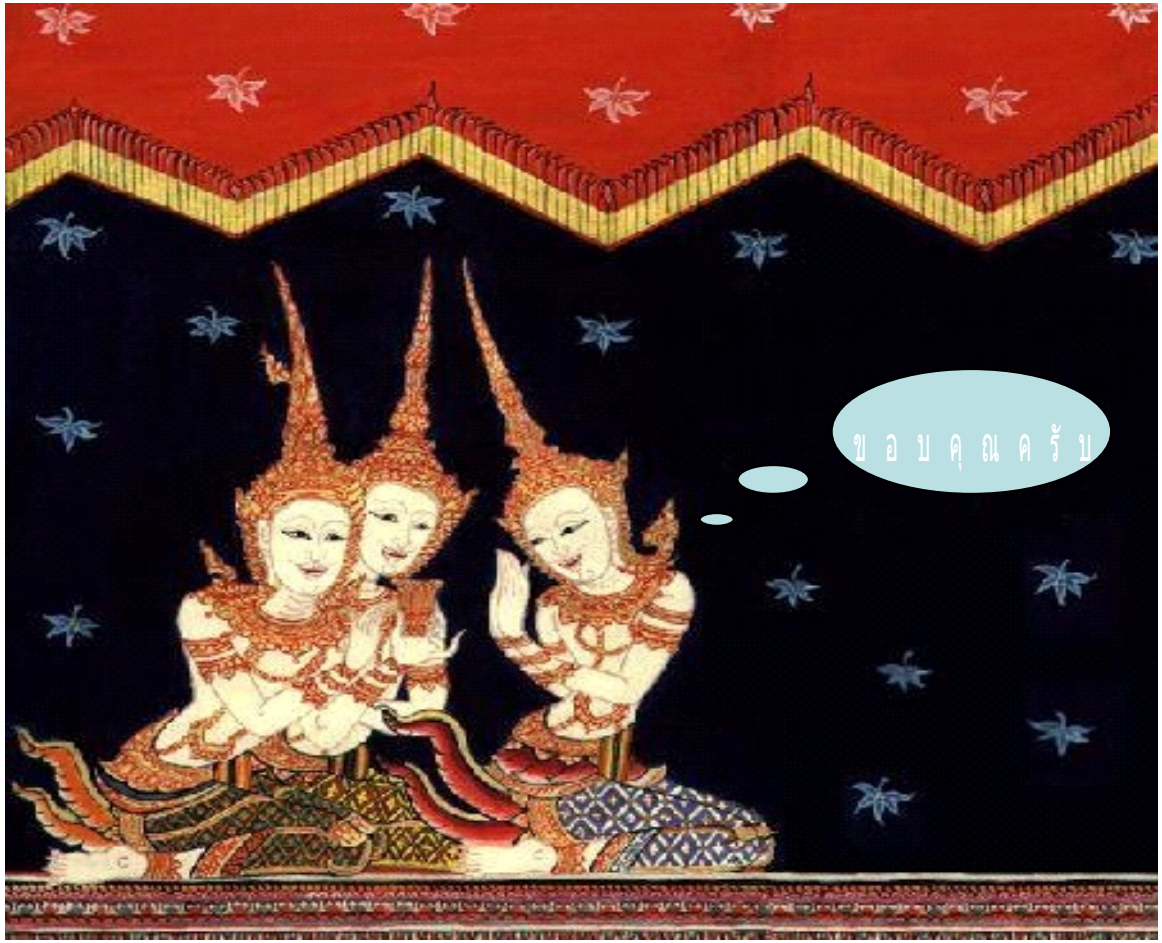




Decision Support System of tap water- *Metropolitan Water Authority*

PaaS for Early Disaster Monitoring System





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Thank you for your attention