Science, Technology, and Innovation (STI) for Community-Led Water Sustainability:
Thailand's Good Practices Advancing Climate Resilience

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Why
Community Water Resources Management?

Thailand's "Water" Background and Problems

1 Water Capital is highly volatile

Heavy rain but limited storage/ storable rainfall is highly volatile/ more frequency of El Niño and La Niña

2 Water demand is higher than manageable Water capital

- Water demand over 150 BCM*/ year
- Total Large reservoir capacity 41,663 MCM**/ year
- Water demand for agriculture is up to **75%**

**BCM = Billion Cubic Meters*
***MBM = Million Cubic Meters*

3 Restriction of irrigation are a expansion

Restriction on uncertainty of water capital, topography, expenses, etc.

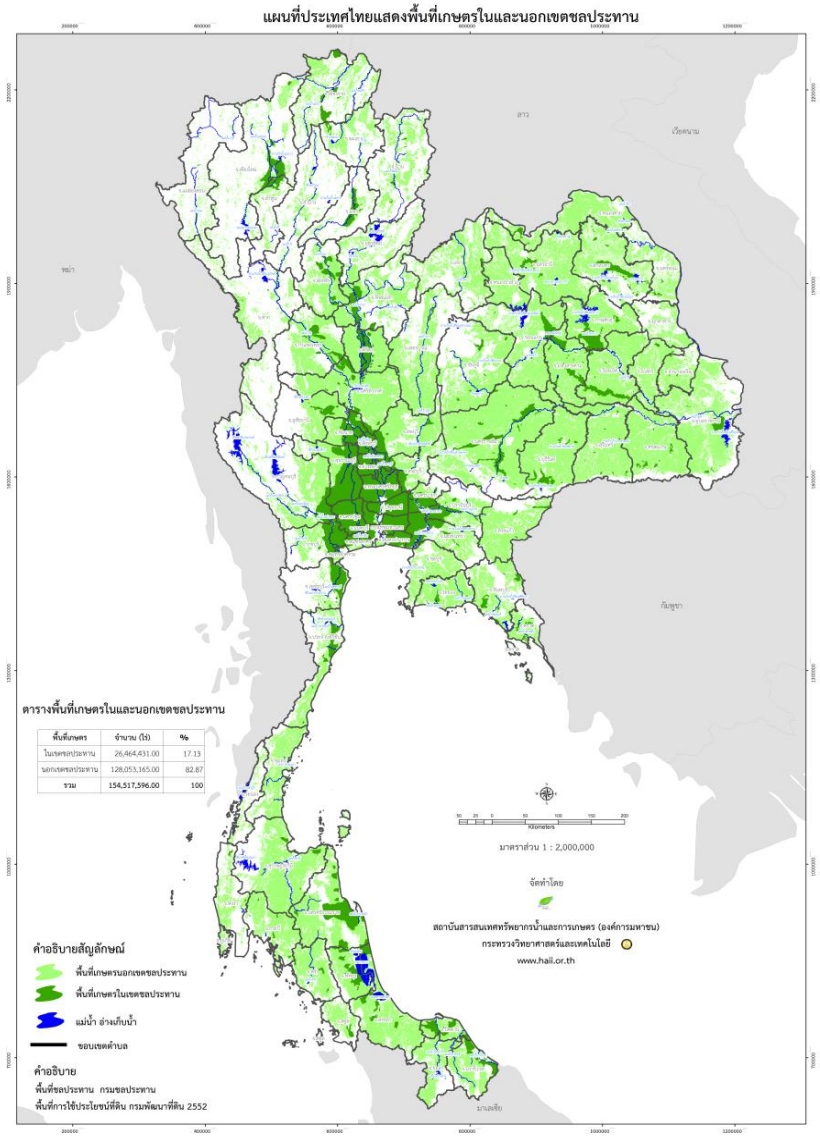
4 Water resources problem

Repetitive flood and drought problem in the same area/ Less rain in the upstream of dam area, insecurity of dam

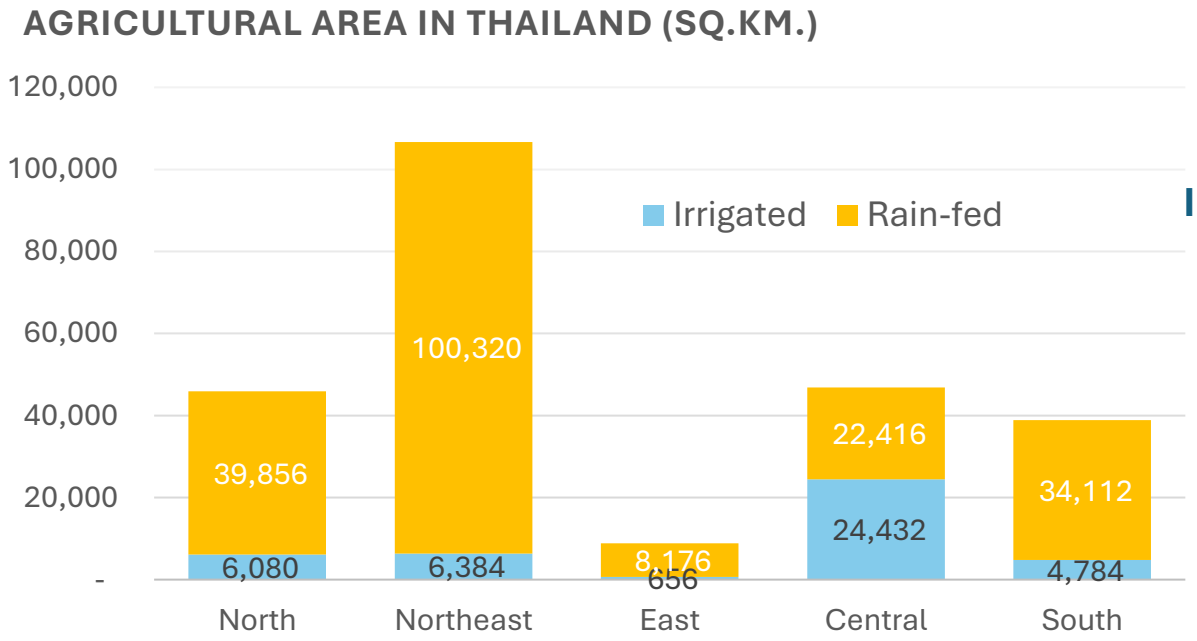
5 Inequality in non-irrigation area

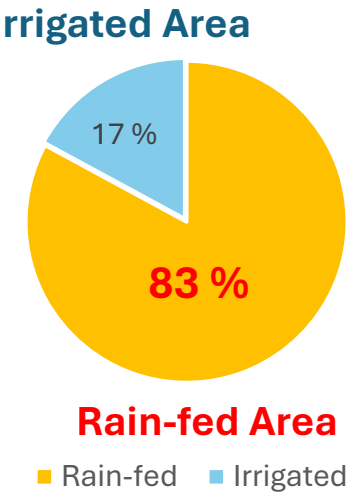
Water resources access/ Flood damage/ Opportunity for knowledge and development tools/ Budget/ Law

Agricultural Area in Irrigation and Rain-fed Area



83% or 204,880 sq.km. of the agricultural area is rain-fed





Note: 20-year Water Resource Management Master Plan (2018-2037)
The goal is to increase irrigation areaby 35% of the agricultural area within 2037

HII's Technologies for Water Management:

Linking the operation system with modeling from **"Sky to Sea"**

7-day rainfall forecast (WRF-ROMS)

Run-off evaluation

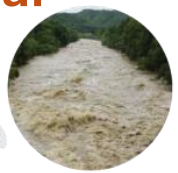
แบบจำลองอุทกวิทยา
Hydrological Model
จำลองความสัมพันธ์ระหว่างปริมาณน้ำฝน-น้ำท่า
A conceptual rainfall-runoff model

เทคโนโลยีการสำรวจระยะไกล
Remote Sensing Technology
ตรวจวัดสภาพอากาศและติดตามสถานการณ์น้ำท่วมและภัยแล้ง
Monitor and assess flood and drought disasters

Short-term rain forecast Radar

แบบจำลองน้ำท่วมในพื้นที่เมือง
Urban Flood Model
จำลองการเกิดน้ำท่วมในพื้นที่เมืองที่มีความสำคัญทางเศรษฐกิจ
Flood protection and flood risk managment in urban area

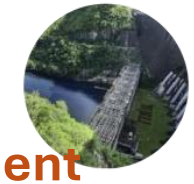
เรดาร์ตรวจอากาศ
Weather Radar
ประเมินปริมาณน้ำฝนและพยากรณ์ฝนล่วงหน้าระยะสั้น
Rainfall estimation and nowcasting



แบบจำลองน้ำท่วมฉับพลัน
Flash Flood Model
จำลองการเกิดน้ำท่วมพื้นที่ลาดชันที่เสี่ยงต่อการเกิดน้ำป่าไหลหลาก
Simulate the rapid flood with a relatively high peak discharge

Identify sub-districts at risk of flash flood

Reservoir management



แบบจำลองบริหารจัดการเขื่อน
Reservoir Optimization Model
จำลองเกณฑ์บริหารจัดการเขื่อนที่เหมาะสมและมีผลกระทบน้อยที่สุด
Optimize operating rules proposed to solve the operation problem

สถานีโทรมาตรอัตโนมัติ
Telemetering Station
ตรวจวัดสถานการณ์น้ำแบบทันเวลา
Monitor real-time water situation

แบบจำลองอุทกพลศาสตร์
Hydrodynamic Model
จำลองปริมาณน้ำท่า ระดับน้ำ และการไหลในลำน้ำทั้ง 1 มิติ และ 2 มิติ
Integrate the 1D river model and 2D overland flow model

Water balance-Water shortage risk area at sub-district level

River management

แบบจำลองคลื่นพายุซัดฝั่ง
Storm Surge Model
จำลองระดับน้ำทะเลภายใต้อิทธิพลน้ำขึ้นน้ำลง คลื่น และพายุ
Calculate water level from the effect of tide, wave and surge

แบบจำลองการรุกล้ำของความเค็ม
Salinity Intrusion Model
วิเคราะห์พฤติกรรมการเคลื่อนตัวของความเค็มเพื่อเป็นแนวทางในการจัดการน้ำ
Analyse salinity intrusion behavior and provide a guideline for water management

แบบจำลองทรัพยากรน้ำ
Water Resources Model
จำลองการบริหาร จัดสรรน้ำ และวิเคราะห์สมดุลน้ำ
Manage and plan water resources in river basins

Manage water and sea

NHC

National Hydroinformatics and Climate Data Center

Website and Application

Monitor water and weather situation
Suitable for executive, government sector, and public

www.thaiwater.net

"ThaiWater"

Download on the App Store | GET IT ON Google Play

ThaiWater Mobile Application

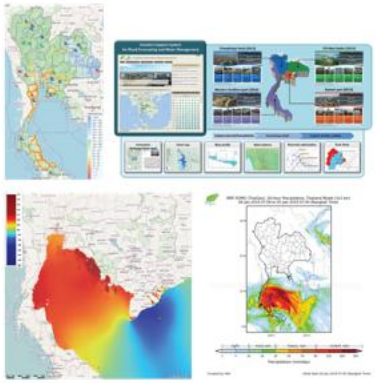
Monitor water and weather data
Suitable for executive and public

Provincial Water Resources Management Operation Center

Enhance provincial water resources management by expanding the implementation of National Hydroinformatics and Climate Data Center (NHC) to local level. Enable provincial and local people to be capable with technology usage, develop monitoring system, water management plan, and prevent disaster risk that may occur in a timely manner.

Modern Data Center

Big Data Platform
Data Center
High Performance Computers
Mobile War Room



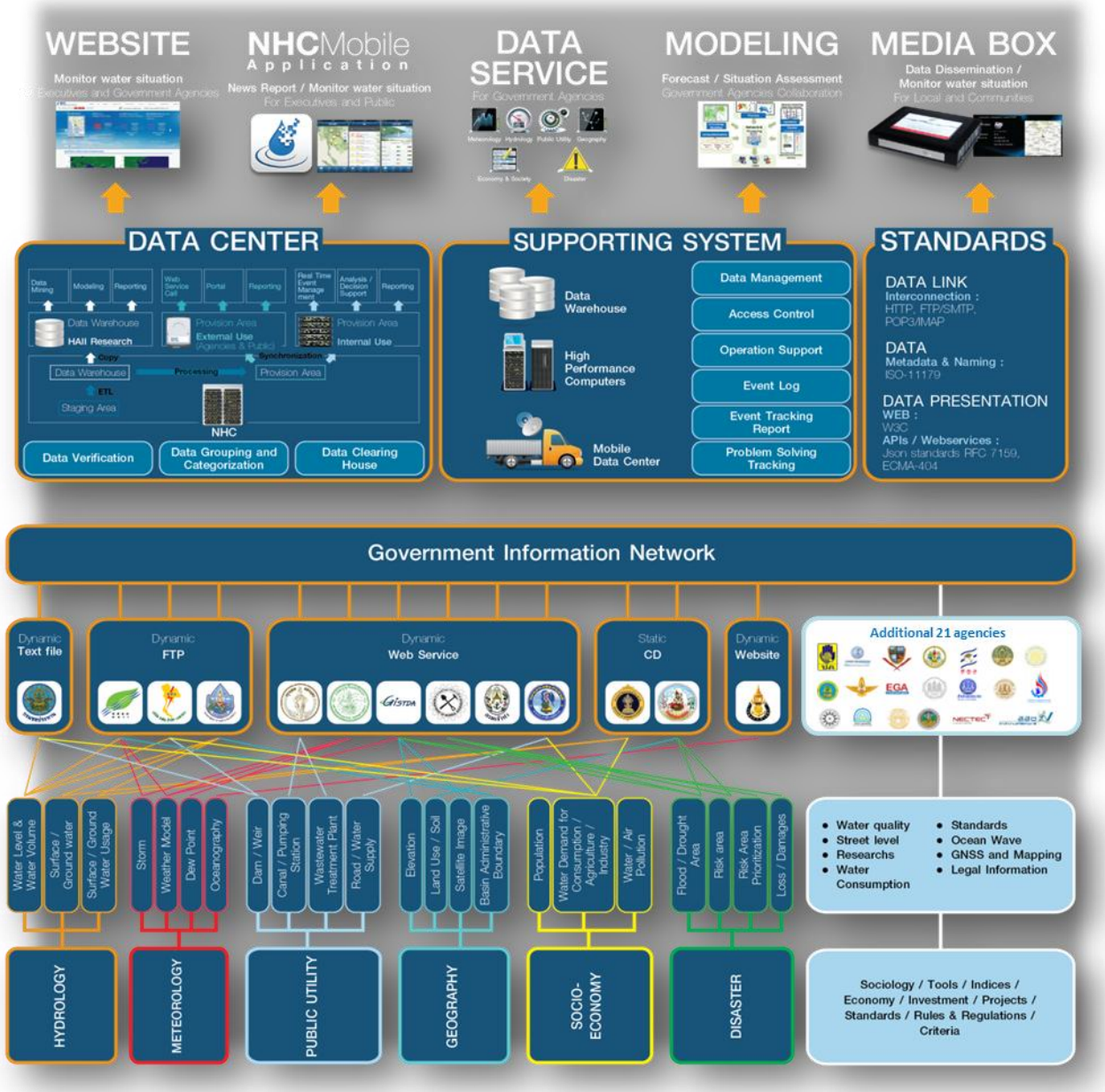
Weather and water situation monitoring system

Collaborate with domestic and international experts to develop high performance technology and precise information in order to support water management agencies, academic, researcher, and public, including support for climate change research.

Data provider for government sector

The integration of data from relevant agencies enable NHC to be the biggest water data warehouse in Thailand. The data center support information to government agencies through member system which can be tailored according to each requirement.

National level Big Data : National Hydroinformatics Data Center (NHC)



- **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 **435 data items 54 agencies**

National Hydroinformatics Data Center (NHC)

Ministry of Agriculture and Cooperatives

Ministry of Natural Resources and Environment

Ministry of Interior

Ministry of Transport

Ministry of Higher Education, Science, Research and Innovation

Ministry of Digital Economy and Society

54 Agencies
12 Ministries
435 Dataset

Ministry of Industry

Ministry of Public Health

Ministry of Energy

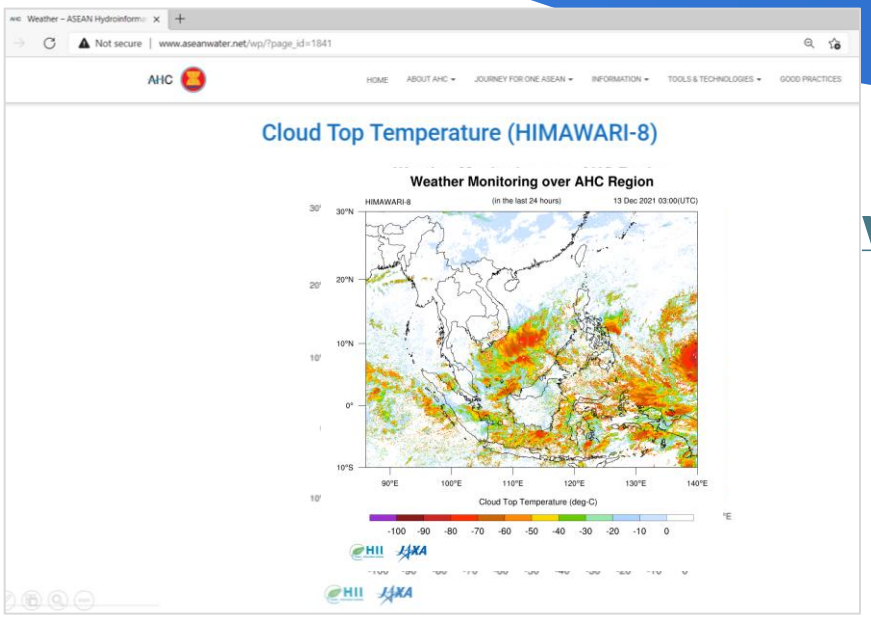
Ministry of Finance

Ministry of Defense

Office of Prime Minister

Communication through the Website and Mobile Application

www.thaiwater.net



www.aseanwater.net

Collaboration within ASEAN and External Partner

Download on the App Store

GET IT ON Google Play

Community Water Resources Management CONCEPT

Community Water Resources Management (CWRM) Framework

Sufficiency Economy Philosophy (SEP) as a tool for Sustainable Development

Sufficiency Economy Philosophy

Knowledge : Learning and doing

Moral: Community's rules and regulations to collaborate together with fairness and transparency

Reason : Availability of Information, Fact, and Analysis

Moderate : Management, Planning, and Monitoring

Immunity : Preparation for Climate change and Disaster Risk Reduction

Science Technology Innovation

Science and Technology transfer to create:

- Community's background information
- Water map
- Water chart
- Water Balance

Knowledge transfer from 60 core communities

- Guideline on water resources development and management

Sustainable Development

Security of Resources such as land, water, forest, & energy

- Water for consumption and agriculture

Food security

- Agroforestry and Integrated agriculture
- Collaboration on planning, production & marketing

Economy security

- Reduce expenses, increase income, reduce dept, increase saving, and community fund

Social security

- Better livelihood
- Good Governance, Strong community & expandable network

The community can achieve Self-management of soil, water, and forest resources, increase water availability for drinking, consumption, and agriculture, increase income, manage risk, improve immunity, leading to the Security and Sustainability of the people






Community Water Resources Management (CWRM) System

- **Community empowered with knowledge and information to solve problems independently**
- **Continuous development for sustainability**
- **Water security, social stability, and economic stability**

Implemented locally and by the community, for self-reliance and community benefit.

Co-Work

- Summarize facts
- Summarize solutions
- Summarize Community Water Management Plans

Co-Create

Restore, upgrade, and develop water infrastructure.

Co-Manage

- Summarize management and maintenance guidelines
- Evaluate and assess outcomes
- Summarize knowledge gained

Continuous

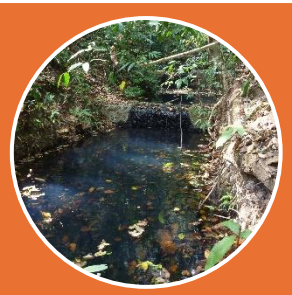
- Formation of working & supporting networks

Government, private sector, & civil society

Linkage

- Develop water infrastructure from source-distribution-end users
- Establish mentoring systems
- Expand outcomes

CWRM Technique



Watershed Forest area

- Bald mountain restoration
- Check Dam
- Wet Fire Break
- 3 Forest, 4 Benefits

Small to Medium reservoir

- Watershed and reservoir restoration
- Pond Network

Flood and Drought area

- Restore & develop monkey cheek
- Overflow-trap canal
- Water way
- Furrow
- Water management structure

Downstream ecological balance area

- Water management on saline/ fresh/ brackish/ wastewater

Community Economy

- Farmer's Group
- Community Fund

Community Water Resources Management Technique

Watershed Forest Area: Bald Mountain Restoration

Don Pha Poon village, Nan province, Northern Thailand

2022

Bald Mountain Restoration 2.02 km^2 Collaborated with Nabong village

Agro-forestry 2.50 km^2

Monitor water and weather situation for early warning

Village's water supply system, water system for agroforestry, achieve Food Security and justify resources allocation.
A water management committee was formed, capable of analyzing problems, monitoring situations, taking action, **creating successful examples, and expanding the results.**

Small Reservoir: Watershed and Reservoir Restoration

Mae Kaming village, Saroi sub-district, Phrae province, Northern Thailand

Present

Past

- Water scarcity and flood issues in the same area.
- Lack of systematic management and distribution.
- Inadequate maintenance of headwater areas.

2011,
Severe flooding and landslide, a new reservoir sufficient for **3 cycles/year**

Capable of Reusing water
Management capacity **6 cycles/year**

Huay Payang Reservoir (max capacity 650,000 m^3)

Flood and Drought: Rehabilitate Ponds and the Networks

Non Tae village, Chaiyaphum province, Northeastern Thailand

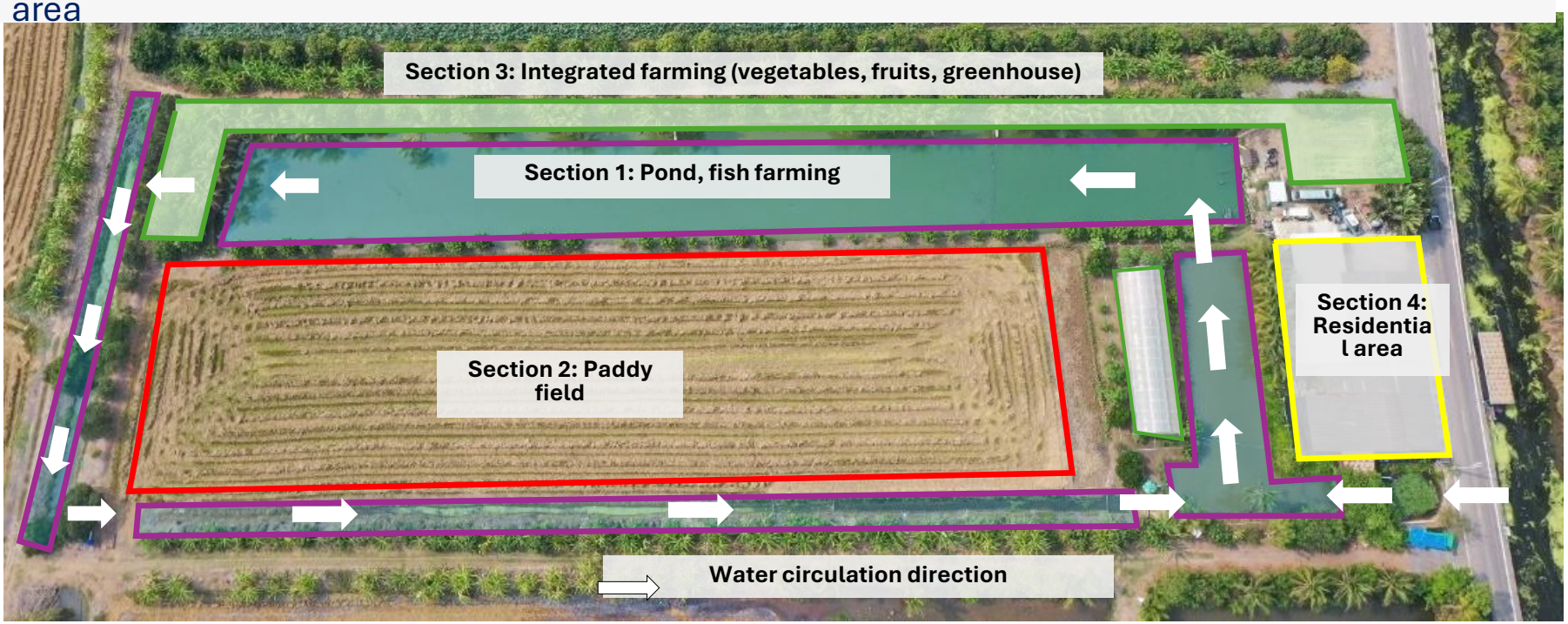
Linking water sources,
Total reserve of
13.21
MCM

Downstream Ecological Balance: Saline/ Fresh/ Brackish, Wastewater Management

Saladin village, Nakhon Pathom province, Central Thailand

Reuse water and apply "Integrated Agriculture"

Section 1: 4,800 m^2 - Pond
Section 2: 4,800 m^2 - Paddy field
Section 3: 5,600 m^2 - Vegetables, Fruits, and Greenhouse area
Section 4: 800 m^2 - Residential



- Built reservoir to increase agricultural water storage, **mitigates drought impact.**
- **Water circulation system** promotes efficient water **reuse** in farming.
- Special Rice Farming technique lowers costs, increases income.
- **Fish** revenue **triples rice farming income**.
- **Value-added rice processing** raises per-ton earnings to 17,800 EUR






Community Economy: Community Funding

Rangsit community, Pathum Thani province, Central Thailand

Water Security increased water **29** MCM

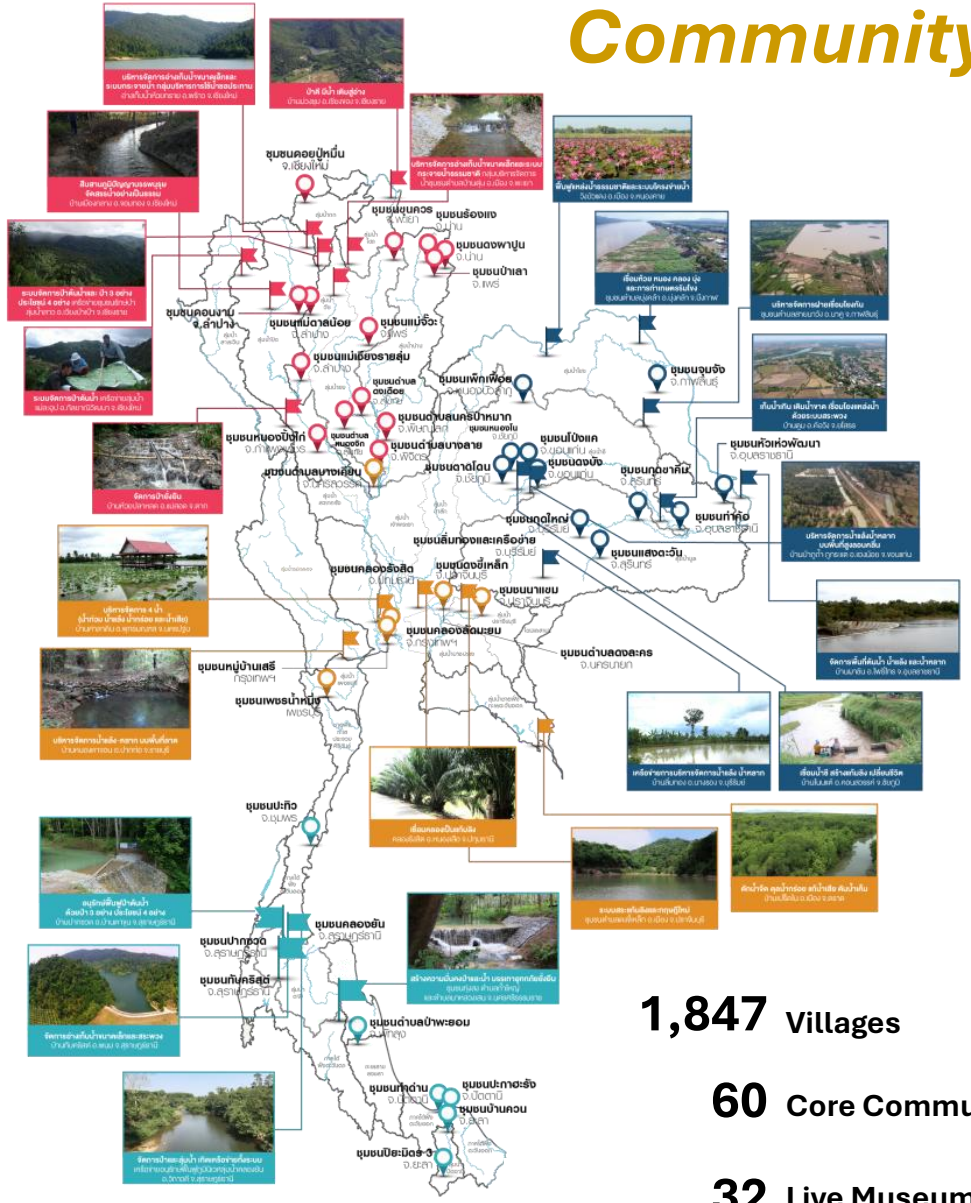
Developed furrows in 36.21 km² Capable of storing **15.84 MCM of water**

Expanded network to **9** subdistrict benefiting **6,400 households, 83.2 km²** agricultural areas

Food security, Increased average income 36.755 EUR/year Reduced expenses 4,320 EUR/year

Palm oil fund generates **16,730 EUR/year**

Community Water Resources Management Network following H. M. King Rama IX's Initiative



1,847 Villages

60 Core Communities

32 Live Museums

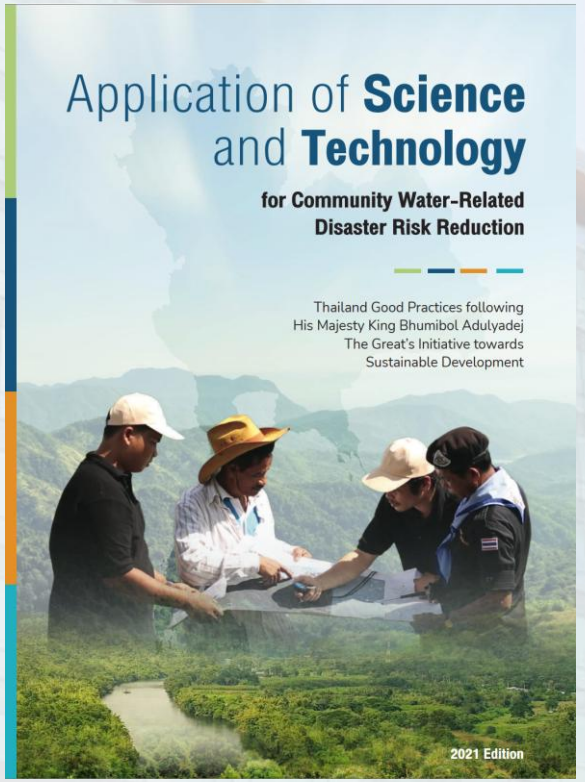
Labels

North Northeast Central and Eastern South

CWRM Live Museum following H.M. the King's Initiative

Sustainable Development Cycle

Thank you



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