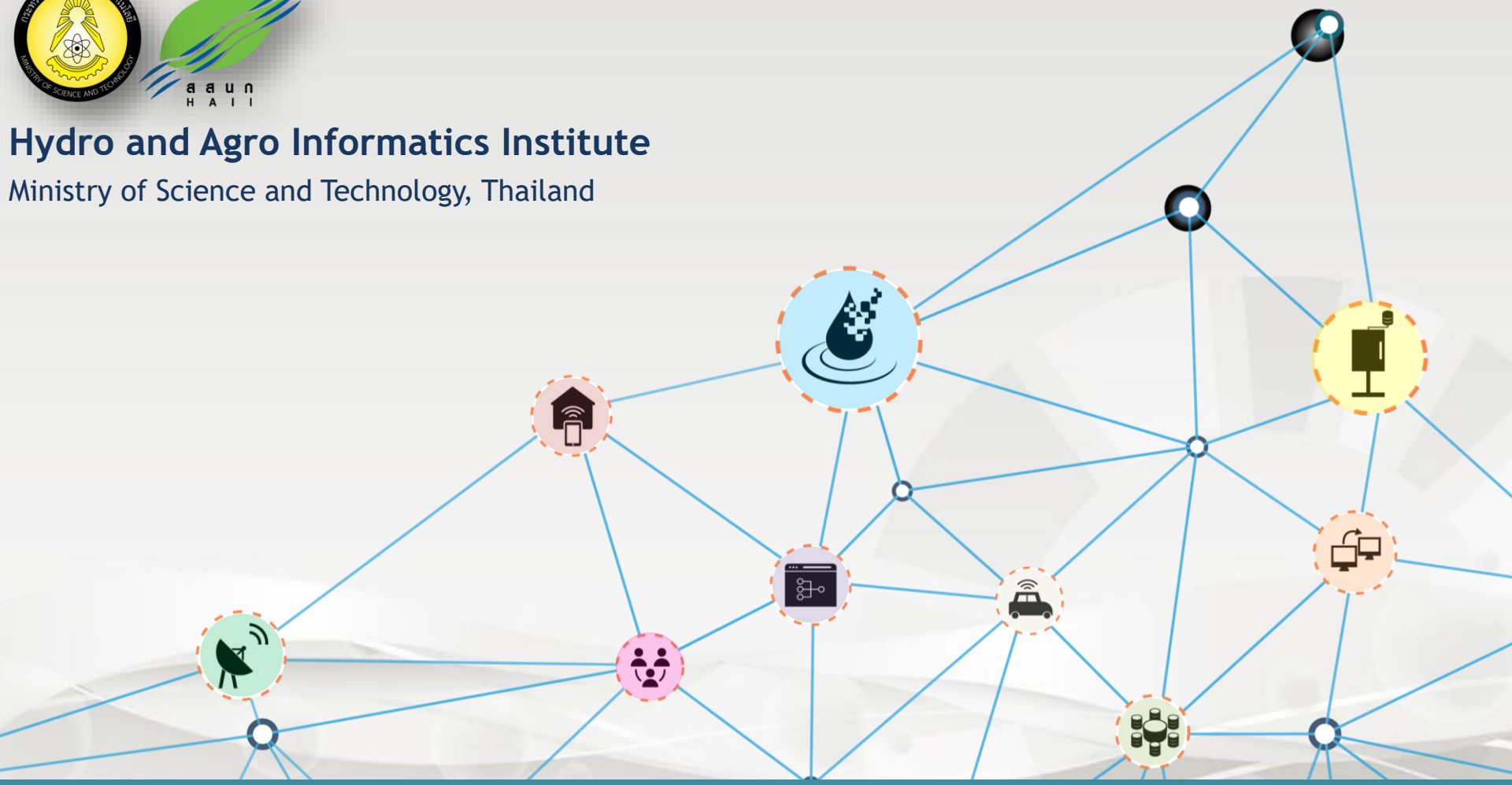
Hydro and Agro Informatics Institute
Ministry of Science and Technology, Thailand



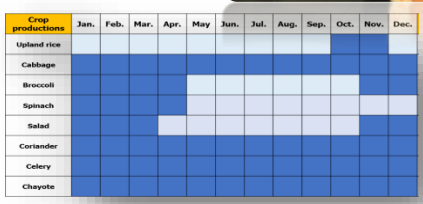
S&T Implementation for Water Resource Management

Turning Challenges into Opportunities: Thailand Case Study

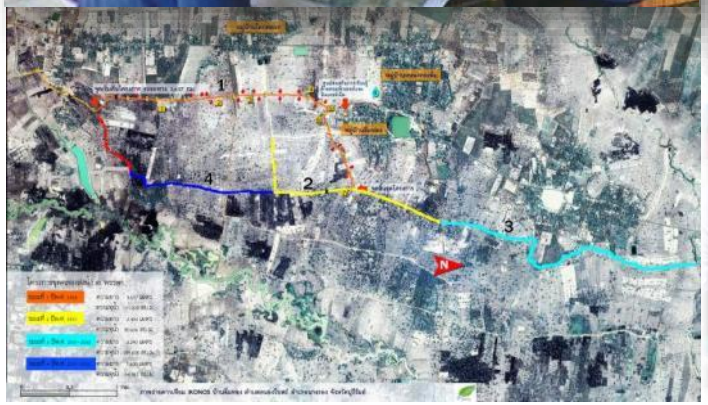
By Dr. Sutat Weesakul
Director

S&T INTO ACTIONS:
COMMUNITY WATER RESOURCE MANAGEMENT (CWRM)

S&T for Community Water Resource Management



Crop productions	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Upland rice												
Cabbage												
Broccoli												
Spinach												
Salad												
Coriander												
Celery												
Chayote												



S&T Adaptation for increasing Community's efficiency

GPS receivers

Satellite Images

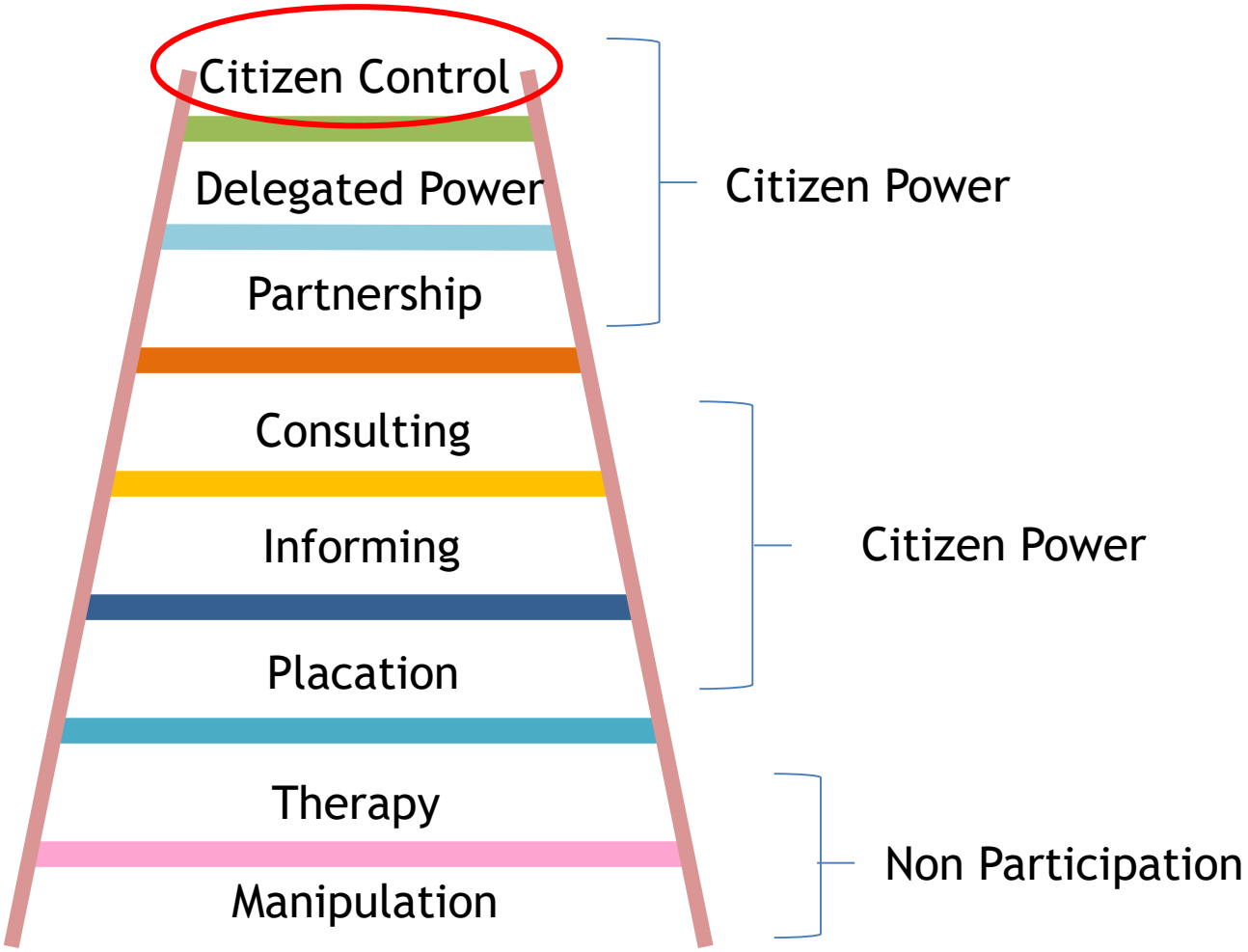
Computer

Internet

Spreadsheet

Crop Calendar

Arnstein's Ladder of Citizen Participation



Source: Arnstein, Sherry R. "A Ladder of Citizen Participation," Journal of the American Institute of Plannes, Vol. 35, No. 4, July, 1969, pp. 216 - 224

S&T into ACTIONS: Community Water Resource Management (CWRM)

S&T → **Innovations** → **Outcomes**

Technology

- Telemetering Station
- GPS/ Topographic map, Satellite Maps
- Q-GIS
- Level Survey
- Echo Sounder

Data

- Water Maps and Diagram
- Water resource development plan and strategy
- Community data base
- Water resource database
- Water Balance Analysis

Engineering/Innovation

- Design simple construction to appropriate with geosocial
- Implementation planning and management including maintenance systematically

Community innovation

- Stone or concrete check dams
- Cement check dams Concrete Floodgates
- Flood canal
- Canal street
- mire suction boat
- Ground water recharge
- Reinforced concrete creek through Brooks
- Household grease trap
- Solar cell water pump system
- Solar cell electric floating system

Water Structure System

- Reforestation System
- Flood and Drought Management System
- Small Reservoir Management System
- Large Reservoir Management
- Sugarcane Water system
- Waste Treatment Management

Water Security

- Water resource management plan in Sub-district level
- Community Water Resource Development Plan
- Sub-district and Provincial Water Resource Management Center

Food & Income Security

- Agroforestry (3 Forest, 4 Benefits)
- Integrated Agriculture (New Theory Agriculture)

Energy Security

- Clean Energy
- Renewable energy




Community Innovation

Mechanism and Operation

Drive by Community with Guidance from HAII

Mechanism

Learning by Doing → Management and Planning → Taking Action

Operation

Data and Information	Problem analysis and solving	Development and Follow up
• Water diagram and Water table • Knowledge and local wisdom • Successful cases • Knowledge sharing	• Water balance analysis • Problem solving approach • Participatory • Agro Forestry • New Theory (Integrated Agriculture)	• Develop and rehabilitate existing water structure including natural water resources • Construct new infrastructures • Follow up and evaluation • Expand CWRM network

Mechanism and Operation

Virtue Collaboration: Driven by Trust and Faith

Goals -> Community's Livelihood and Sustainability Development

Community's Roles

- **Volunteer for community's benefit**
- Understand and utilize information and data for management and planning
- Operate and take action the development plans

Partner and Friend

Learn Together
Do Together
Win Together

HAII's Roles

- **Non-profit operation**
- 2 ways communication
- Involve and participate with communities
- Provide information, data, tools, etc. for co-critical thinking and planning

GOOD PRACTICES COMMUNITIES

S&T Application for Water Management

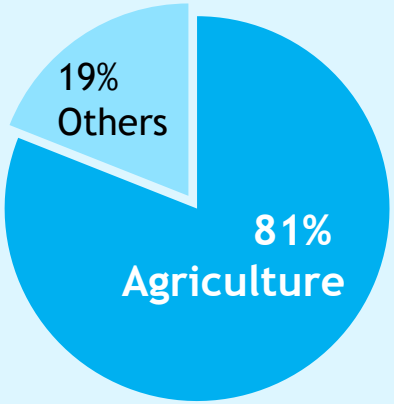
Rangsit Community

Development of Catchment Area
in Rangsit Agricultural Area, Pathum Thani

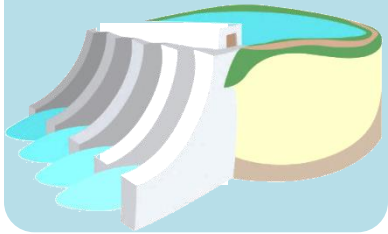
General Information

Bueng Cham Or sub-district
Nong Sua district, Pathum Thani province,
Central of Thailand

Total area
54.48 km²

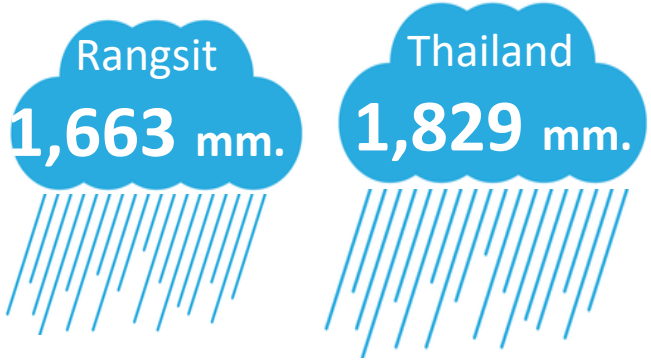


Pa Sak Jolasid Dam

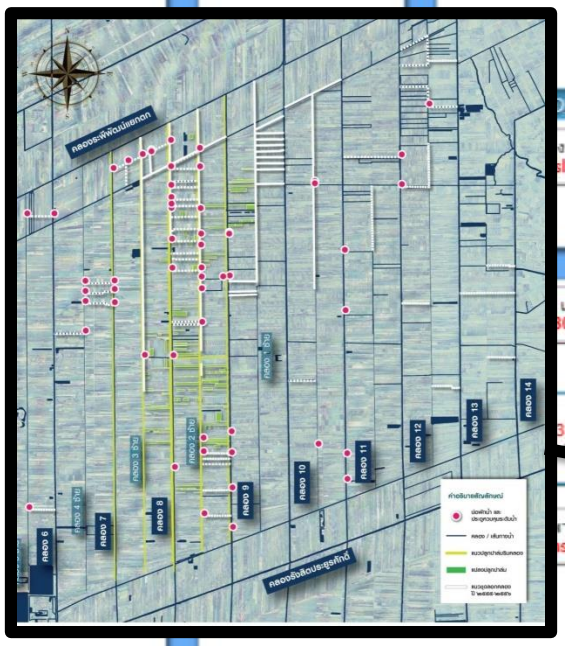


Total population
52,455 people

2017 Annual cumulative rainfall



Water Diagram of Rangsit Area



Chaophraya River

Pasak river

Pasak Jolasid dam

Rama VI dam

Western Raphiphat canal

Rangsit Community

Rangsit canal

Problems

- Over 400 water gates **damaged**
- **Isolate** water infrastructure
- **Lack of management**

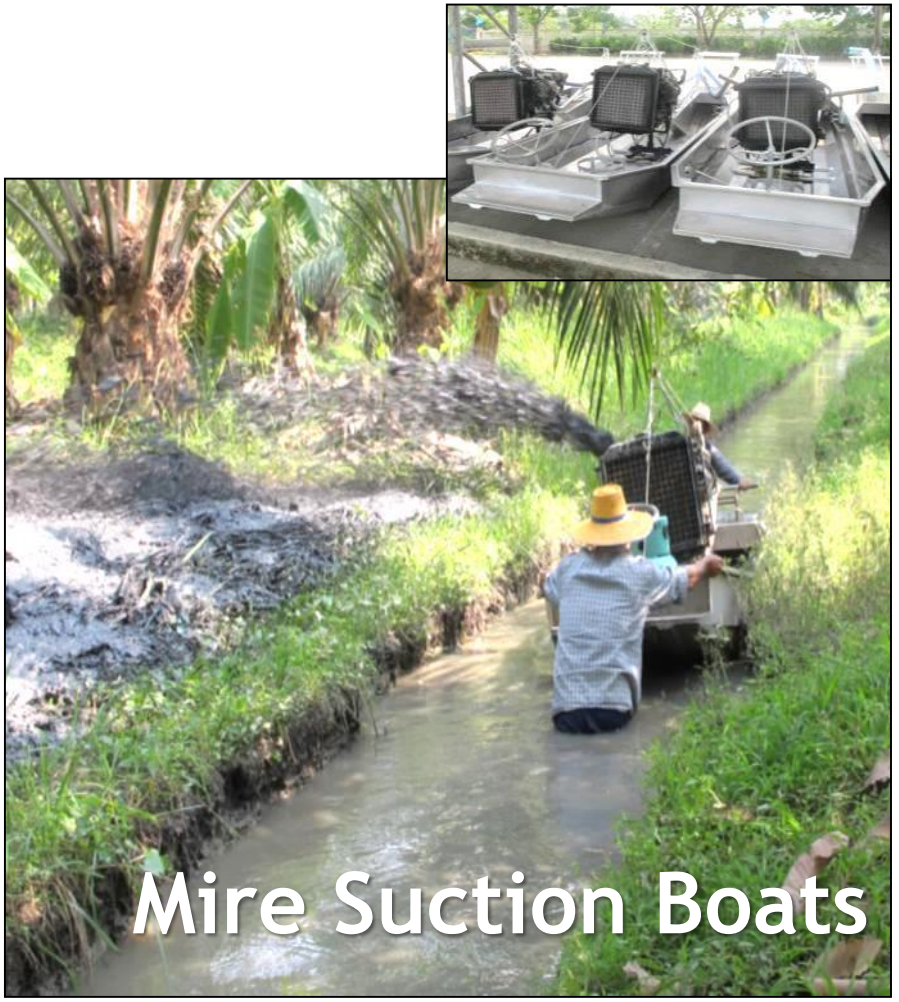
Solutions

- Local **committee/ working group**
- **Survey** existing infrastructure
- Develop management **planning and action**
- **Expand the success** to nearby community

Optimize water storage, drainage & reservation

- **Increase water storage**
  by excavating main and sub-canals (129 km.)

- Renovate furrows by
  “Mire Suction Boats”
  a community’s innovation



Optimize water management system

- **Control** inflow/outflow level
- **Link** irrigated canal and palm furrows
- Construct 85 **water gates and clarifiers**

Cultivation Adjustment

- **Change cultivation pattern**
- **Mixed plants**
- Small integrated agriculture area
- Decrease cultivated area in dry season
- Grow trees that consume less water

Additional **Income All Year**

Income from Integrated agriculture **2.14 times higher** than monoculture

Example: Small Waterside Cultivation in 40 x 3 m.

NOT Appropriate in DRY season

Appropriate in DRY season

Fruitful trees

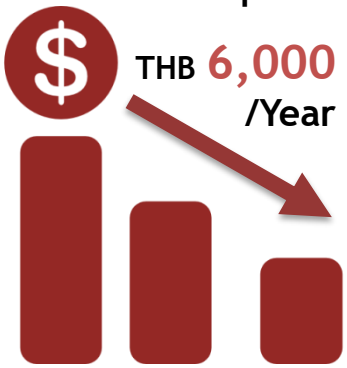
Month	1	2	3	4	5	6	7	8	9	10	11	12
Season	Dry					Rainy					Dry	

Income increase

THB 12,000 /Year

Reduce expense

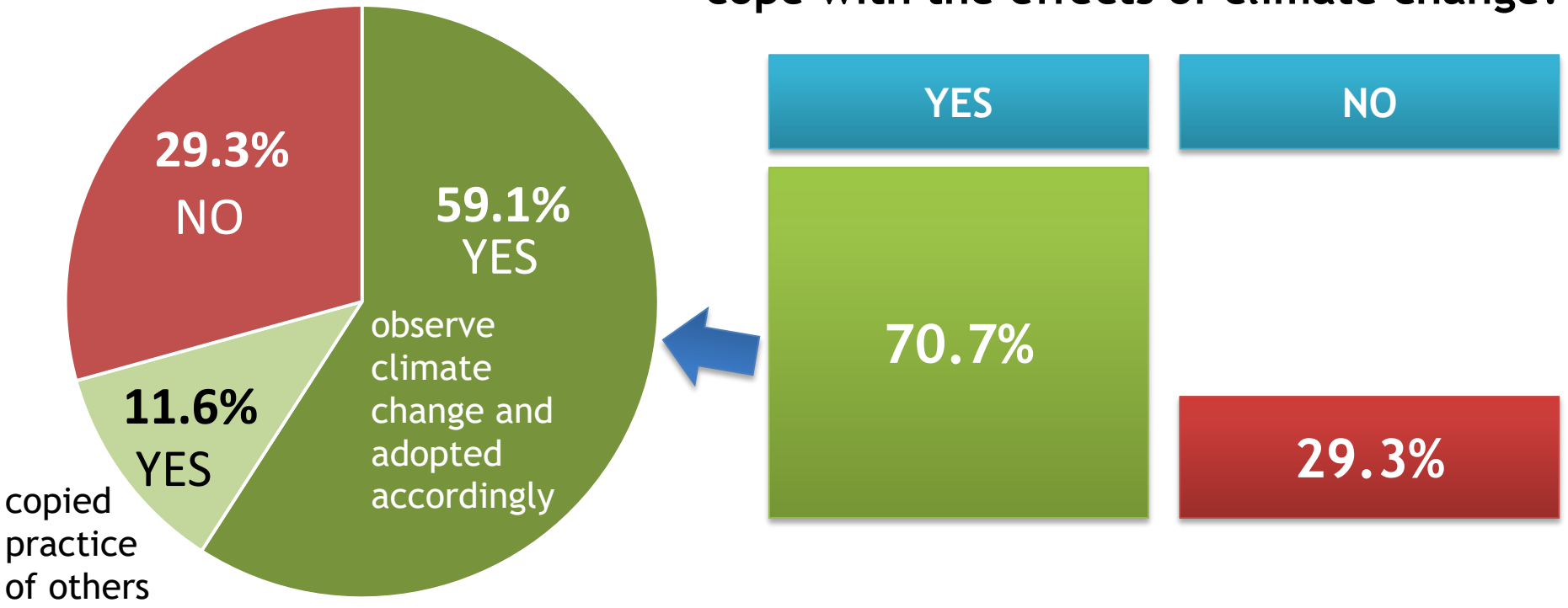
THB 6,000 /Year



Farmer Adaptation and Barriers

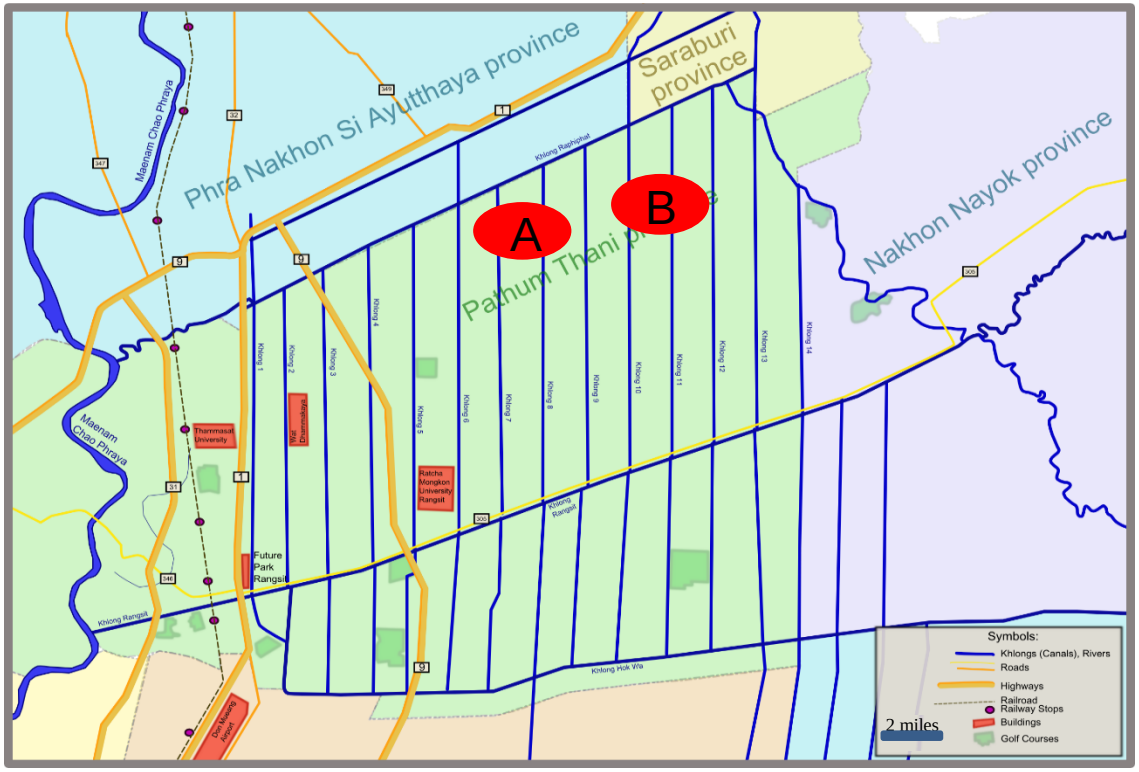
CLIMATE CHANGE ADAPTATION PRACTICES

Have you adopted any measures/ adjustment to cope with the effects of climate change?



Farmer Adaptation and Barriers

Perceiving of Farmers' Agricultural Adaptation in Community Water Resources Management Scale



A **Bueng Cham Or**
(Klong 7-8)
Villages:12
Area:48.85 km^2
Population: 8,624
Household: 1,425

B **Sala Kru**
(Klong 11-12)
Villages:10
Area: 49.65 km^2
Population: 5,181
Household: 1,493

Farmer Adaptation and Barriers

AGRICULTURAL ADAPTATION

70.7%

AGRICULTURAL ADAPTATIONS

Change in sowing and planting date

63.9 % | 31 %

Change in use of fertilizer

41.7 % | 27 %

Shading and shelter

2.8 % | 3 %

Reducing Farm Size

5.6 % | 14 %

Change in cropping pattern

37 % | 34 %

Pest management practice

45.4 % | 23 %

Change in frequency of irrigation

35.2 % | 47 %

Agriculture allied activities

1.9 % | 8 %

Bueng Cham Or

Sala Kru

Farmer Adaptation and Barriers

ROLE OF GOVERNMENT IN ADAPTATION

61%

ROLE OF LOCAL GOVERNMENT

Capacity building and information sharing

45.6 % | **25 %**

Investment in research & development

21.3 % | **43 %**

Formation of community based water management groups

50.9 % | **8 %**

Bueng Cham Or

Sala Kru

Farmer Life Satisfaction

LIFE SATISFACTION

Focus

Quality of Life

- Agriculture
- Social aspects/ Community
- Income/ assets holding
- Family characteristics

Difference in the level of satisfaction of farmers of Bueng Cham Or and Sala Kru

Statement	Likert Scale (Mean)		Percentage Difference
	Bueng Cham Aor	Sala Kru	
Income/ Assets holding	3.7	2.85	23%
Agriculture	3.5	2.8	20%
Social Aspects /Community	3.67	3.23	11%
Family Characteristics	3.93	3.6	8.5%

(* 1= not at all satisfied and 5=highly satisfied)

SUSTAINABLE DEVELOPMENT GOALS

Achievements

SDG10
Reduced Inequality

SDG9
Innovation

SDG11
Sustainable
Communities

SDG8
Economic Growth

SDG13
Climate Action

SDG7
Clean Energy

SDG15
Life on Land

SDG5
Gender Equality

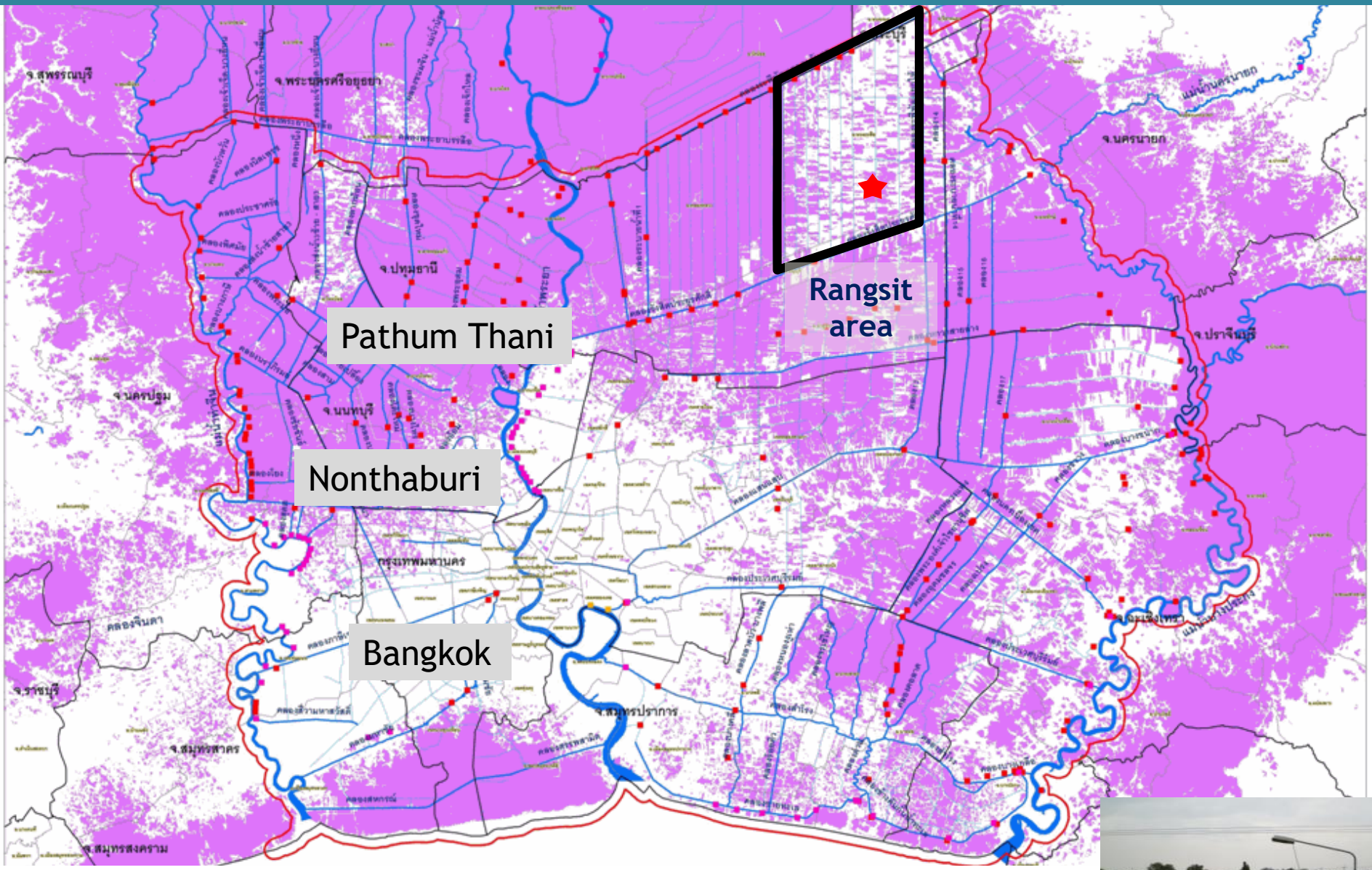
SDG17
Partnership
for the
Goals

SDG2
Zero Hunger

SDG1
No Poverty

For more information of
Rangsit Community
https://youtu.be/ozzUcTuza0s

Extreme Event: Chaophraya Flood 2011 (in pink)



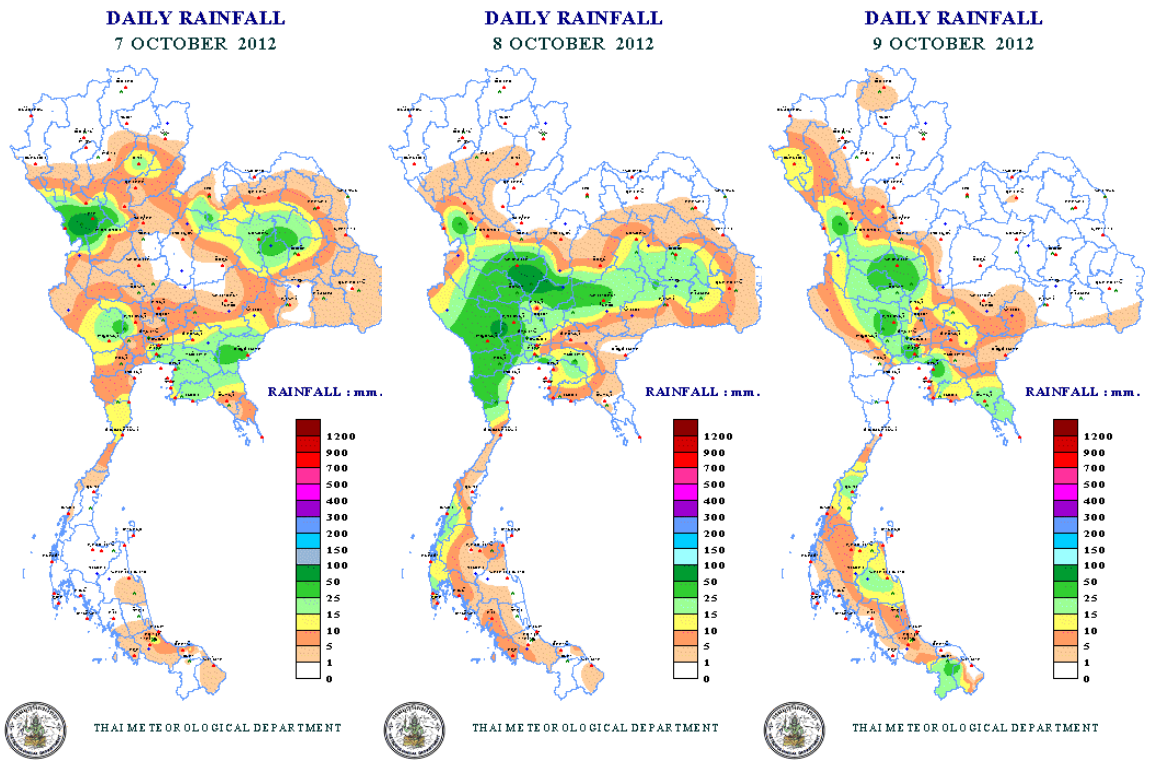
Store flood from Raphiphat canal to sub-canals in the area to delay the flood before flushing to Rangsit canal

Extreme Event: Flood Reduction during Gaemi Typhoon 2012

7 - 9 October 2012

- Gaemi typhoon hit Thailand and caused flood in Eastern, Central and Western of Thailand
- Some part of Bangkok was flooded by heavy rain
- Need to find retention area to retain flood before flushing to Bangkok

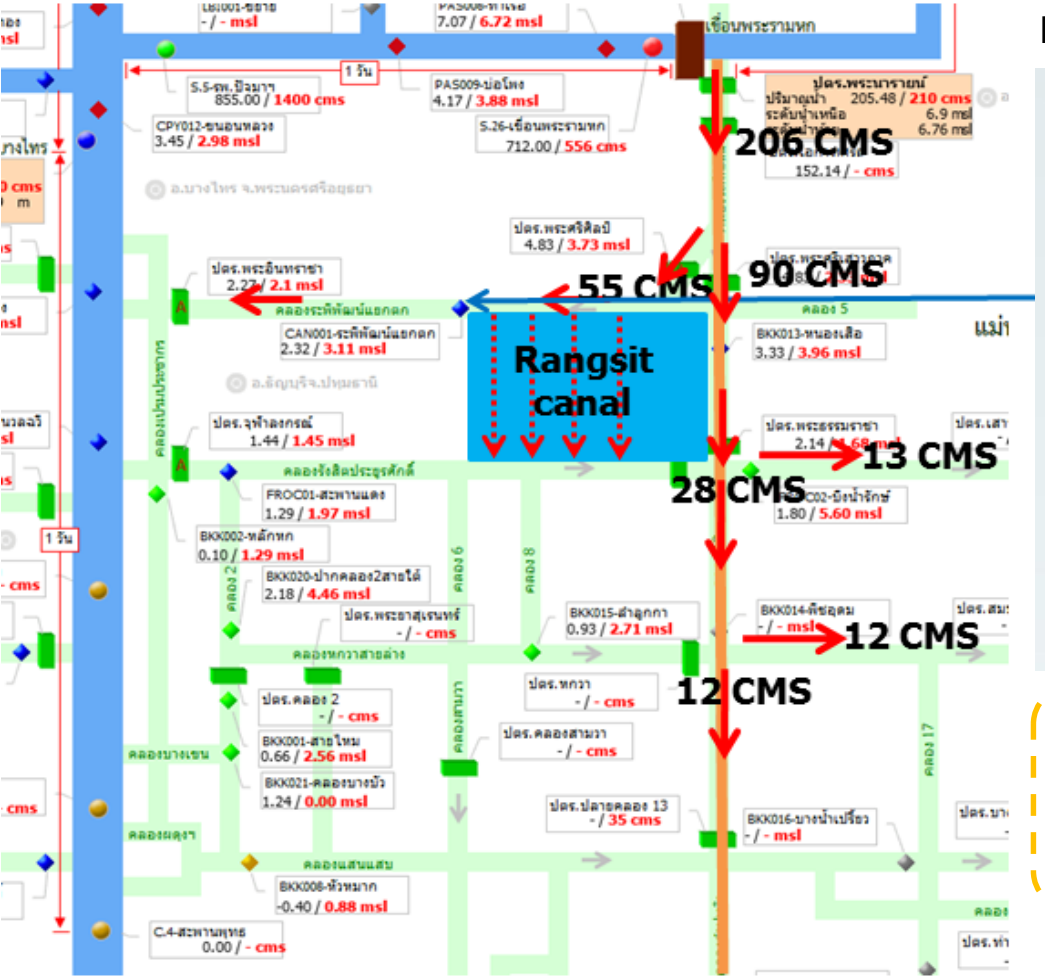
With early warning, Rangsit community can drain their existing water and retained **17 MCM of flood** before flushing to Ayutthaya, Nonthaburi, and Bangkok.



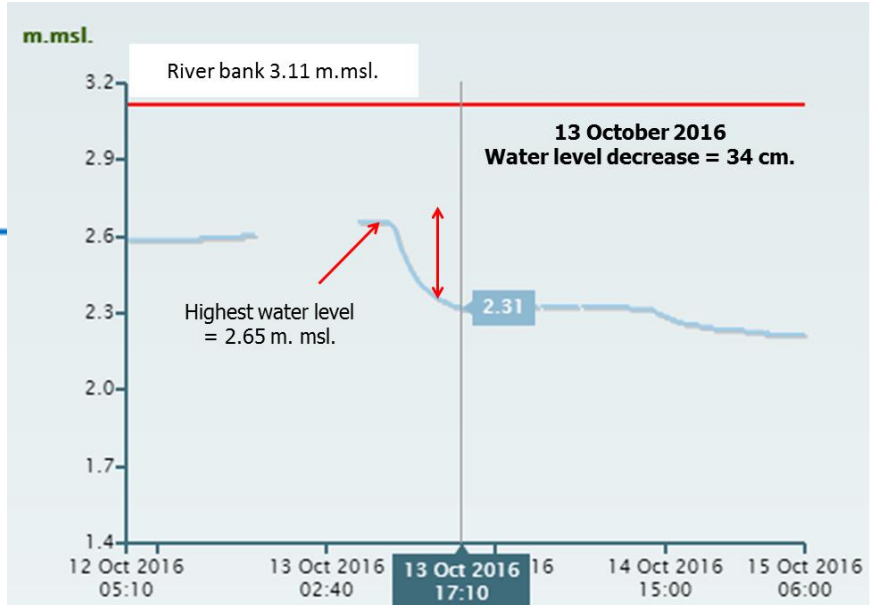
Extreme Event: Flood Risk Reduction during Rai Typhoon 2016

September - October 2016
Tropical storm “Rai” blew to north eastern Thailand
Very high dam level in Chao Phraya and Pa Sak dam
Drain water along Pa Sak river through Raphiphat canal

Rangsit community opened their Watergates to drain overflow to Rangsit Retention Area



Reduced water level in Raphiphat canal

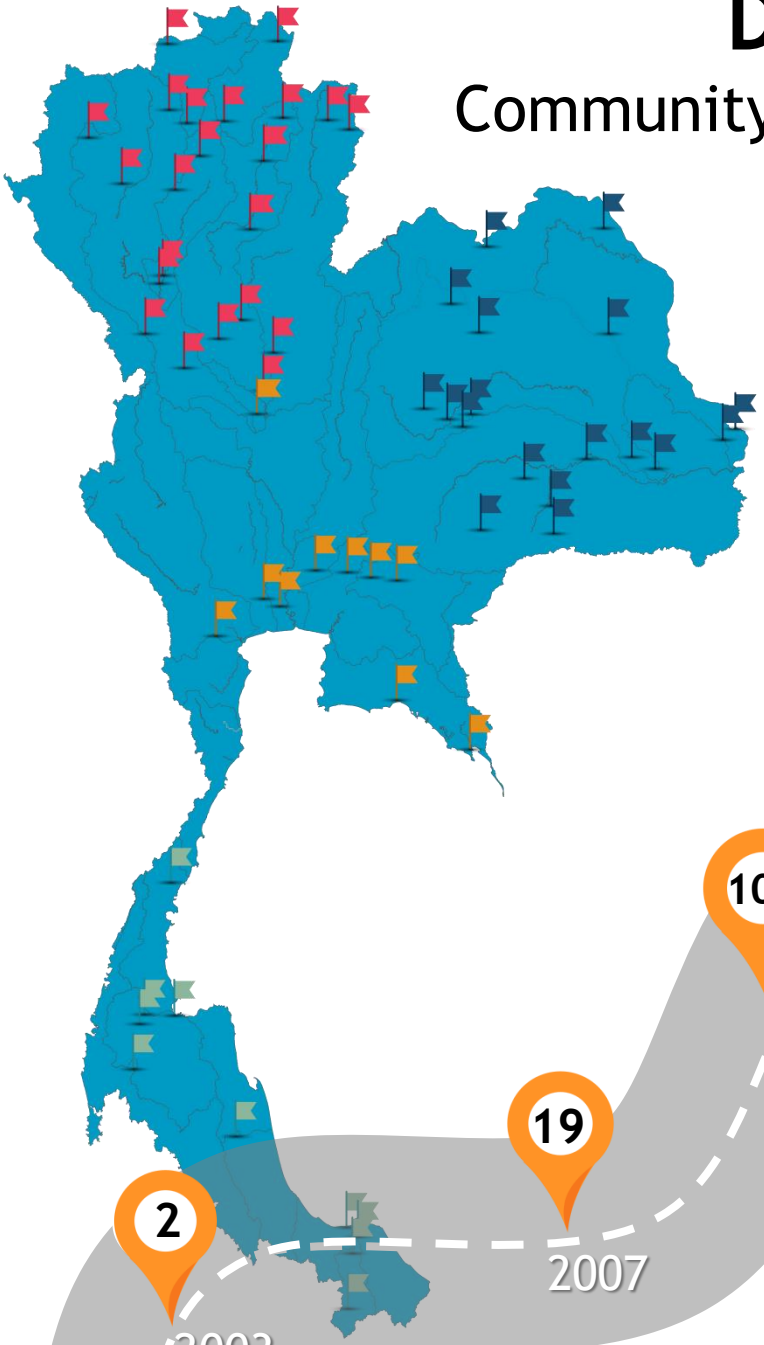


Water level in Raphiphat canal decreased 34 cm within half a day without any flood in community

BRIDGING SUSTAINABILITY

Development Pathway

Community Water Resource Management Network



2003 — 2

2007 — 19

2008 — 106

2011 — 291

2015 — 603

2016 — 932

2017 — 1,258

End of 2017

60 Core Communities

1,258 Villages

19 River Basins

Number of villages in CWRM Network

Sufficiency Economy Philosophy (SEP) for Sustainable Development

SEP

Knowledge

- Learning by Doing

Virtues

- Participation Laws & Justices

Reasonableness

- Data, Fact, Apply S&T

Moderation

- Management, Planning, Monitoring, and Assessment

Prudence

- Disaster Risk Reduction and Climate Change Resilience

SDGs

Sustain Environment

- Water, Forest, Soil, and Energy

Sustain Economy

- Food and incomes

Sustain Society

- Livelihood and Health

Sustain Culture

- Community-driven and network

SUFFICIENCY ECONOMY PHILOSOPHY for SUSTAINABLE DEVELOPMENT GOALS

THANK YOU