Thai Water Expo 2021

Regional Water Talks 2021 (Thailand)

Water Balance Assessment and National Water Management Guidelines

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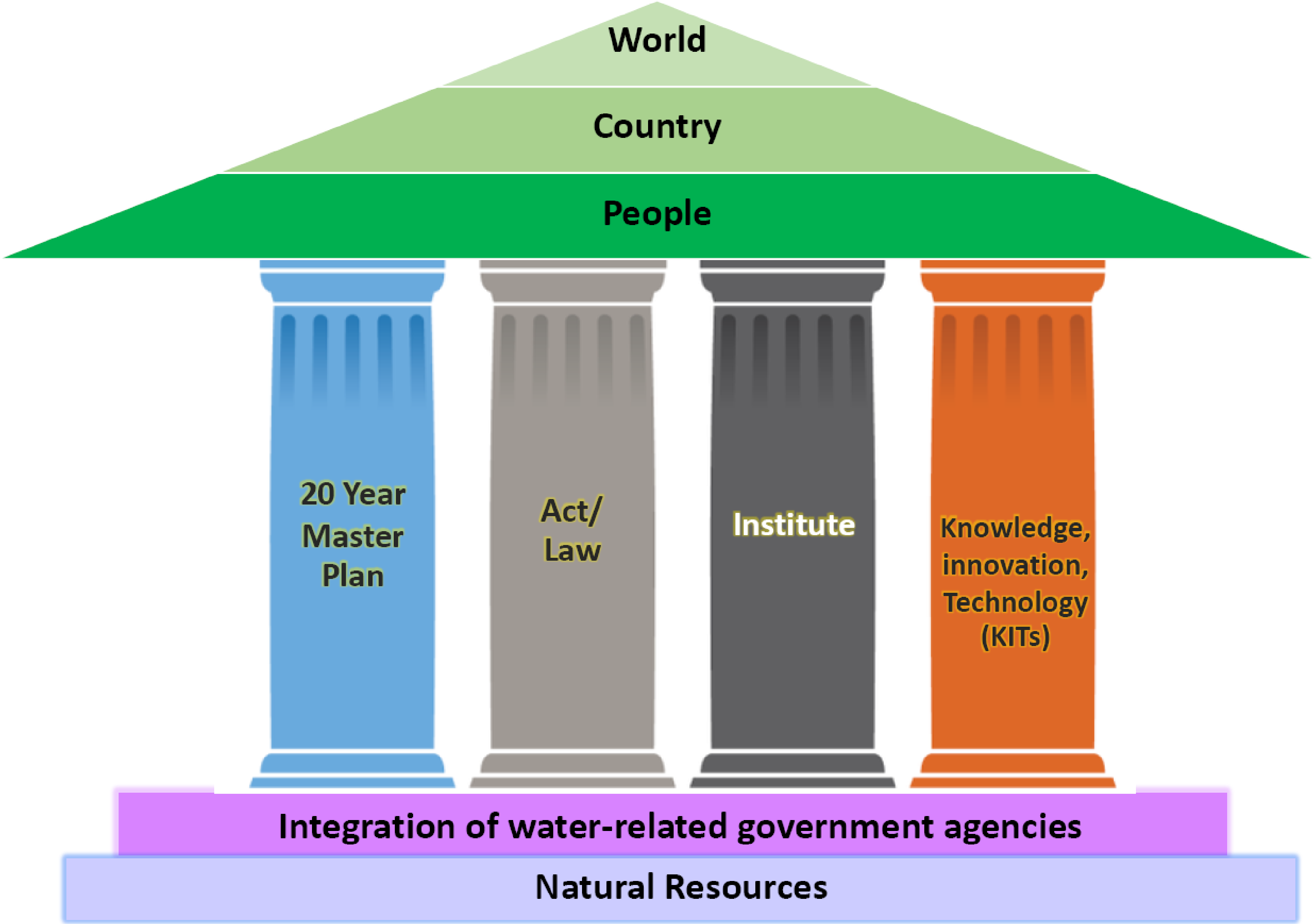
5th August 2021

The Four Pillars: Concept for Management



The 20 Year Water Resources Master Plan

1 20 Year National Strategy : goals

- Security
- Competitiveness
- Capacity development
- Equality and Equity
- Environmental friendly
- Management and Government

2 Master plan (under the National Strategy) Issue 19: Water Resources Management

23 Issues

19
การบริหารจัดการน้ำทั้งระบบ

19.1 Watershed-based management for **water security**

19.2 Increase **water productivity and value** to reach international standard

19.3 **Conservation and restoration natural water courses** nationwide

3 20 Year Water Resources Master Plan: to support the Master Plan Issue 19

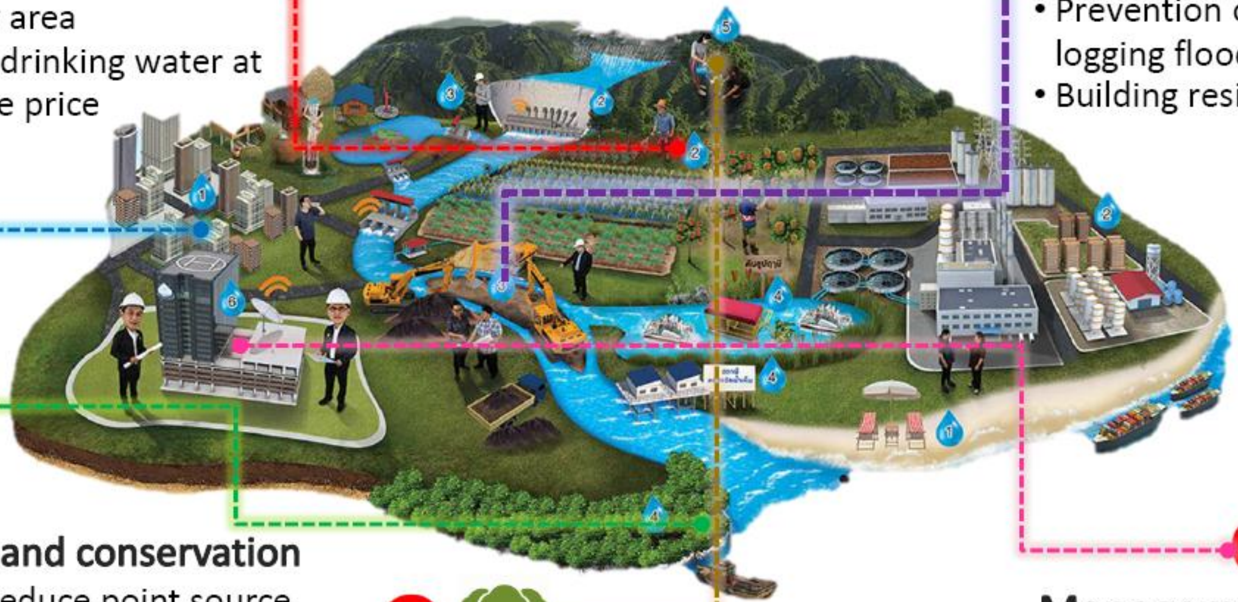
- Domestic use
- Water security for production sector
- Flood management
- Water quality and conservation
- Upstream forest restoration
- Management

The 20 Year Water Resources Master Plan

1 Domestic Use
- Provide clean water for all villages, cities, tourist hotspot and economic zone
- Provide sufficient water for water-scarcity area
- Provide clean drinking water at the reasonable price

2 Water for production (Agri + Ind)
- Develop water storage and delivery system
- Develop alternative water sources
- Rain harvesting
- Increase water use efficiency

3 Flood management
- Improve drainage capacity
- Integrated land use planning: waterways schematics vs. land use map
- Prevention of city/ community logging flood
- Building resilience in risk area



4 Water quality and conservation
- Prevent and reduce point source
- Construct community wastewater treatment plant
- Reuse and recycle
- Allocate sufficient water for ecosystem services
- Natural watercourse restoration and renovation

5 Watershed conservation
- Upstream forest restoration
- Prevent soil erosion in highly steep agricultural area

6 Management
- Institute, Laws
- International cooperation and finance
- Data and Monitoring system
- Participation approach
- R&D, KITs

Institutional Framework for Water Resources Management

Cabinet

National Water Resources Committee (NWRC)

Chairman: Prime Minister/ Secretary: SG of ONWR

Office of the National Water Resources (ONWR)

Center for Water Crisis Management
- Collaboration and Integration during water crisis/ emergency

Data/ Information
- MOAC
- MOI
- MNRE
- MDES
- Ministry of Energy
- HAI

Master Plan and Action Plan
- All water-related agencies
- Local participation

Project and Budget
- Proposed projects with sound budget must be aligned with the Master plan/ National Strategy

River Basin Committees/ Regional and local implementing agencies

6

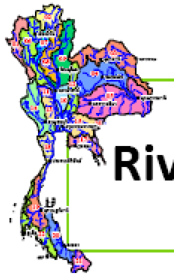
What are new? (Water Law)

Definition of Water Resources

Water Management
- ✓ Water allocation criteria
- ✓ Water use category

River Basin Planning

Waterways Plan (Schematic)



River Basin Identification

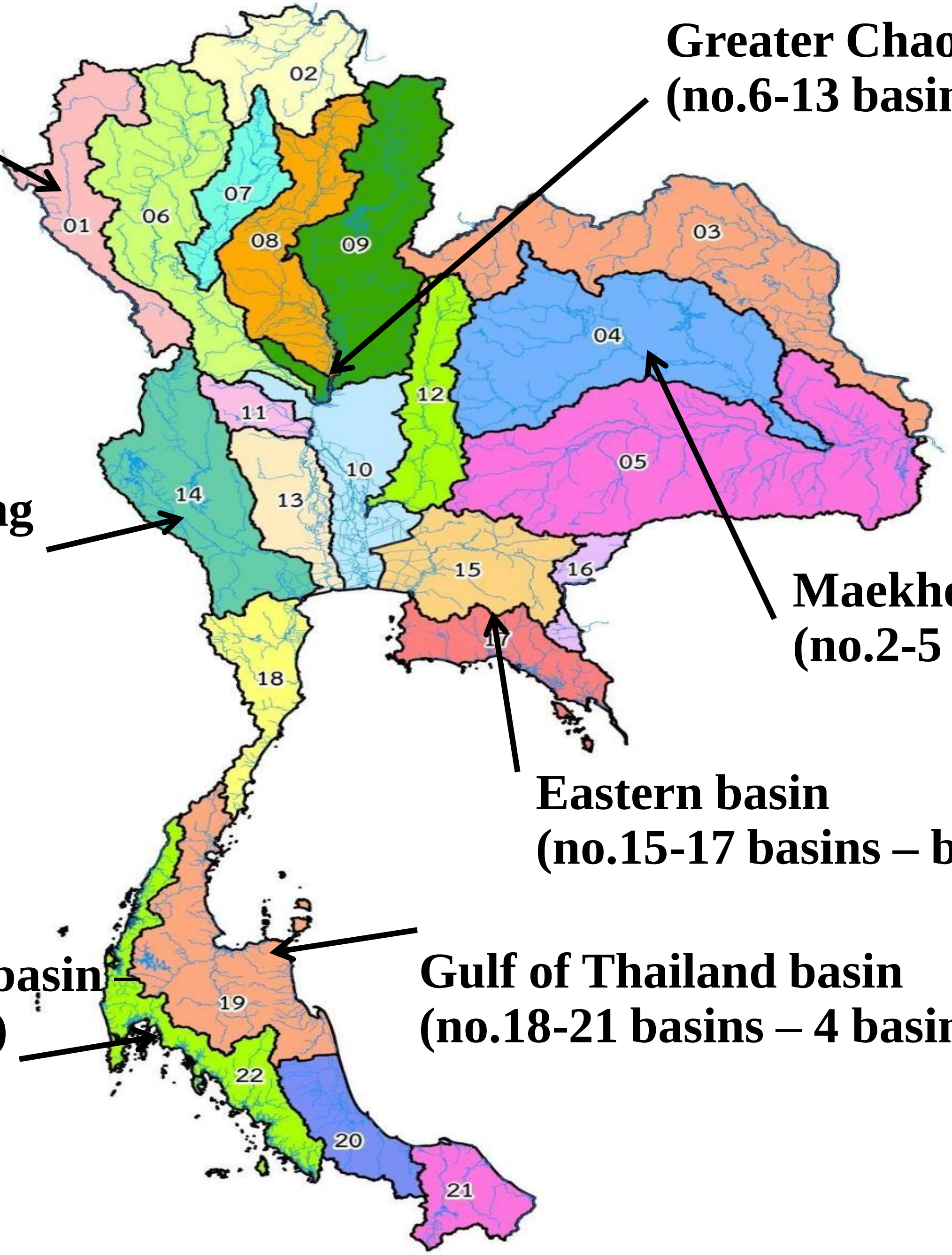
The **Prime Minister, Minister of MOAC, Minister of MNRE and Minister of MOI** shall have responsibility and control for the execution of this Act, and shall have the authority to <u>appoint an officer</u> and issue a Ministerial Rule for the purpose of he execution of this Act

Institutional Framework
- ✓ National Water Resources Committee
- ✓ River Basin and River Basin Committee
- ✓ Water User Association

Special National Command Centre for Water Crisis

Salawin basin

Greater Chaopraya basin
(no.6-13 basins – 8 basins)



Maeklong
basin

Maekhong branches basin
(no.2-5 basins – 4 basins)

Eastern basin
(no.15-17 basins – basins)

Southwestern basin –
(Andaman sea)

Gulf of Thailand basin
(no.18-21 basins – 4 basins)

River basin in Thailand

Total of 22 river basins

Hub of International Water Corporation

Bilateral

America

USA

Asia-Oceania

Australia

China

Israel

Japan

Korea

Europe

France

Germany

Hungary

Netherlands

Multilateral

ACMECS

LMC

LMI

MRC

Organisation/ MDB

ASEAN

Asia Water Council

UN (FAO, UNDP, UNEP, UNESCO, UNFCCC, WHO etc.)

World Bank

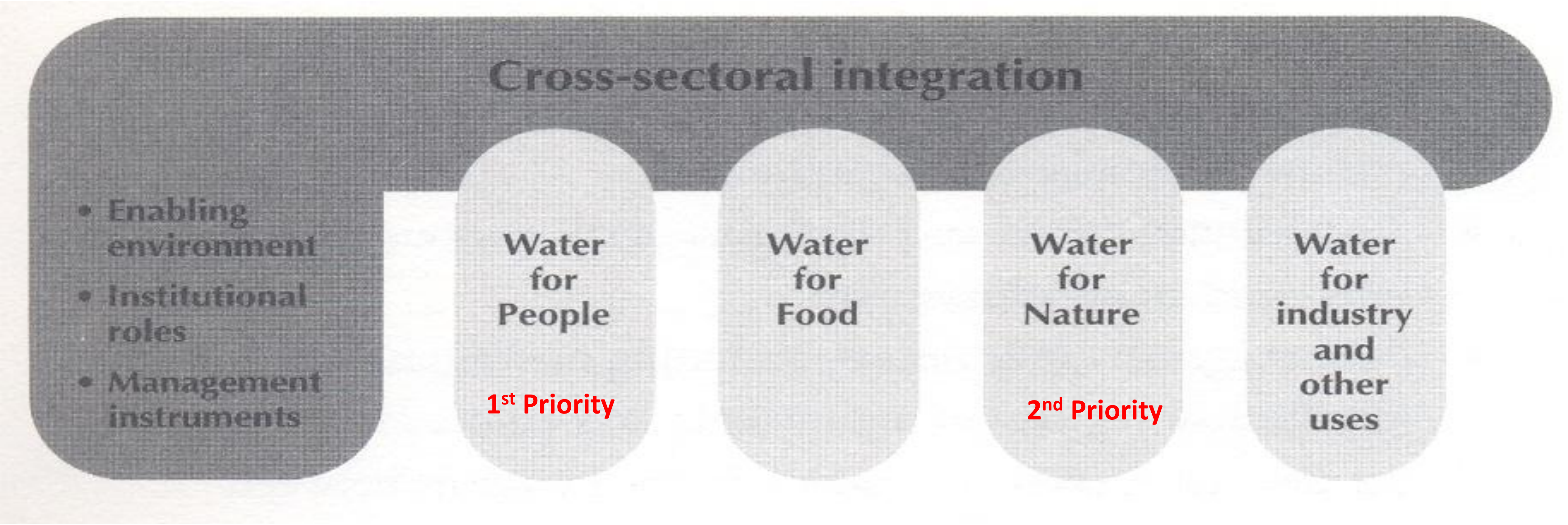
The Power of Partnership

Academic institutes

Local communities

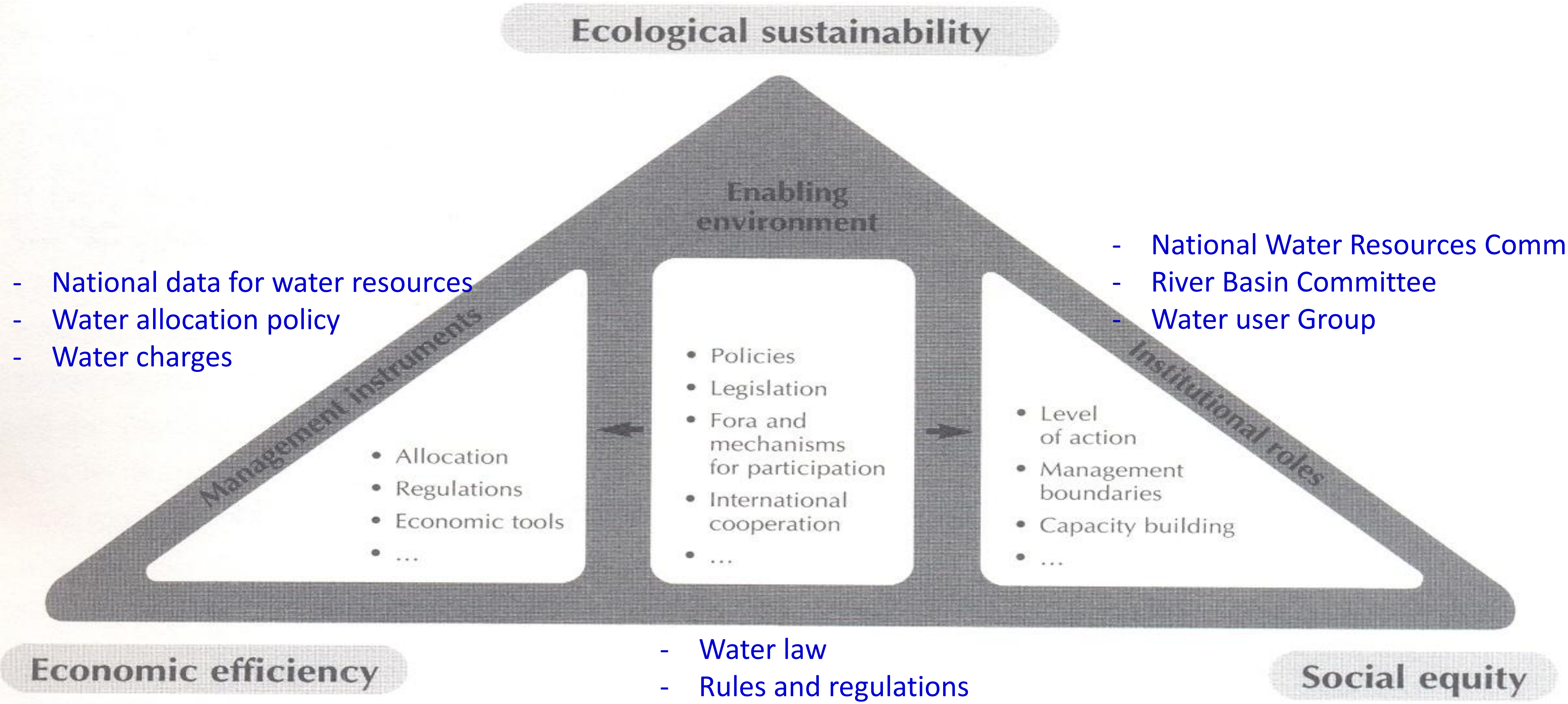
International partners

Adaptation of Integrated Water Resources Management to National Water Management



- National data for water resources
- Water allocation policy
- Water charges

- National Water Resources Committee
- River Basin Committee
- Water user Group



- Water law
- Rules and regulations

General framework for IWRM

Example of Policy on Water Resources Management

Priority of Water Allocation Plan for water demand according to water supply in Greater Chaophraya Basin

1. Domestic water supply

2. Water for Environment

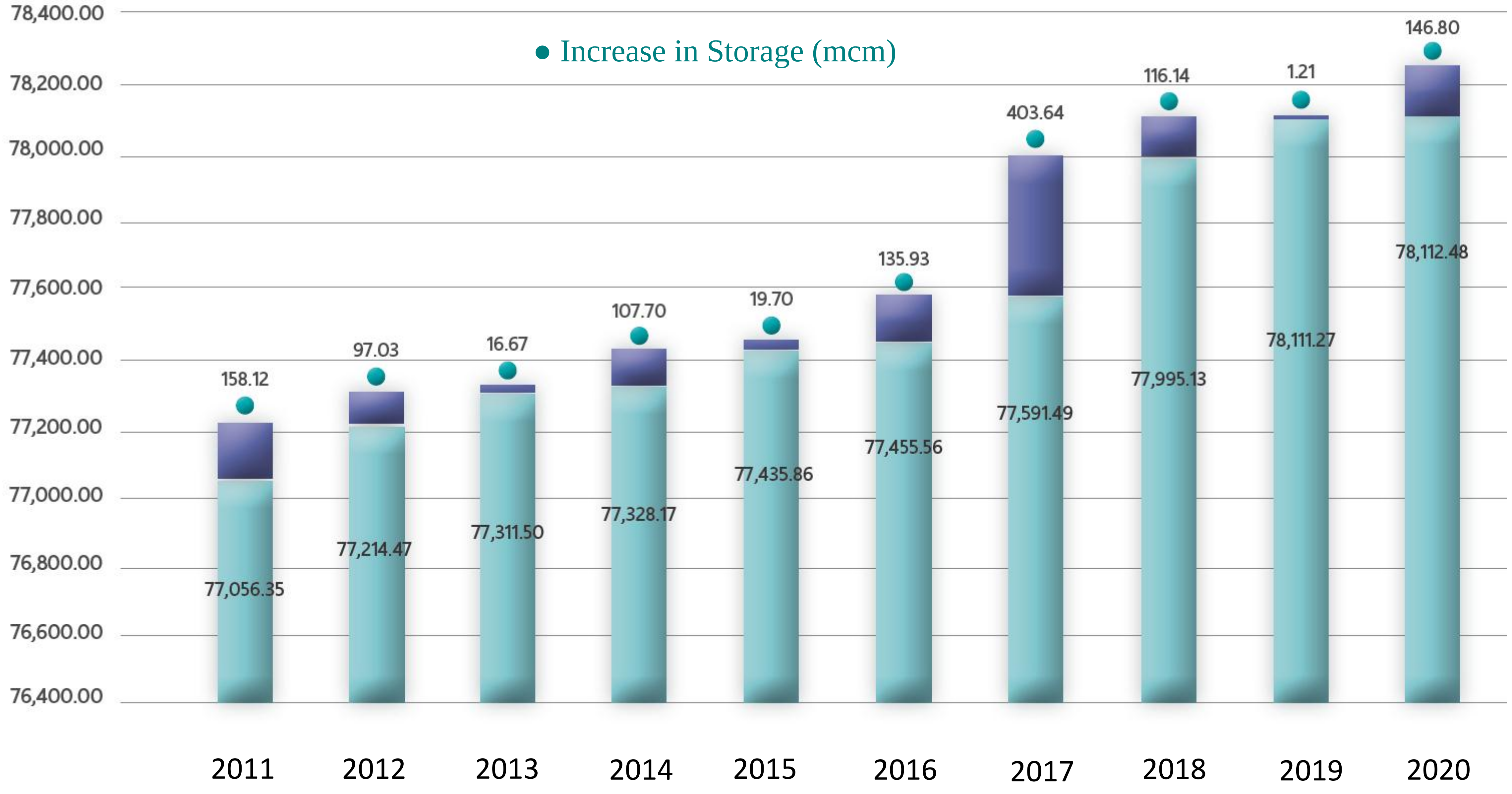
3. Water reserve for use in the early of wet-season

4. Agriculture

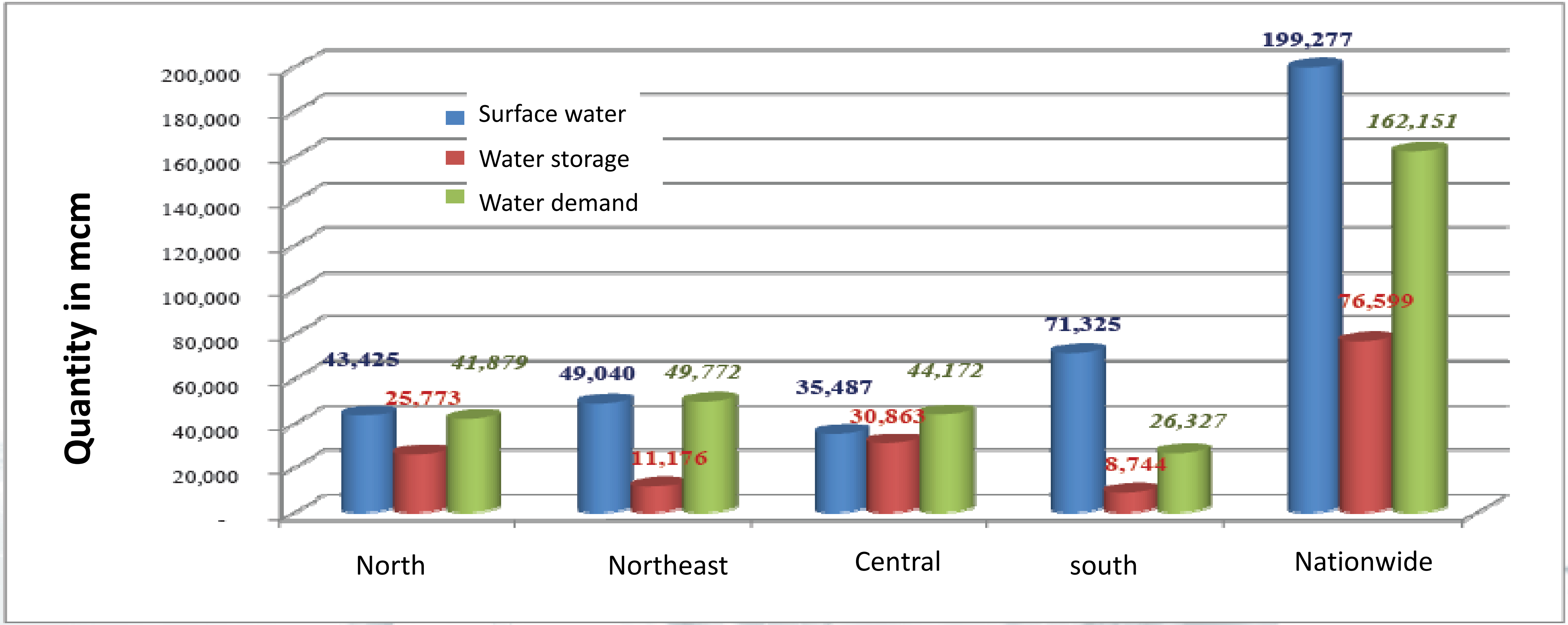
5. Industry and other

"Water must be sufficient for dry season and the residual should be enough for water use in the early of wet-season and water security of the coming year."

MCM (million cubic meter)



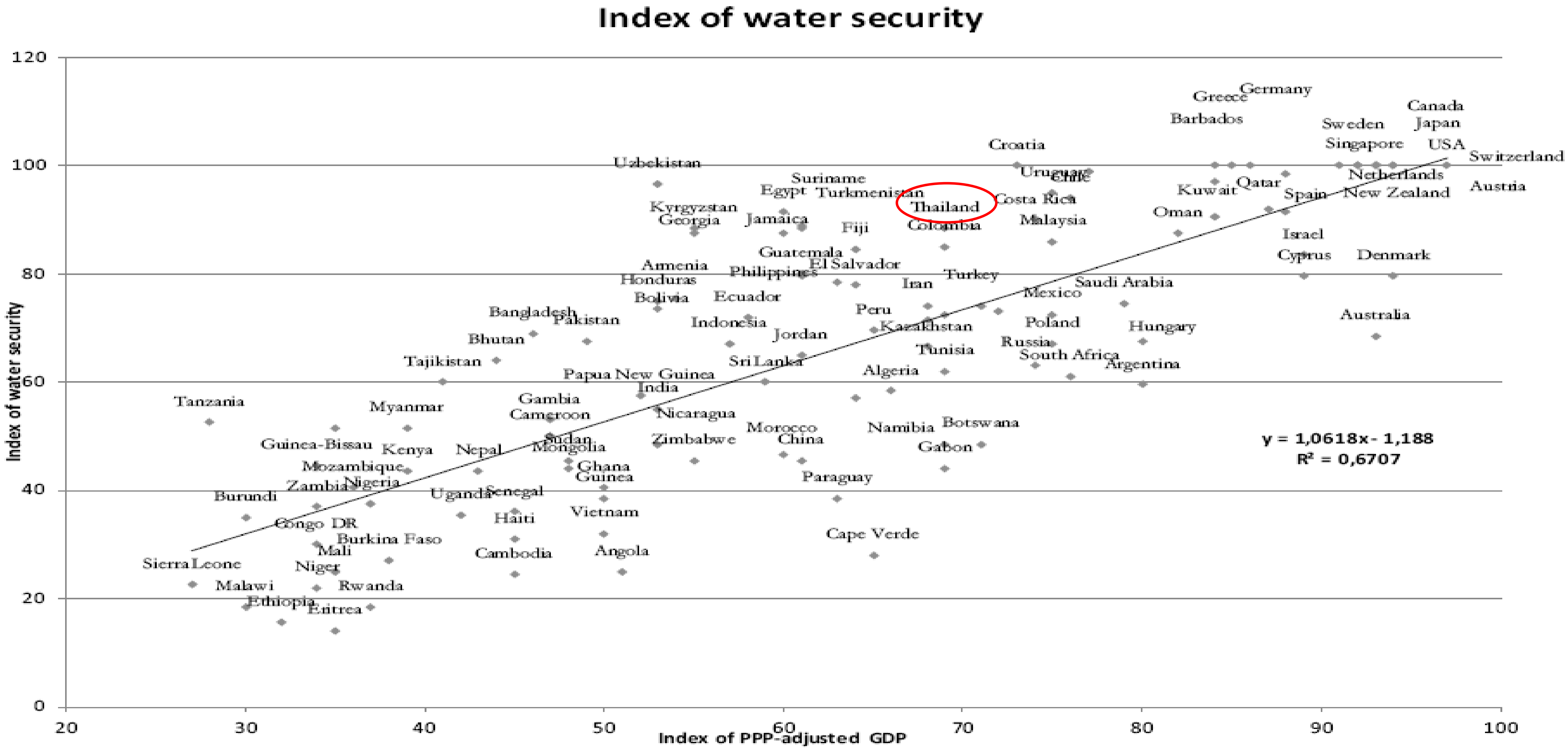
Water Supply and Reservoir Storage in Thailand



National and Regional Surface water, Water storage and Water Demand of Thailand

Water Security to support SDG

SDG 6.5 (and IWRM)



Effect of Climate Change to Delta Area of Costal River Basin

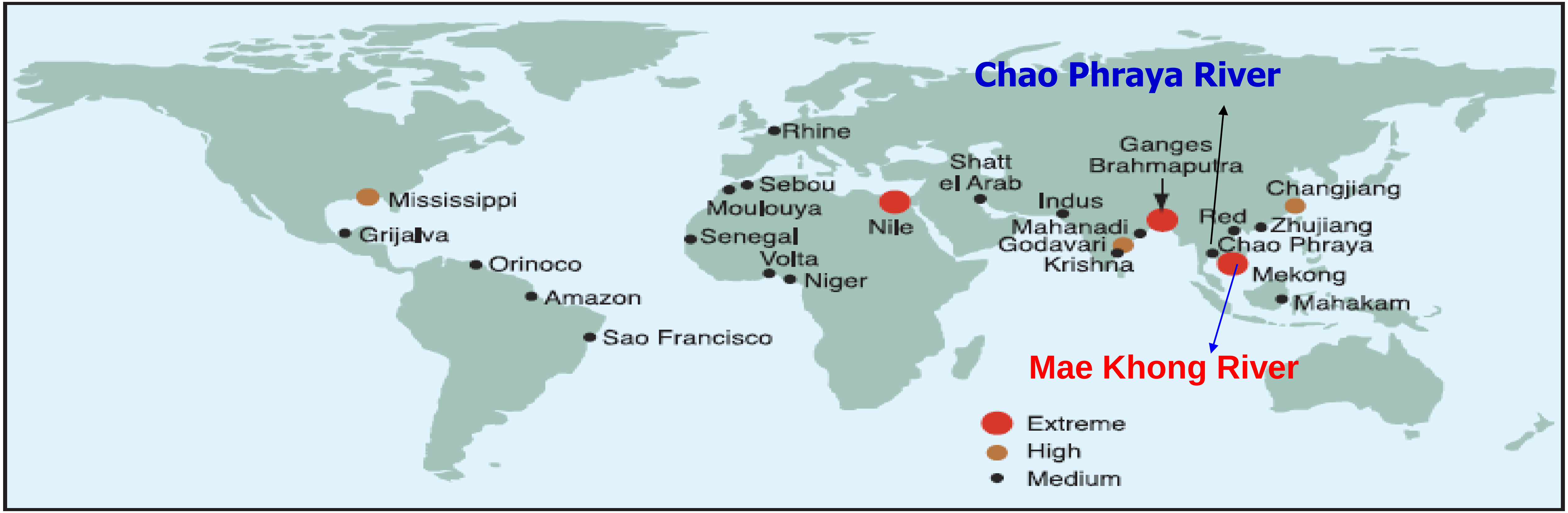
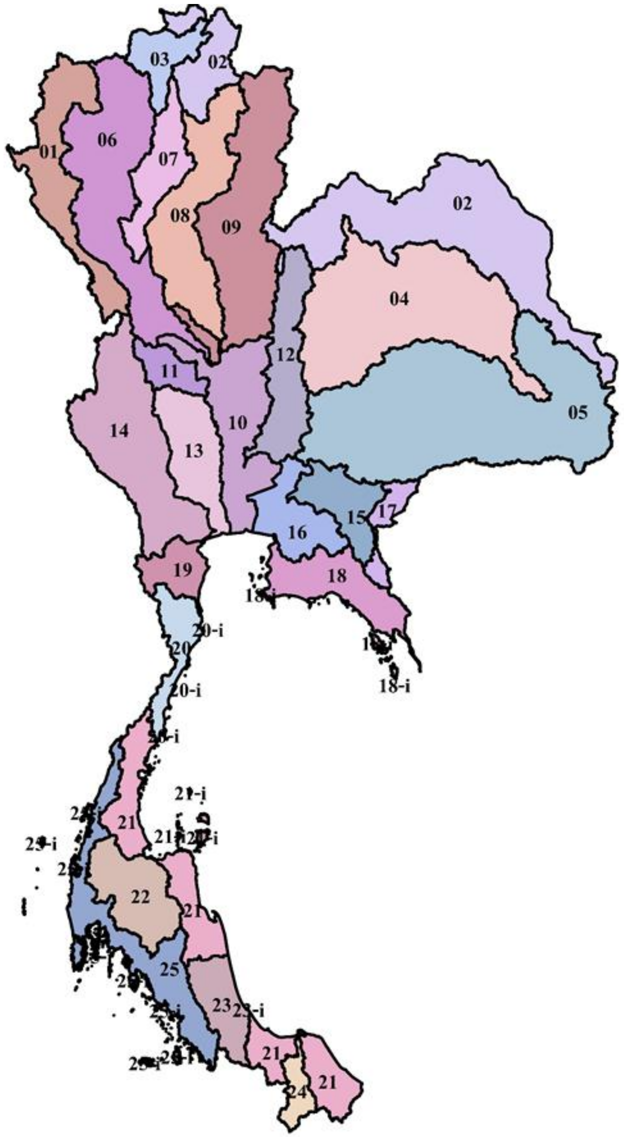


Figure 1. Relative vulnerability of coastal delta populations as indicated by population potentially displaced by current sea-level trends to 2050, including local effects. Extreme > 1 million people, high = around 500,000 people, and medium is > 5000 people potentially displaced (Source: IPCC 2007a, based on Ericson et al., 2005).

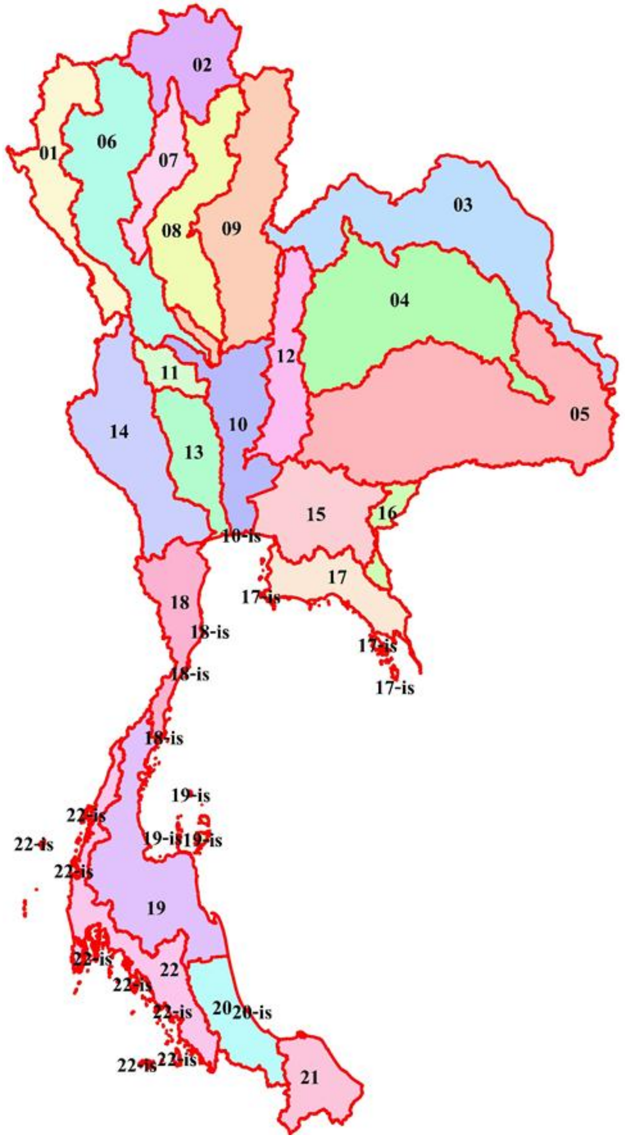
Thailand River Basin

25 Basin (Old)



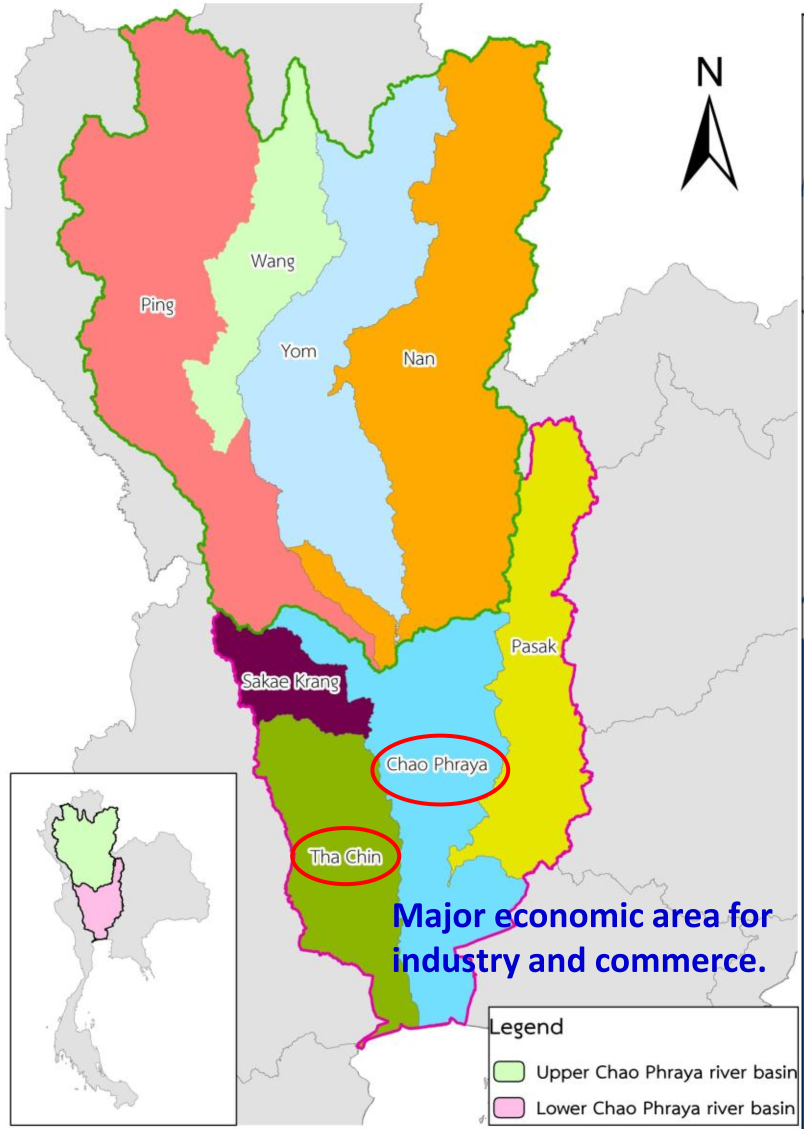
Code	25 Basin (Old)
01	Salawin
02	Khong
03	kok
04	Chi
05	Mun
06	Ping
07	Wang
08	Yom
09	Nan
10	Chao Phraya
11	Sakae Krang
12	Pasak
13	Tha Chin
14	Mae Klong
15	Prachinburi
16	Bang Pakong
17	Tonle Sap
18	East Coast Gulf
19	Phetchaburi
20	Prachuap Khiri Khan Coast
21	Peninsula - East Coast
22	Mae Nam Tapi
23	Thale Sap Songkhla
24	Mae Nam Pattani
25	Peninsula - West Coast

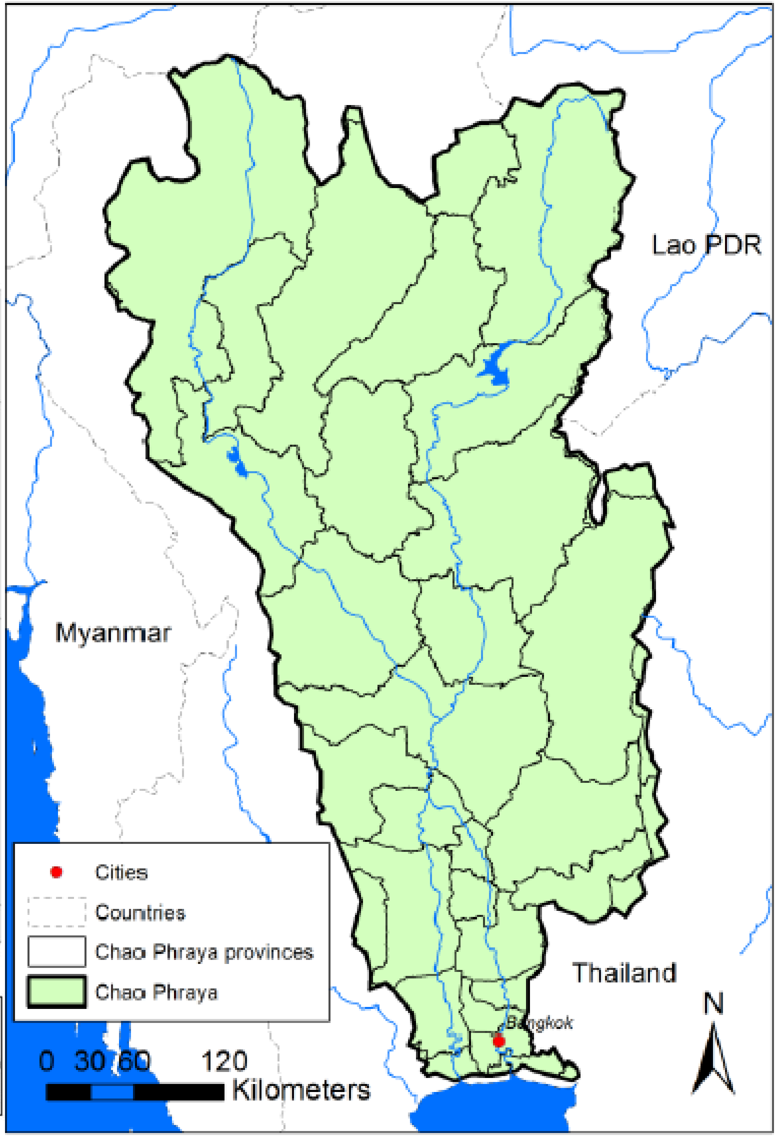
22 Basin (New)



Code	22 Basin (New)
01	Salawin
02	North Khong
03	Northeast Khong
04	Chi
05	Mun
06	Ping
07	Wang
08	Yom
09	Nan
10	Chao Phraya
11	Sakae Krang
12	Pasak
13	Tha Chin
14	Mae Klong
15	Bang Pakong (15 + 16)
16	Tonle Sap
17	East Coast Gulf
18	Phetchaburi - Prachuap Khiri Khan (19 + 20)
19	Peninsula - Upper East Coast (21 + 22)
20	Thale Sap Songkhla (23)
21	Peninsula - Lower East Coast (21 + 24)
22	Peninsula - West Coast

The Chao Phraya River Basin





- **The Chao Phraya River Basin** consists of Ping Basin, Wang Basin, Yom Basin, Nan Basin, Sakae Krang Basin, Pasak Basin, Tha Chin Basin and Chao Phraya River Basin
- The basin covers an area of **159,000 Sq.km.**, **corresponding to 30%** of Thailand’s land surface area.
- During the **rainy season** of **the Chao Phraya River Basin**, there are **frequent flooding in many provinces**, including Sukhothai, Phitsanulok, Pichit, Nakhon Sawan, Chainat, Ang Thong, Phra Nakhon Si Ayutthaya, Suphanburi, Nonthaburi, Samut Prakan and Bangkok.
- The Chao Phraya River Basin has the main water resources as follows: **Bhumibol Dam, Sirikit Dam, Khwae Noi Dam, Pa Sak Jolasid Dam, and Kiew Lom Dam, Kewkoma Dam** .

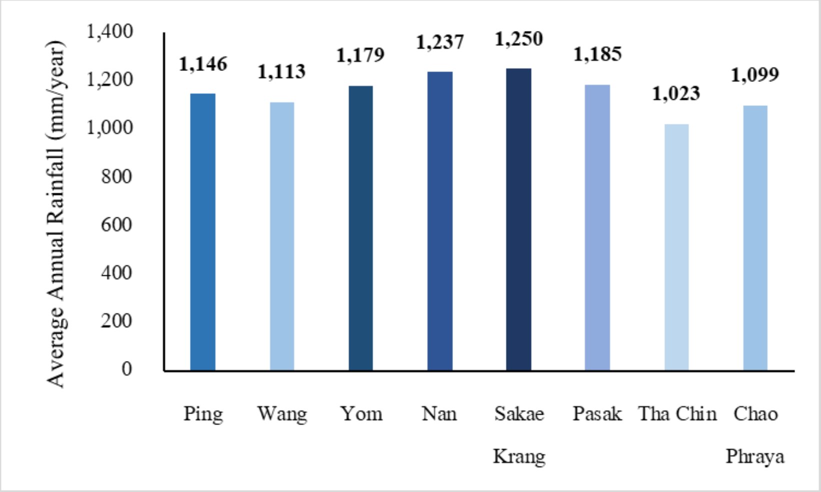
Source : Royal Irrigation Department (2017)

Rainfall and Runoff in The Chao Phraya River Basin

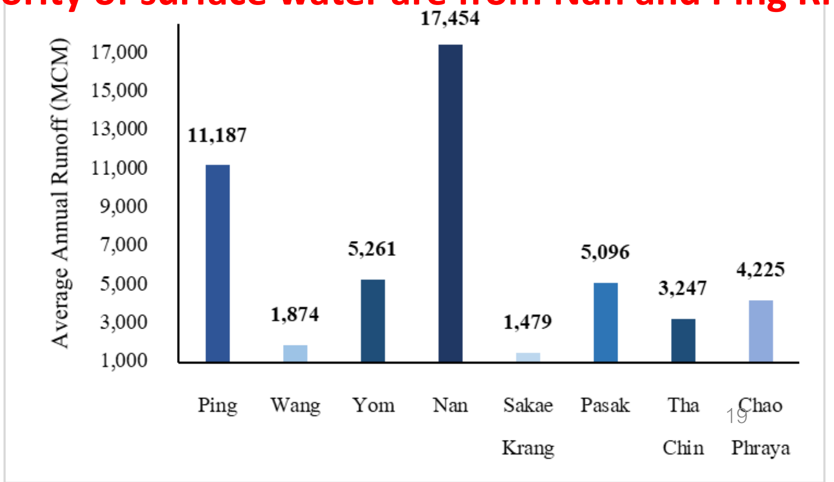
- Average annual rainfall = 1,163 (mm/year)
- Sum of average annual runoff = 49,823 (MCM)

Basin	Average Annual Rainfall (mm)	Average Annual Runoff (MCM)
Ping	1,146	11,187
Wang	1,113	1,874
Yom	1,179	5,261
Nan	1,237	17,454
Sakae Krang	1,250	1,479
Pasak	1,185	5,096
Tha Chin	1,023	3,247
Chao Phraya	1,099	4,225

Source : Office of the National Economic and Social Development Council (2017)

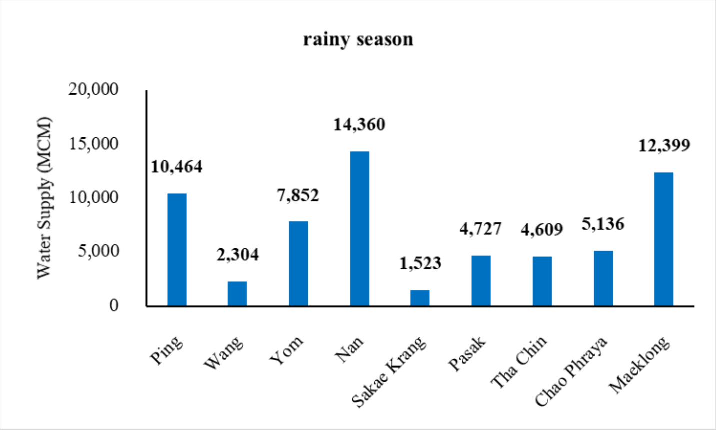


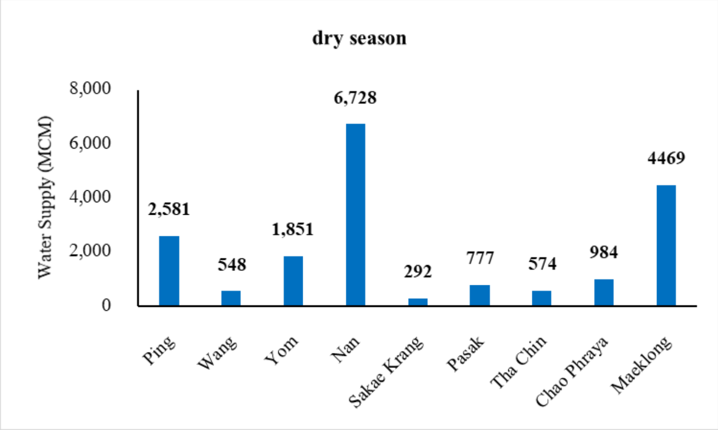
Majority of surface water are from Nan and Ping Rivers.

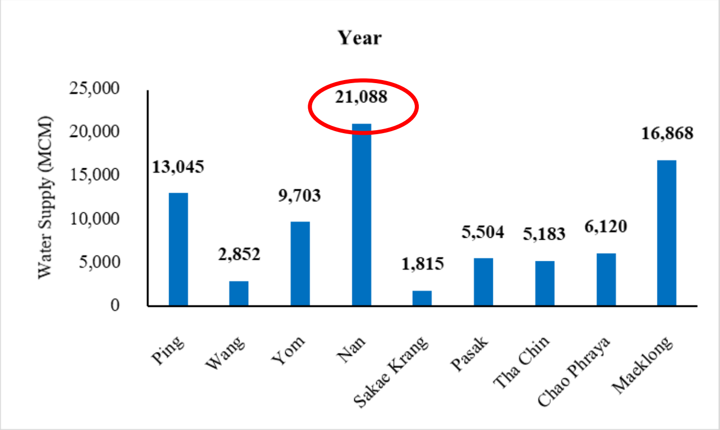


Water Balance in The Chao Phraya River Basin (2017)

Water Supply :

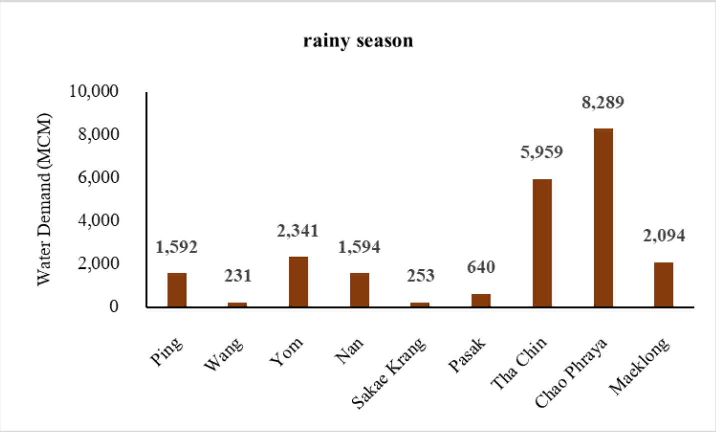


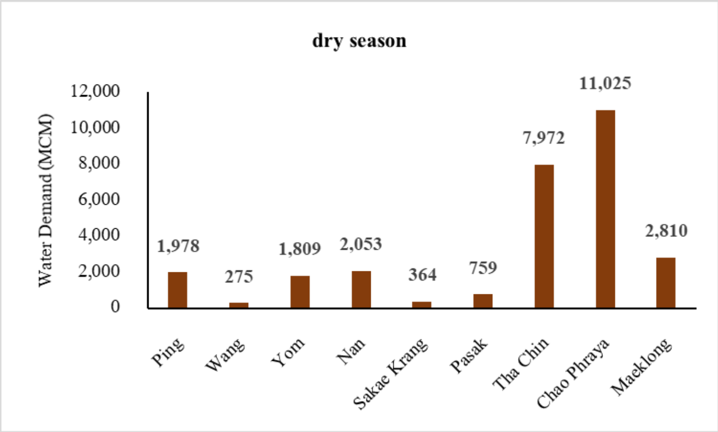


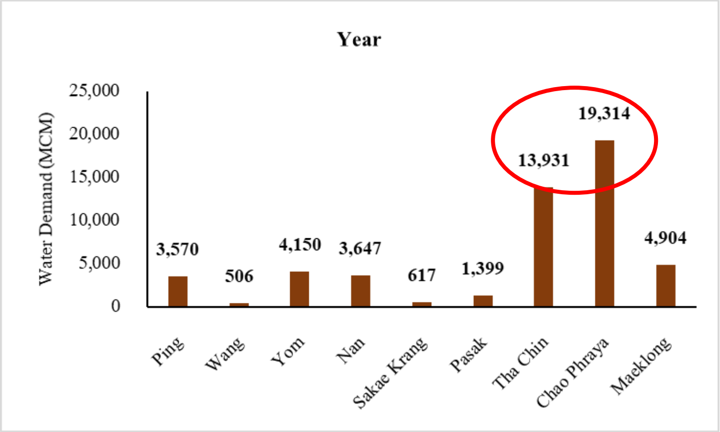


More than 70% of demand is agriculture.

Water Demand :



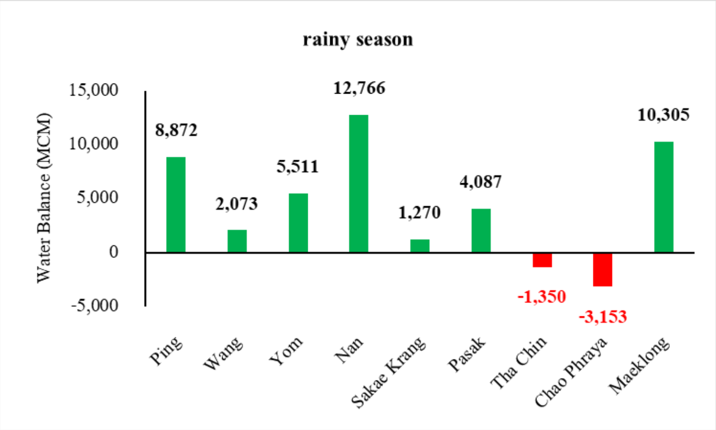


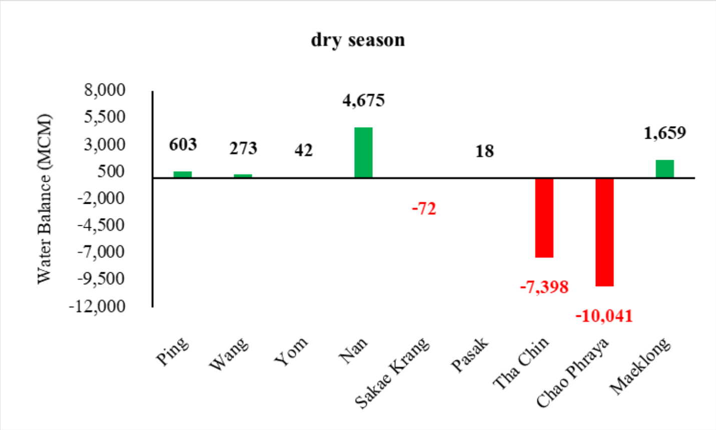


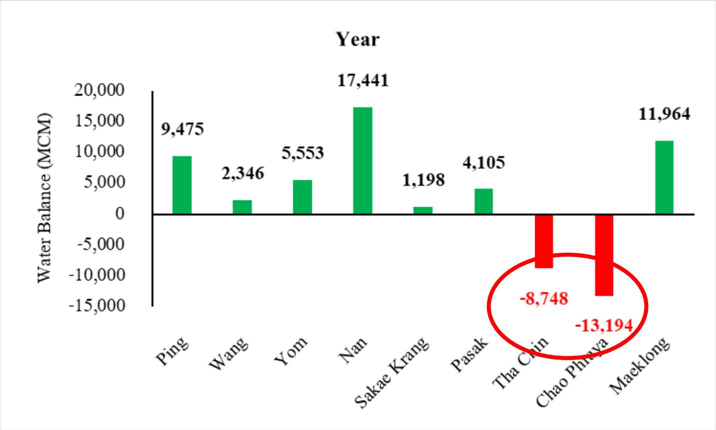
Source : Office of the National Economic and Social Development Council (2017)

Water Balance in The Chao Phraya River Basin (2017)

Water Balance :







Basin	Water List	Average Water Volume (MCM)		
		rainy season	dry season	Year
Ping	Water Supply	10,464	2,581	13,045
	Water Demand	1,592	1,978	3,570
	Water Balance	8,872	603	9,475
Wang	Water Supply	2,304	548	2,852
	Water Demand	231	275	506
	Water Balance	2,073	273	2,346
Yom	Water Supply	7,852	1,851	9,703
	Water Demand	2,341	1,809	4,150
	Water Balance	5,511	42	5,553

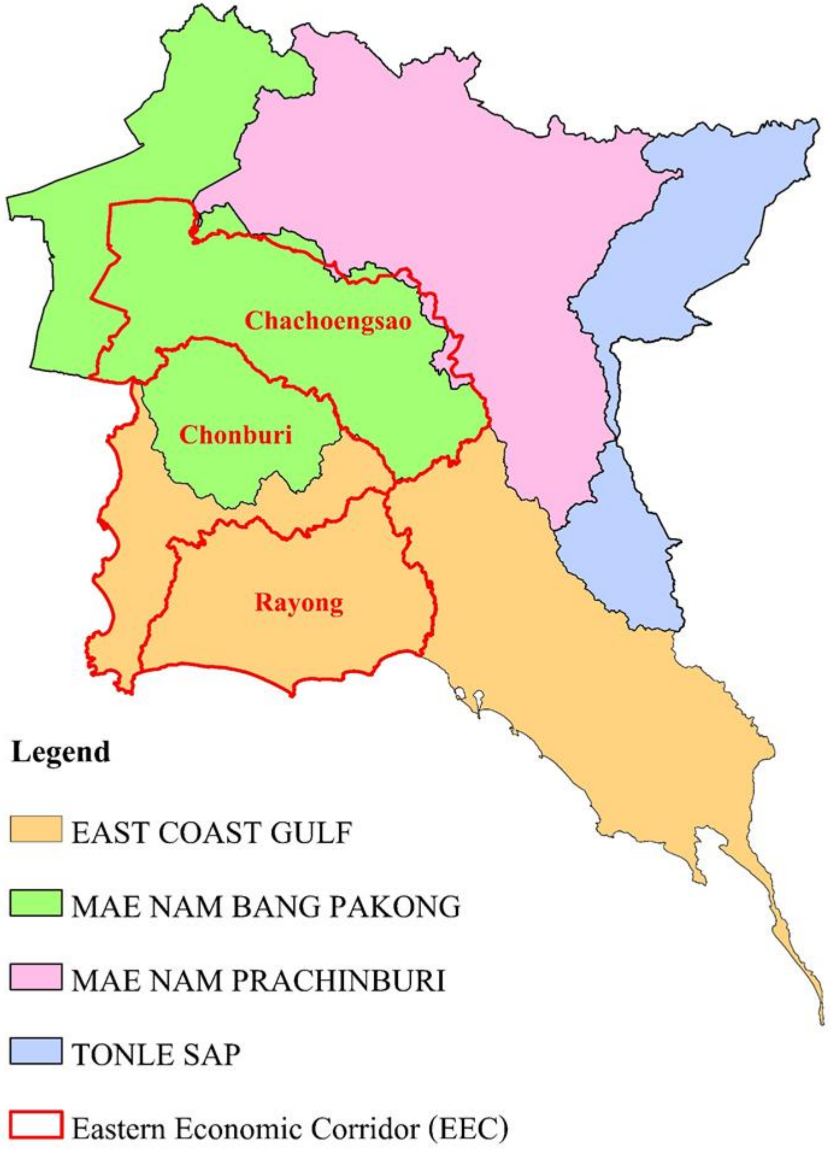
Basin	Water List	Average Water Volume (MCM)		
		rainy season	dry season	Year
Nan	Water Supply	14,360	6,728	21,088
	Water Demand	1,594	2,053	3,647
	Water Balance	12,766	4,675	17,441
Pasak	Water Supply	4,727	777	5,504
	Water Demand	640	759	1,399
	Water Balance	4,087	18	4,105
Sakae Krang	Water Supply	1,523	292	1,815
	Water Demand	253	364	617
	Water Balance	1,270	-72	1,198

Basin	Water List	Average Water Volume (MCM)		
		rainy season	dry season	Year
Tha Chin	Water Supply	4,609	574	5,183
	Water Demand	5,959	7,972	13,931
	Water Balance	-1,350	-7,398	-8,748
Chao Phraya	Water Supply	5,136	984	6,120
	Water Demand	8,289	11,025	19,314
	Water Balance	-3,153	-10,041	-13,194
Mae Klong	Water Supply	12,399	4,469	16,868
	Water Demand	2,094	2,810	4,904
	Water Balance	10,305	1,659	11,964

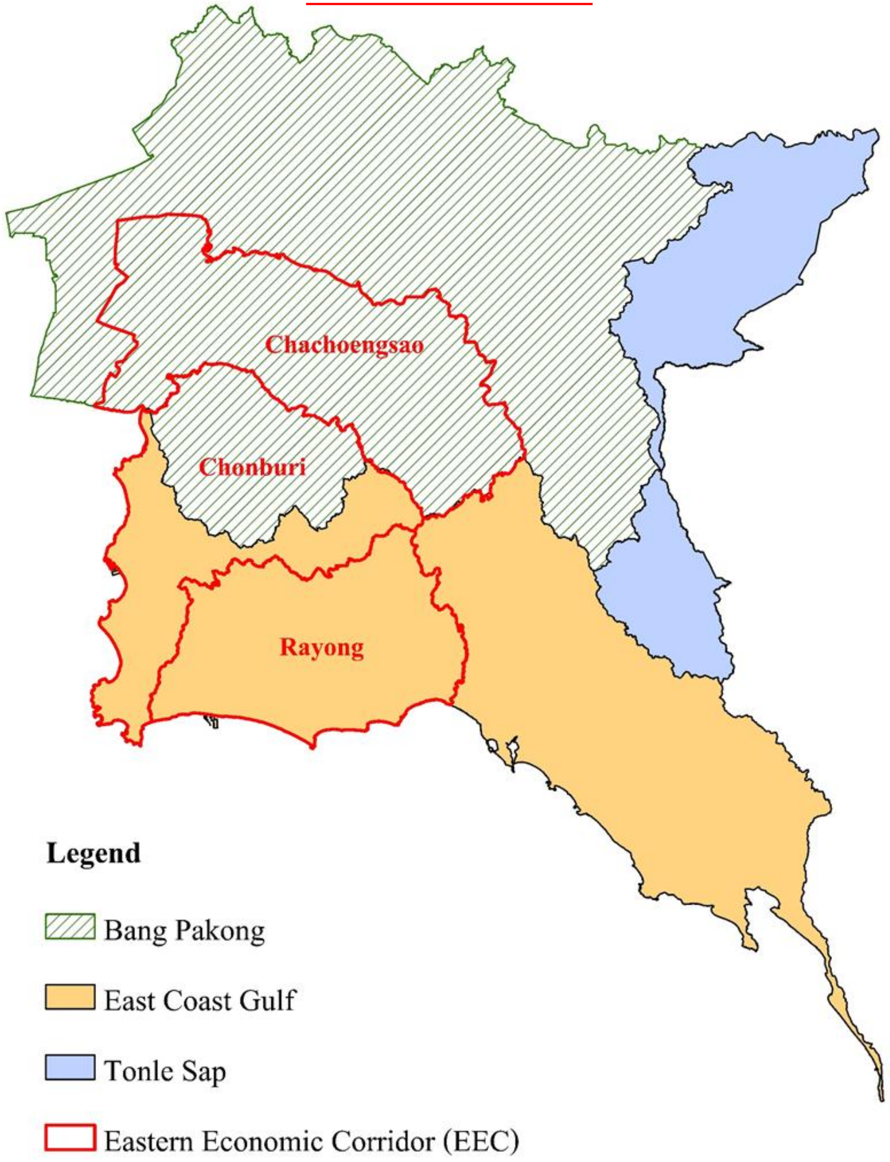
Source : Office of the National Economic and Social Development Council (2017)

Eastern Basin

Old Basin

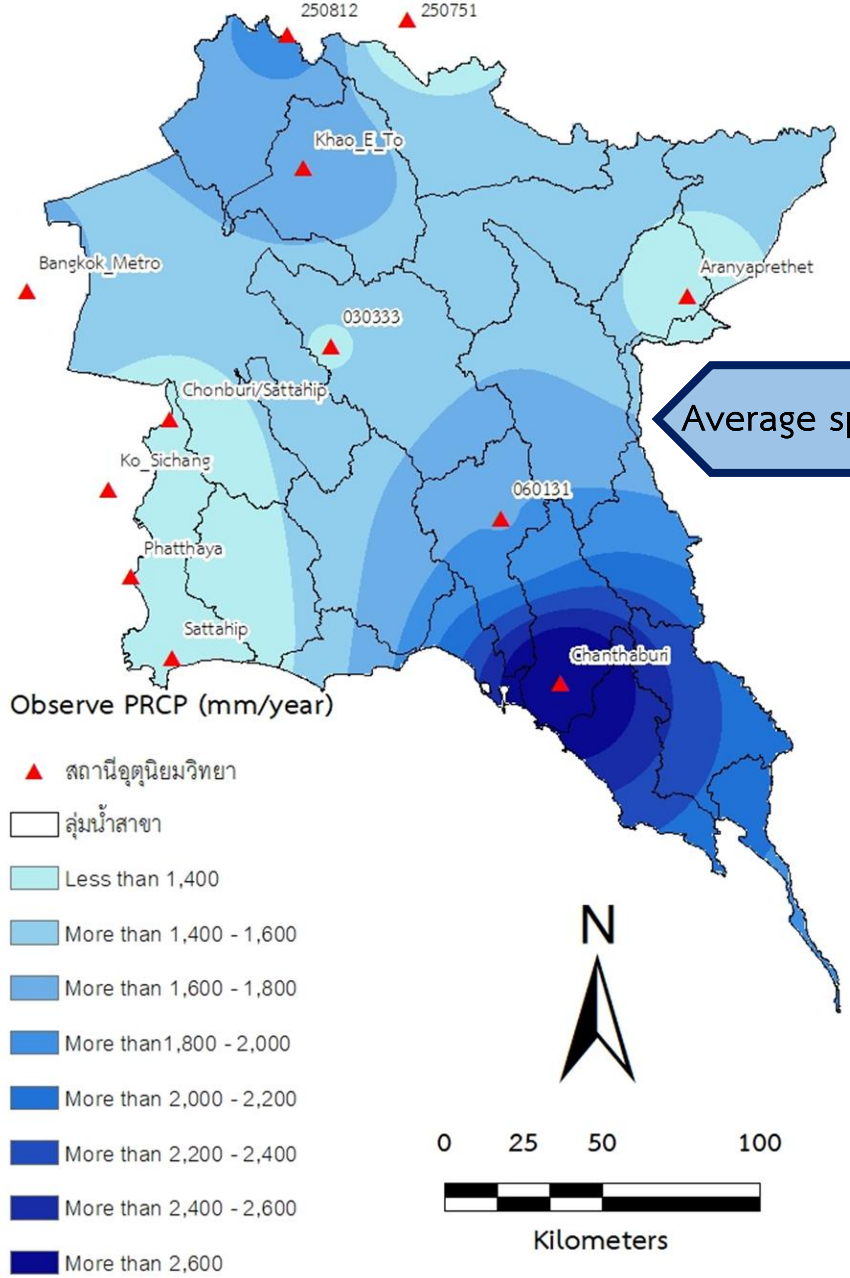


New Basin



- **The East Basin** (New Basin) consists of East Coast Gulf Basin, Bang Pakong Basin (Bang Pakong Basin + Prachinburi Basin) and Tonle Sap Basin
- The Basin covers an area of **37,549 Sq.km**
- **The Eastern Economic Corridor (EEC)** was located in the east of Thailand, which was **an important area to the accelerated economic development and the 20-year national strategy of Thailand.** The EEC had an area of approximately 13,266 sq.km that covering 3 provinces consisting of **Chachoengsao, Chonburi, and Rayong**.

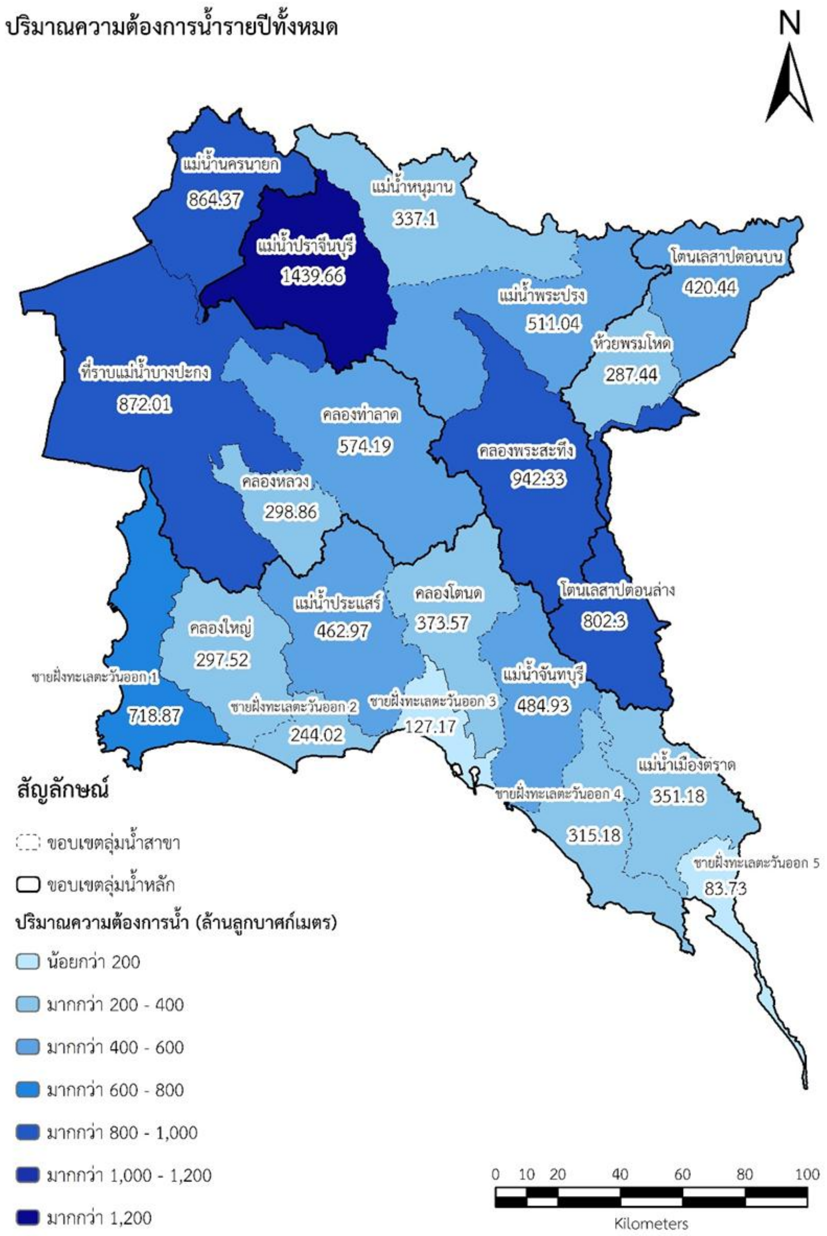
Rainfall and Runoff in The East Basin



Average spatial annual rainfall **1,723.08** (mm/year)

Average spatial annual runoff **18,659.93** (MCM)

Water Demand in The East Basin



476.23 (MCM/Year)

+

492.87 (MCM/Year)

+

1,014.13 (MCM/Year) ***

+

5,981.03 (MCM/Year) (Rainfed area)

3,328.46 (MCM/Year) (Irrigation area)

=

Total 5,312.39 (MCM/Year)

Water Demand in The Eastern Economic Corridor

Chachoengsao

68.31 1,104.44 101.06

Total 1,273.81 (MCM/Year)

Chonburi

234.82 44.06 301.37

Total 580.25 (MCM/Year)

Rayong

59.25 146.86 520.14

Total 726.25 (MCM/Year)

3 Province

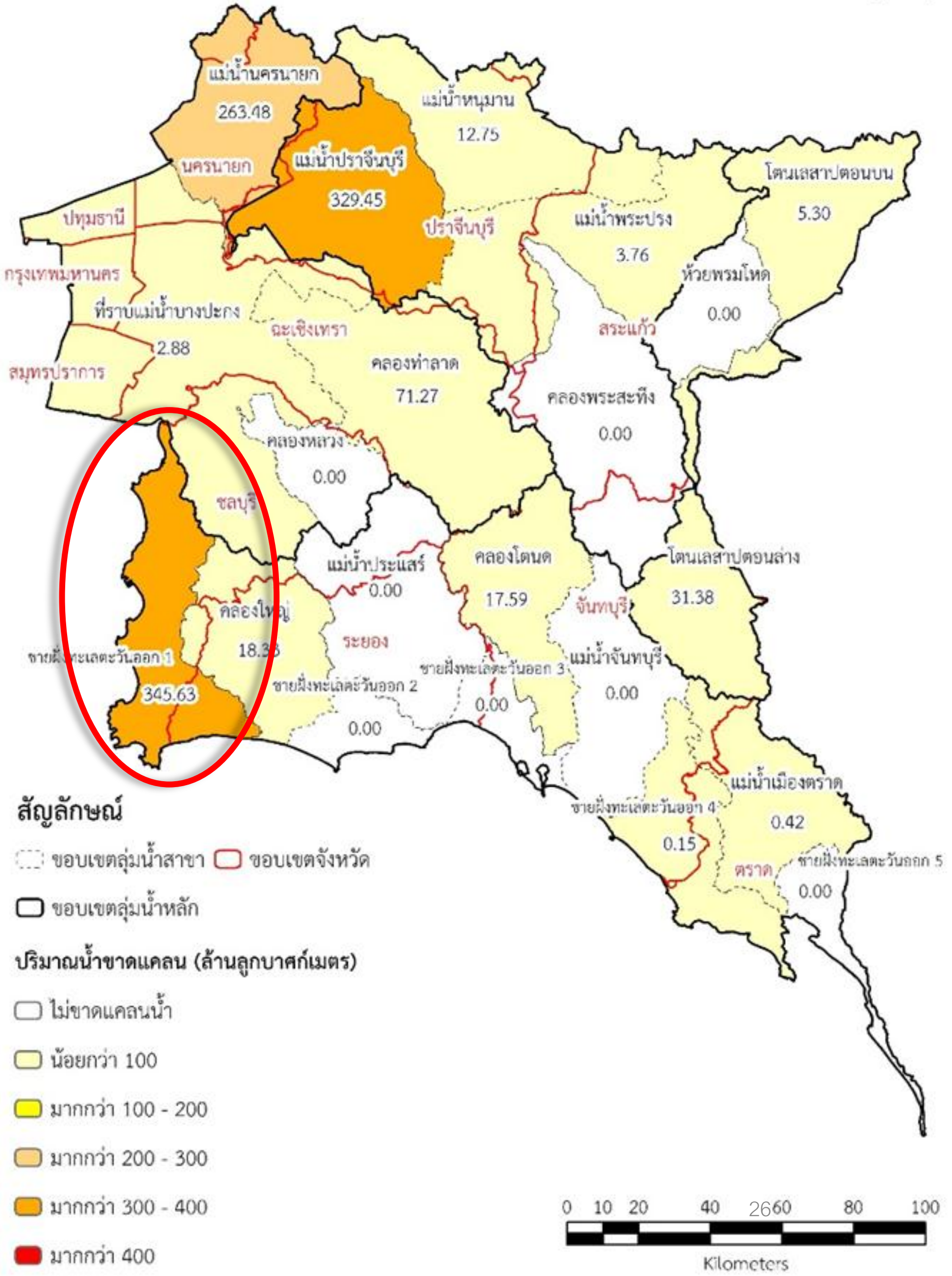
362.38 1,295.36 922.57

Total 2,580.31 (MCM/Year)

Water Deficit in The East Basin (2018)

Subbasin	Present Condition (MCM)		
	rainy season	dry season	Year
Mae Nam Bang Pakong Plain Area	0.45	2.87	3.31
Khlong Thalat	11.68	59.56	71.24
Khlong Luang	0.00	0.00	0.00
Khlong Yai	3.00	14.74	17.74
Mae Nam Prasae	0.00	0.00	0.00
East Coast Gulf (Sub - Basin 1)	**118.94**	**224.25**	**343.20**
East Coast Gulf (Sub - Basin 2)	0.00	0.00	0.00

There is a severe water shortage in the **East Coast Gulf (Sub - Basin 1)** that covers **Chonburi** and **Rayong** provinces. Especially in the **industrial sector (Industrial Estate) and water consumption and Tourism.**



THAIWATER

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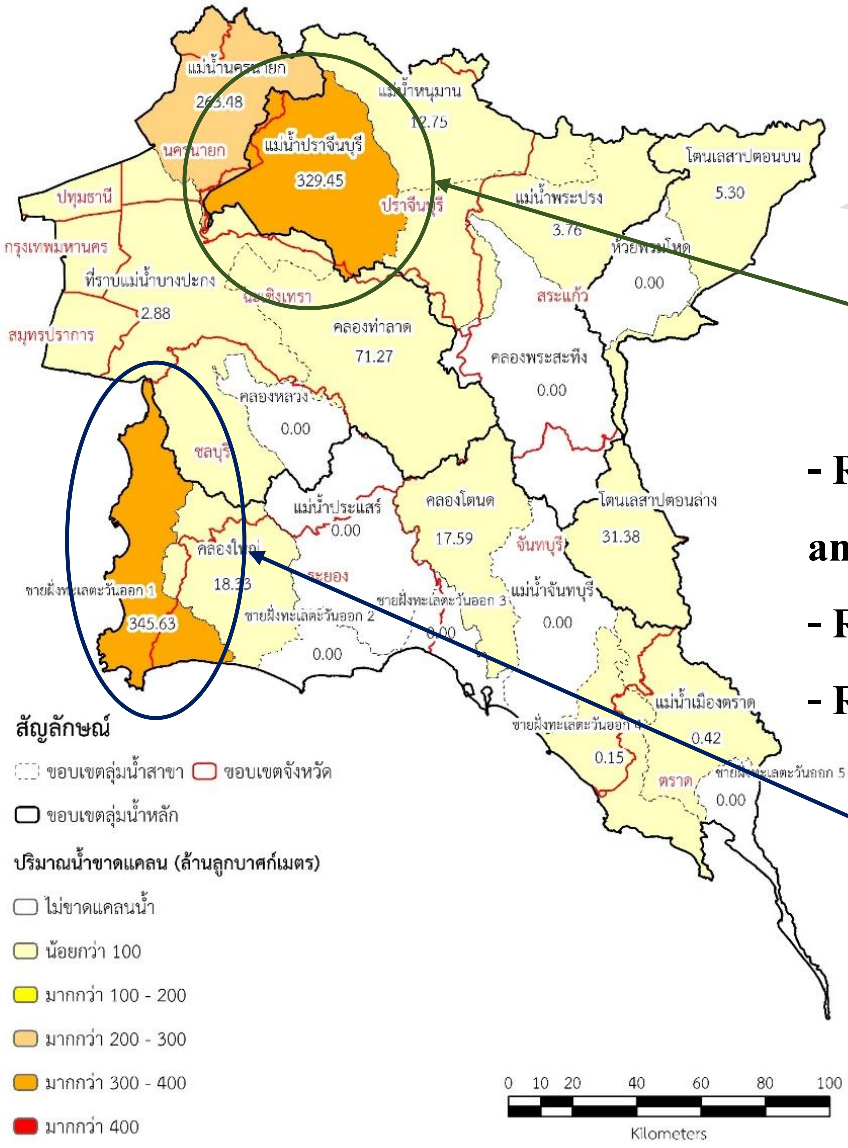
Comparison of Average Annual Water Deficit

(Present Case VS Water Reuse Case)

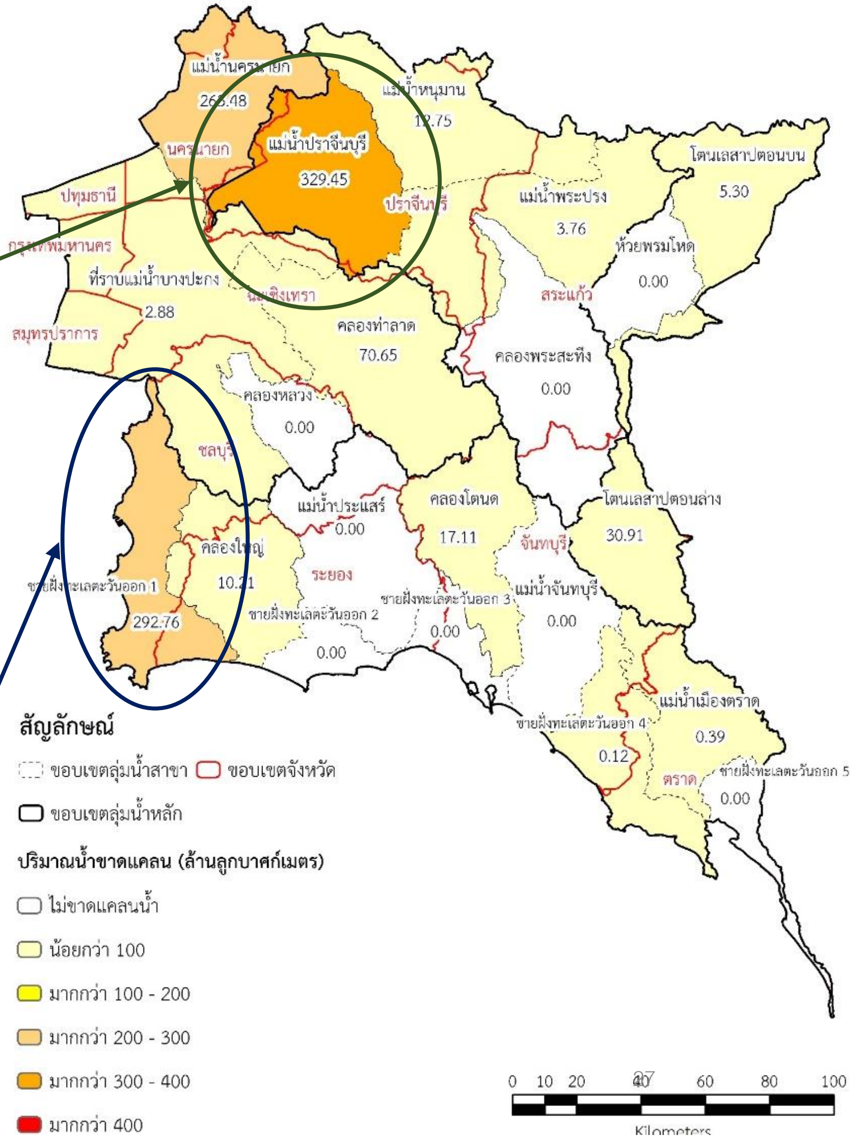


Decreased at least 15%

Agricultural

- Reduce the water for consumption and Tourism 10 – 15 (%)
- Reduce the water for industrial 15 – 20 (%)
- Reduce the water for agricultural 10 (%)

Water Consumption and Industrial



Summary of Water balance for EEC

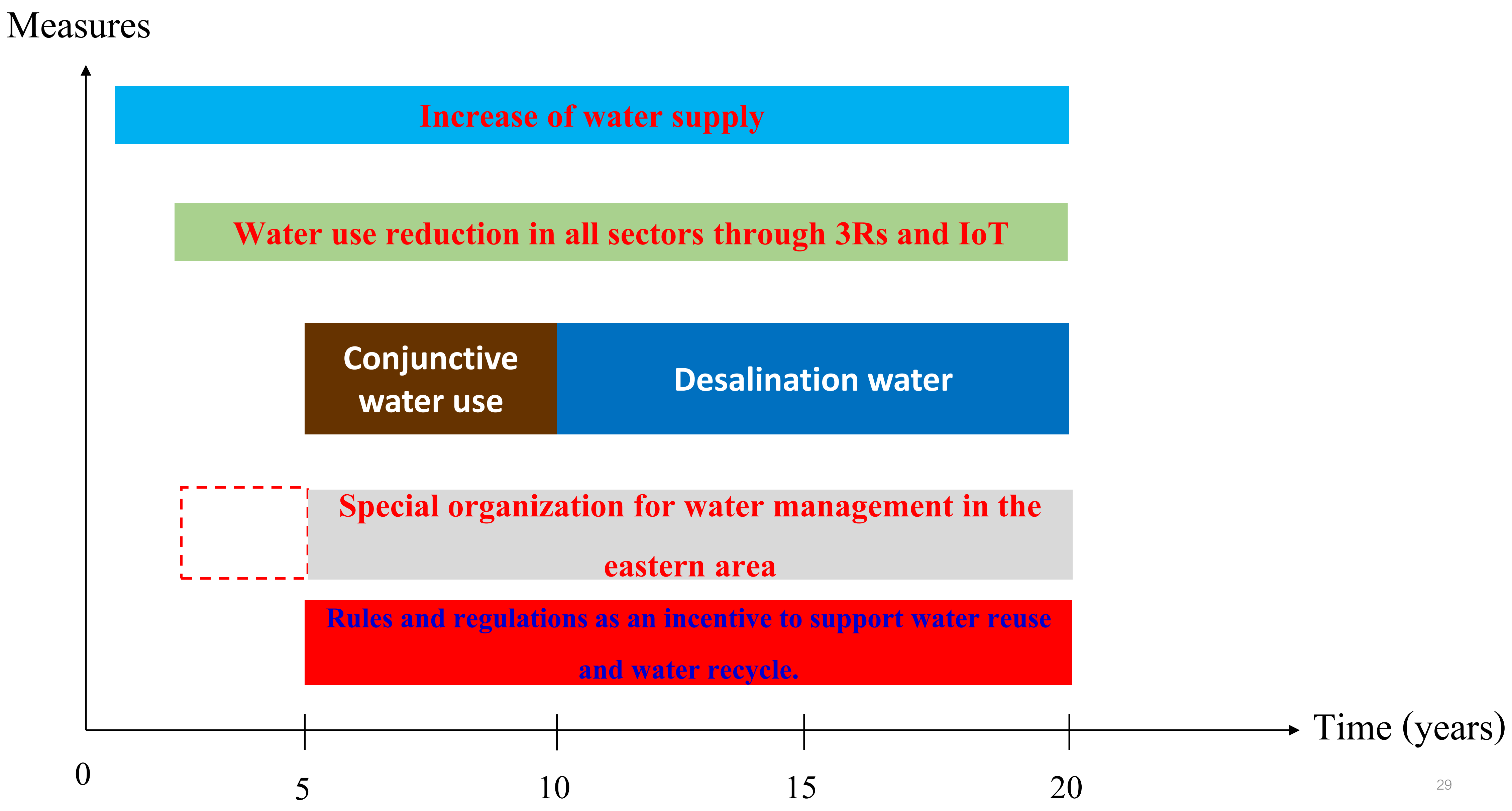
20 Years Projection

- There is risk of water shortage in dry year therefore: two measures must be implemented.
  - Increase of water supply
  - Reduction of water demand through 3R (reduce, reuse, recycle)
- An extension of pipe network to transfer water from nearby basins or reservoirs to shortage areas.
- Construction of all suitable reservoirs.

Climate Change (RCP4.5)

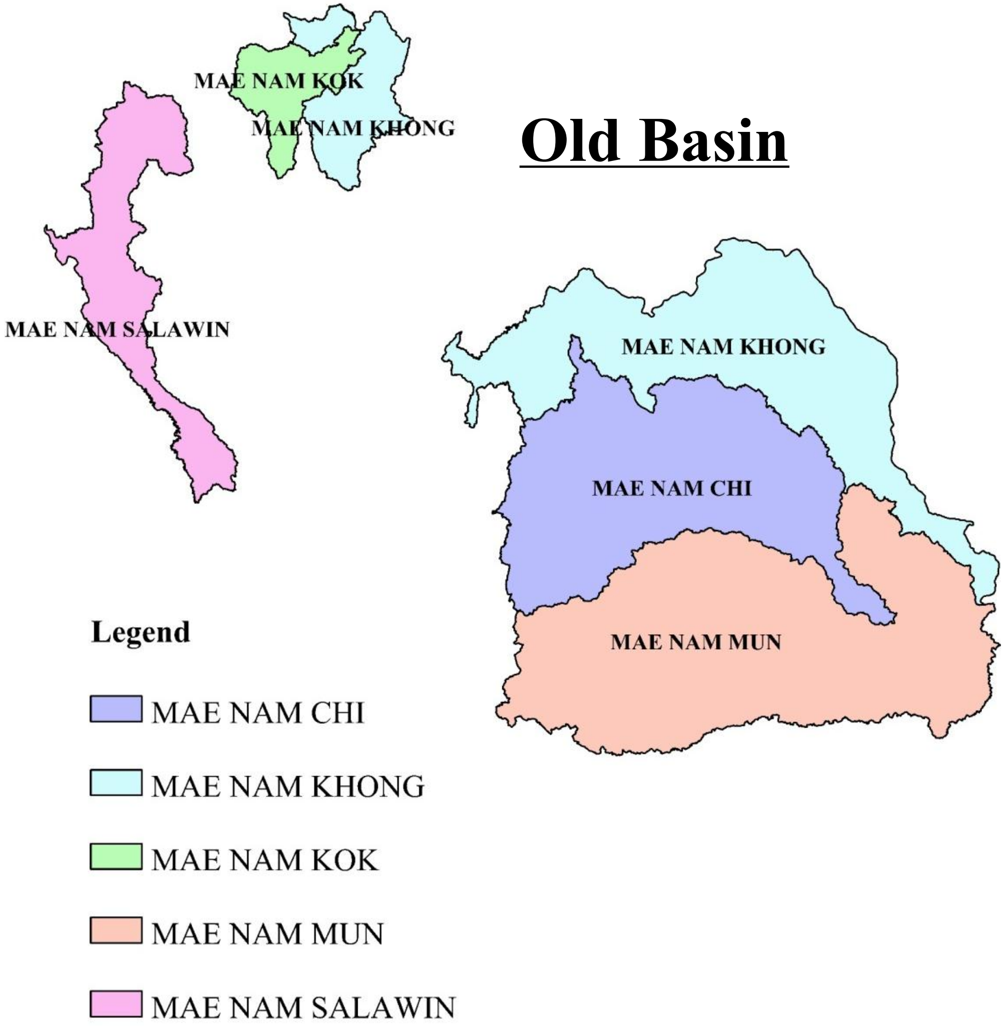
- Increase of rainfall variation, drought may be occur more frequent.
- Water diversion through pipeline network is very important for dry year.
- Reservoir construction and other methods to increase water supply is necessary.
  - Conjunctive use of surface and Groundwater
  - Desalination water

Timeline for measures to solve water shortage in the east and EEC



Northern and Northeastern Basins

Old Basin



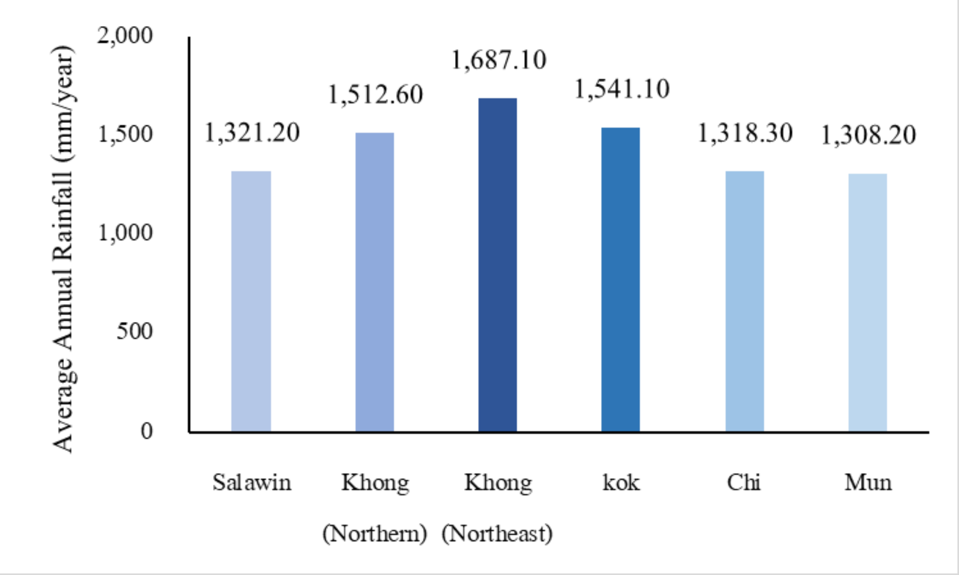
New Basin

The basin in the northeastern region of Thailand consist of the Chi, Mun and Khong basins, which are partly located in the northern region. The basin in the northern region of Thailand consist of Kok and Khong basins. In the new 22 basin system, the Kok Basin and the Khong Basin were merged and re-called the **North Khong**.

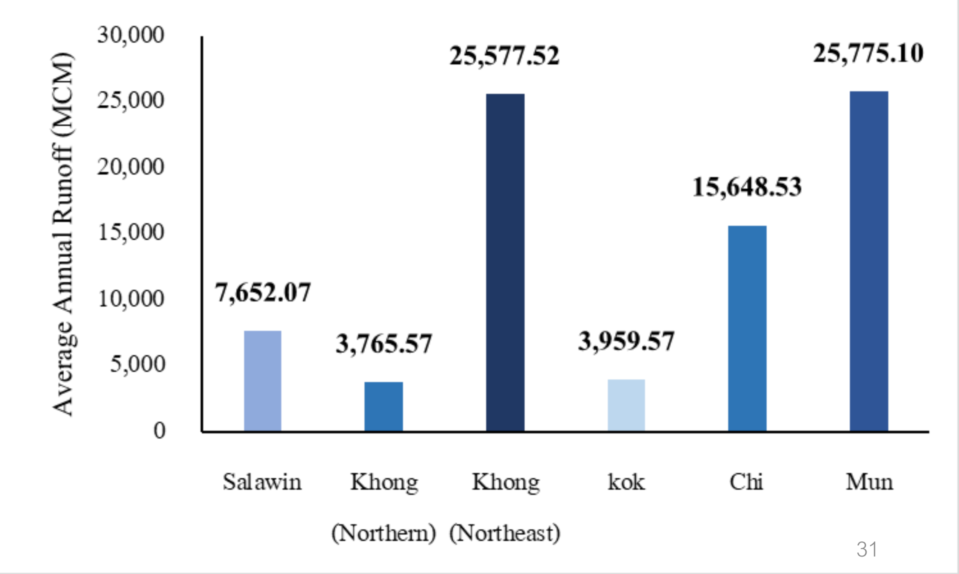
Rainfall and Runoff in the North and Northeast Basin

Average Annual Rainfall and Runoff (2003 - 2013)

Basin (25 Basin)	Rainfall (mm/year)	Runoff (MCM)
Salawin	1,321.20	7,652.07
Khong (Northern)	1,512.60	3,765.57
Khong (Northeast)	1,687.10	25,577.52
kok	1,541.10	3,959.57
Chi	1,318.30	15,648.53
Mun	1,308.20	25,775.10



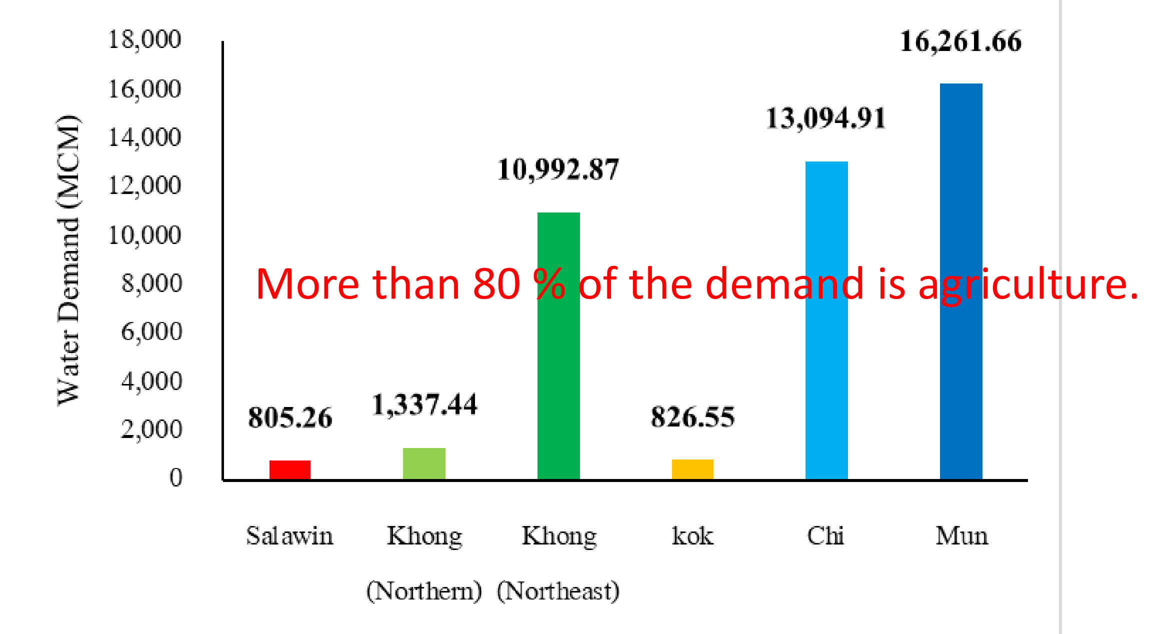
Good Rainfall but few locations are suitable for reservoirs.



Source : Department of Water Resource. (2016)

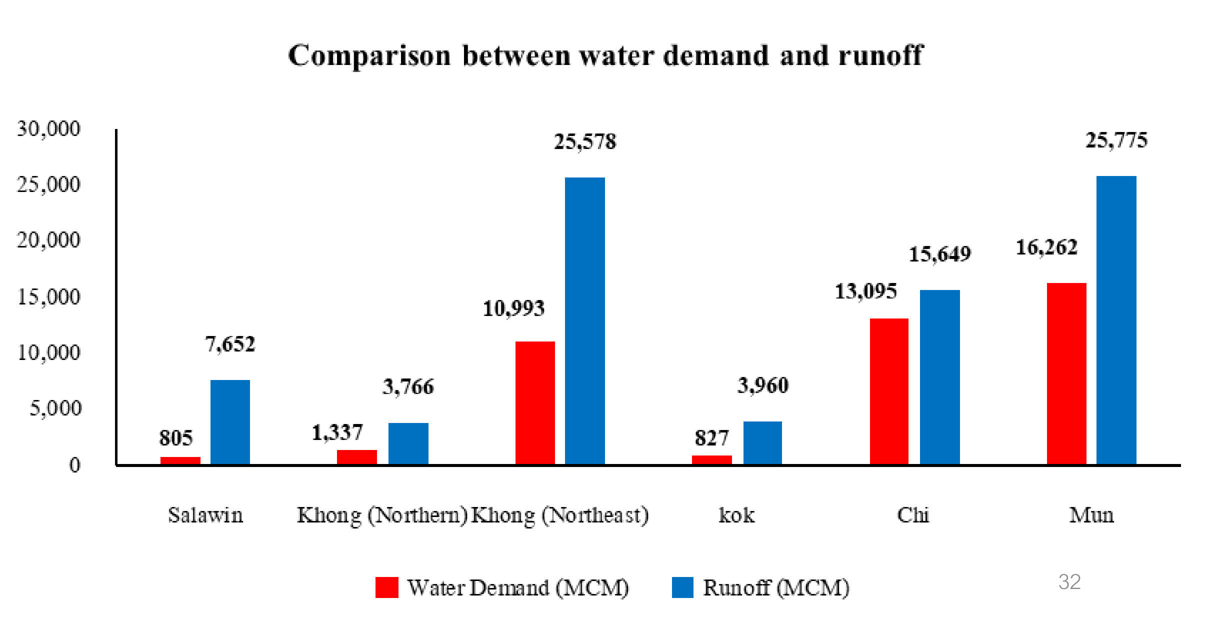
Water Demand in the North and Northeast Basin (2015)

Basin (25 Basin)	Water Demand (MCM)
Salawin	805.26
Khong (Northern)	1,337.44
Khong (Northeast)	10,992.87
kok	826.55
Chi	13,094.91
Mun	16,261.66

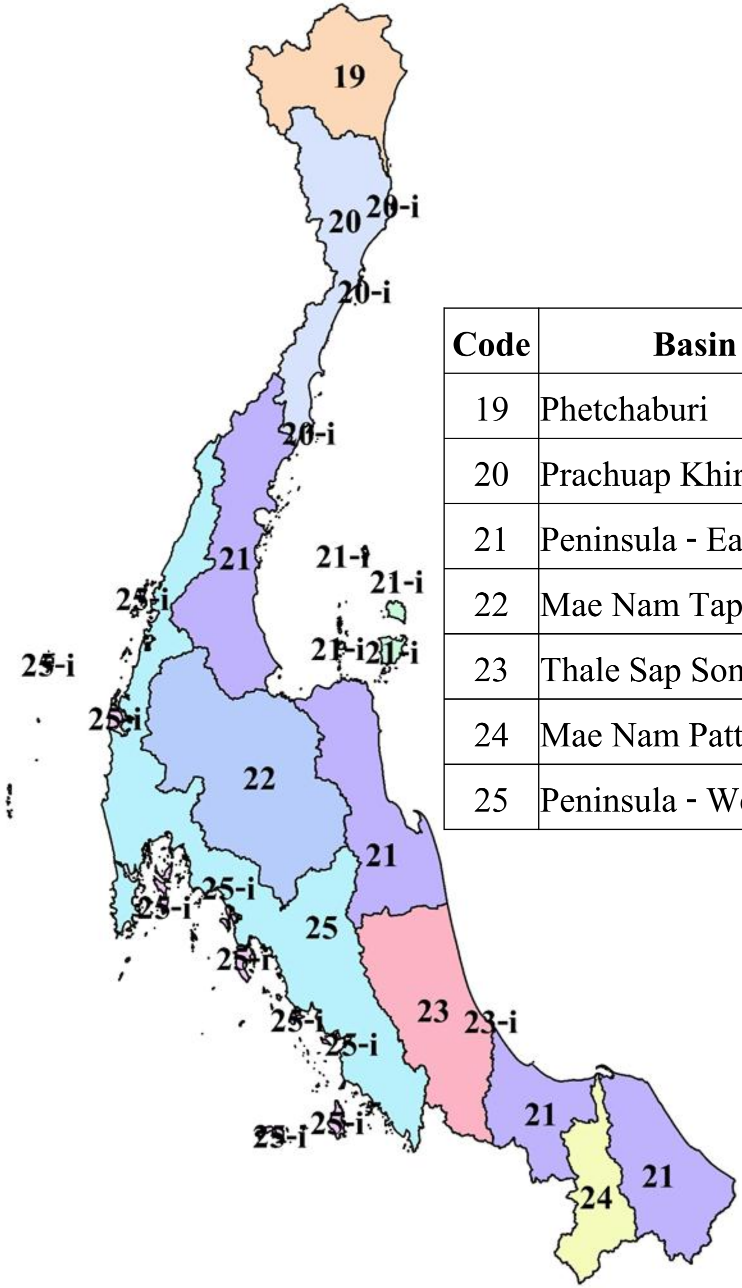


Basin (25 Basin)	Water Demand (MCM)	Runoff (MCM)	Comparison
Salawin	805	7,652	Runoff > Water Demand
Khong (Northern)	1,337	3,766	Runoff > Water Demand
Khong (Northeast)	10,993	25,578	Runoff > Water Demand
kok	827	3,960	Runoff > Water Demand
Chi	13,095	15,649	Runoff > Water Demand
Mun	16,262	25,775	Runoff > Water Demand

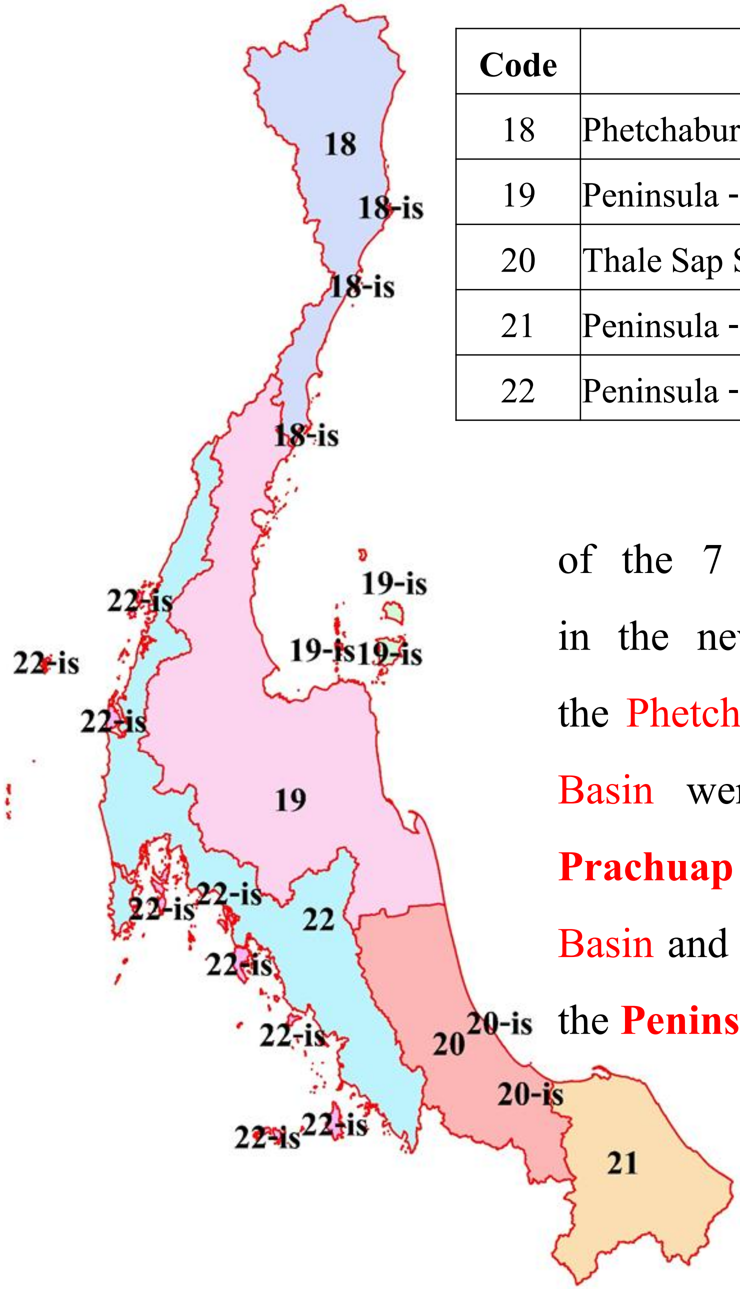
Source : Department of Water Resource. (2016)



Southern Basin



Code	Basin (Old)
19	Phetchaburi
20	Prachuap Khiri Khan Coast
21	Peninsula - East Coast
22	Mae Nam Tapi
23	Thale Sap Songkhla
24	Mae Nam Pattani
25	Peninsula - West Coast



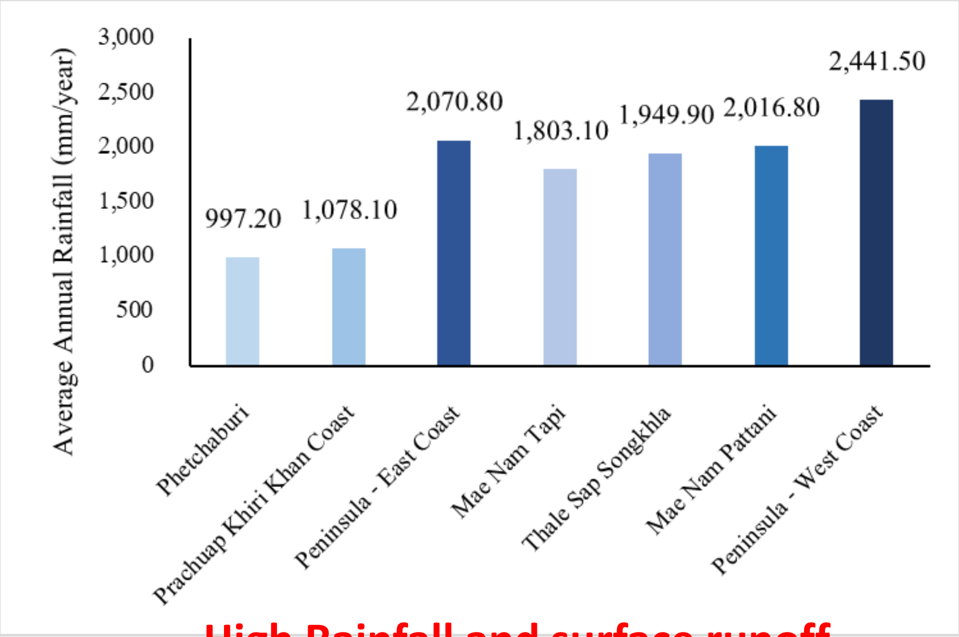
Code	Basin (New)
18	Phetchaburi - Prachuap Khiri Khan (19 + 20)
19	Peninsula - Upper East Coast (21 + 22)
20	Thale Sap Songkhla
21	Peninsula - Lower East Coast
22	Peninsula - West Coast

The basin in the south region of Thailand consist of the 7 basin in the old basin system and 5 basin in the new basin system. In the new 22 basin system, the Phetchaburi Basin and the Prachuap Khiri Khan Coast Basin were merged and re-called the **Phetchaburi - Prachuap Khiri Khan**. and the Peninsula - East Coast Basin and Mae Nam Tapi Basin were merged and re-called the **Peninsula - Upper East Coast**.

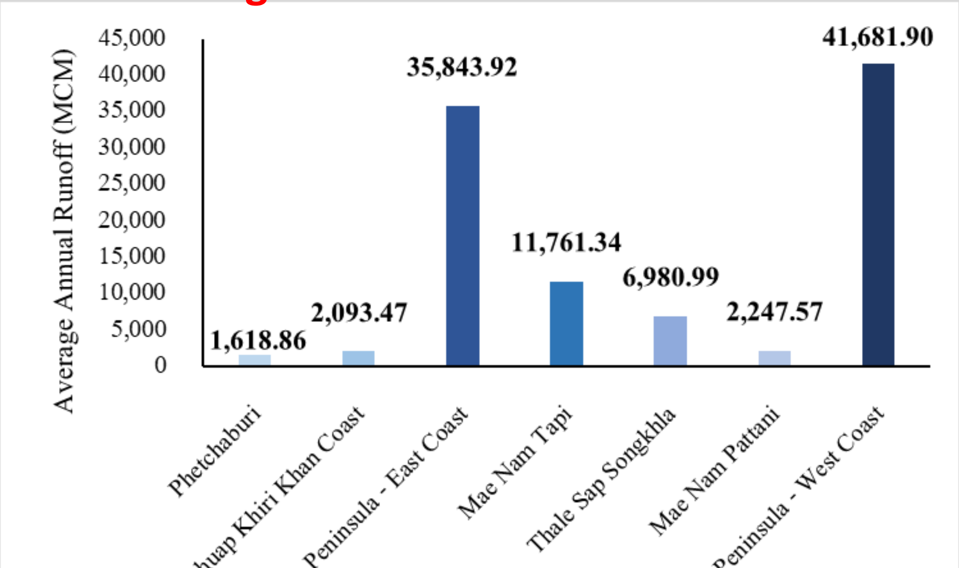
Rainfall and Runoff in the South Basin

Average Annual Rainfall and Runoff (2003 - 2013)

Basin (25 Basin)	Rainfall (mm/year)	Runoff (MCM)
Phetchaburi	997.20	1,618.86
Prachuap Khiri Khan Coast	1,078.10	2,093.47
Peninsula - East Coast	2,070.80	35,843.92
Mae Nam Tapi	1,803.10	11,761.34
Thale Sap Songkhla	1,949.90	6,980.99
Mae Nam Pattani	2,016.80	2,247.57
Peninsula - West Coast	2,441.50	41,681.90



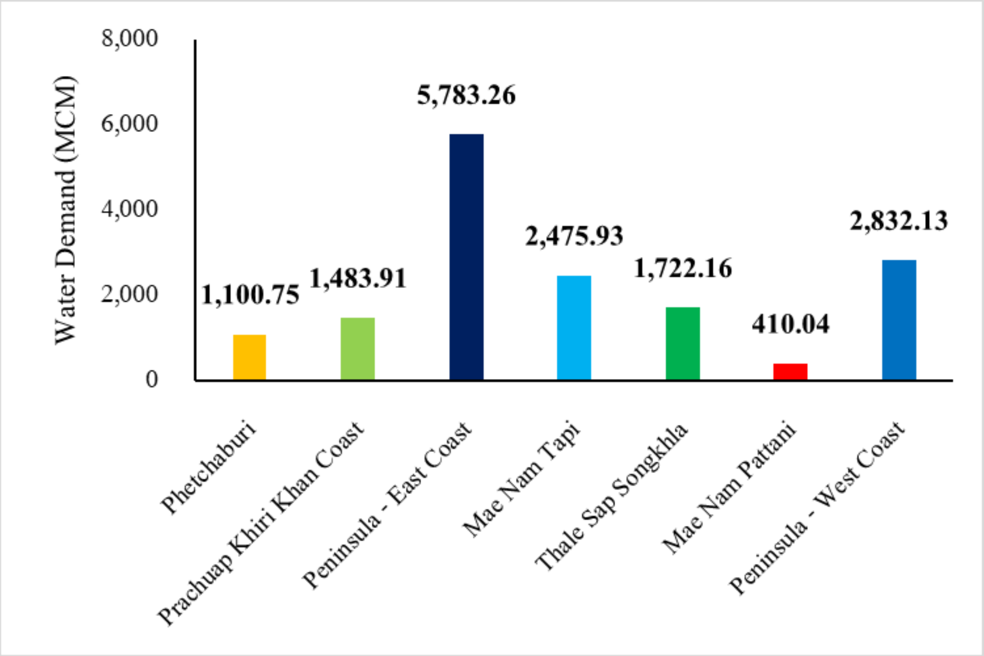
High Rainfall and surface runoff



Source : Department of Water Resource. (2016)

Water Demand in the South Basin (2015)

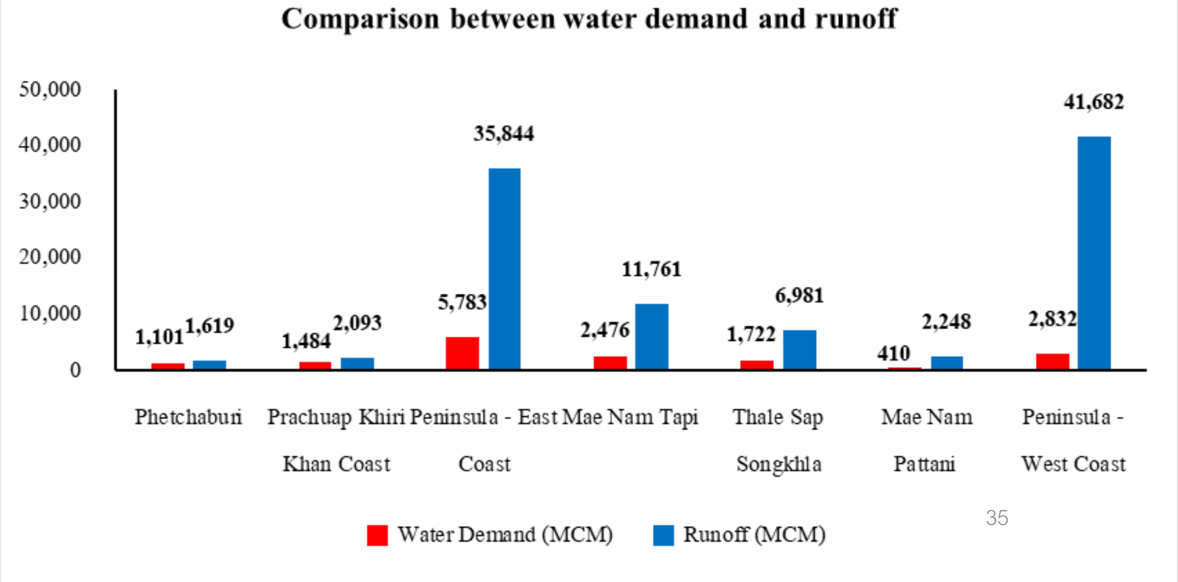
Basin (25 Basin)	Water Demand (MCM)
Phetchaburi	1,100.75
Prachuap Khiri Khan Coast	1,483.91
Peninsula - East Coast	5,783.26
Mae Nam Tapi	2,475.93
Thale Sap Songkhla	1,722.16
Mae Nam Pattani	410.04
Peninsula - West Coast	2,832.13



Overall - No water shortage but some shortage in local tourist areas.

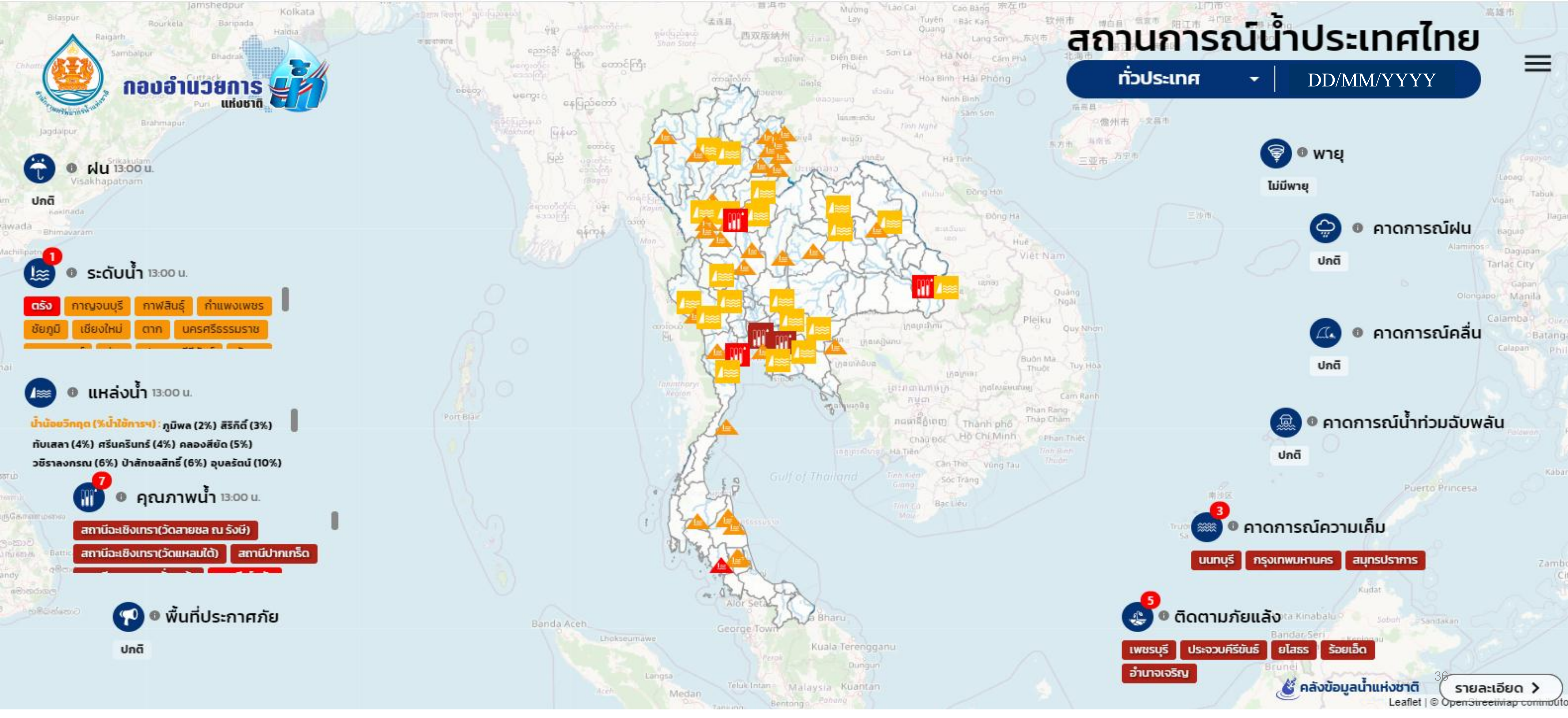
Basin (25 Basin)	Water Demand (MCM)	Runoff (MCM)	Comparison
Phetchaburi	1,101	1,619	Runoff > Water Demand
Prachuap Khiri Khan Coast	1,484	2,093	Runoff > Water Demand
Peninsula - East Coast	5,783	35,844	Runoff > Water Demand
Mae Nam Tapi	2,476	11,761	Runoff > Water Demand
Thale Sap Songkhla	1,722	6,981	Runoff > Water Demand
Mae Nam Pattani	410	2,248	Runoff > Water Demand
Peninsula - West Coast	2,832	41,682	Runoff > Water Demand

Source : Department of Water Resource. (2016)

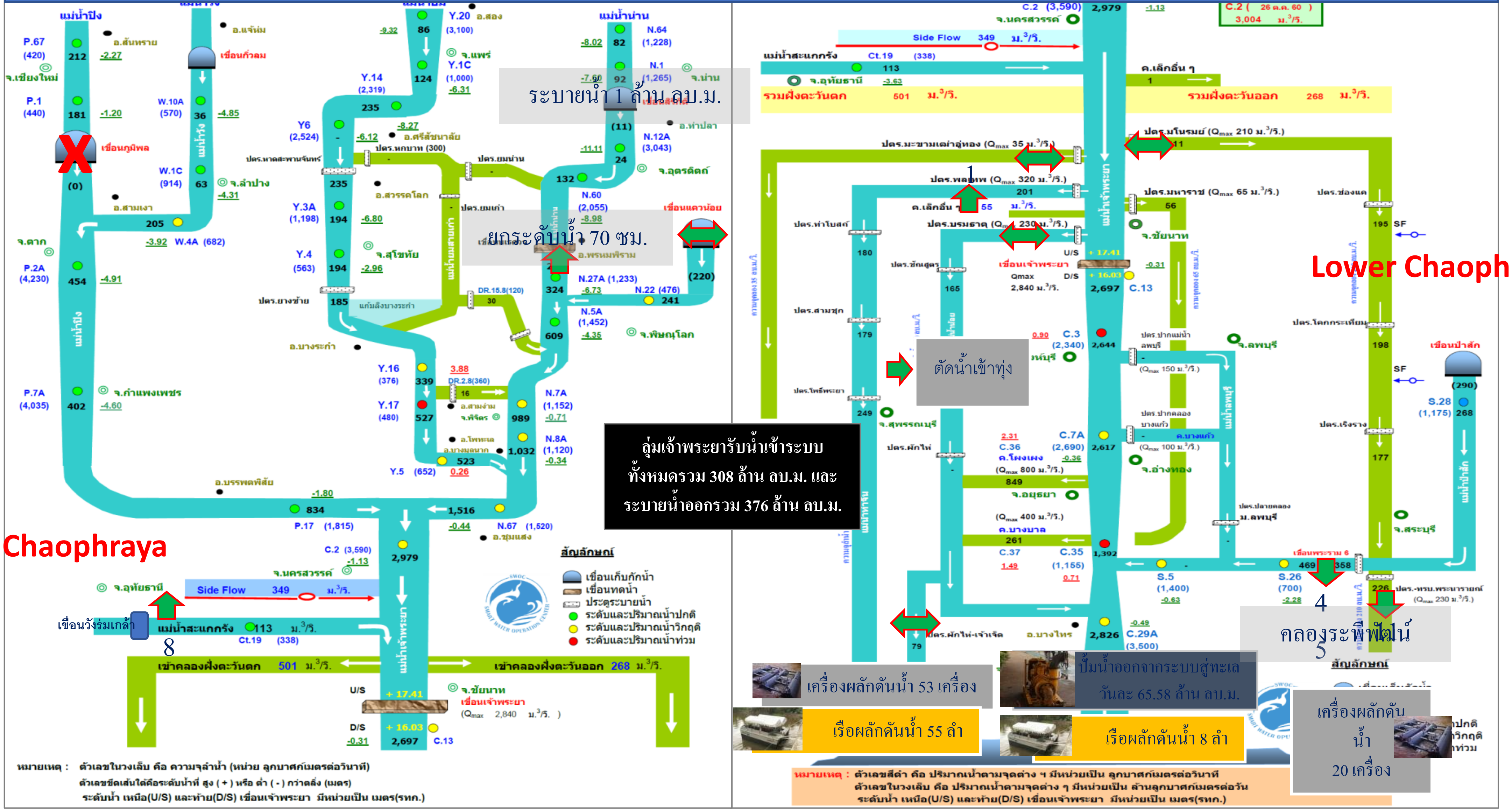


National Data of Water Resources

(Office of the National Water Resources)



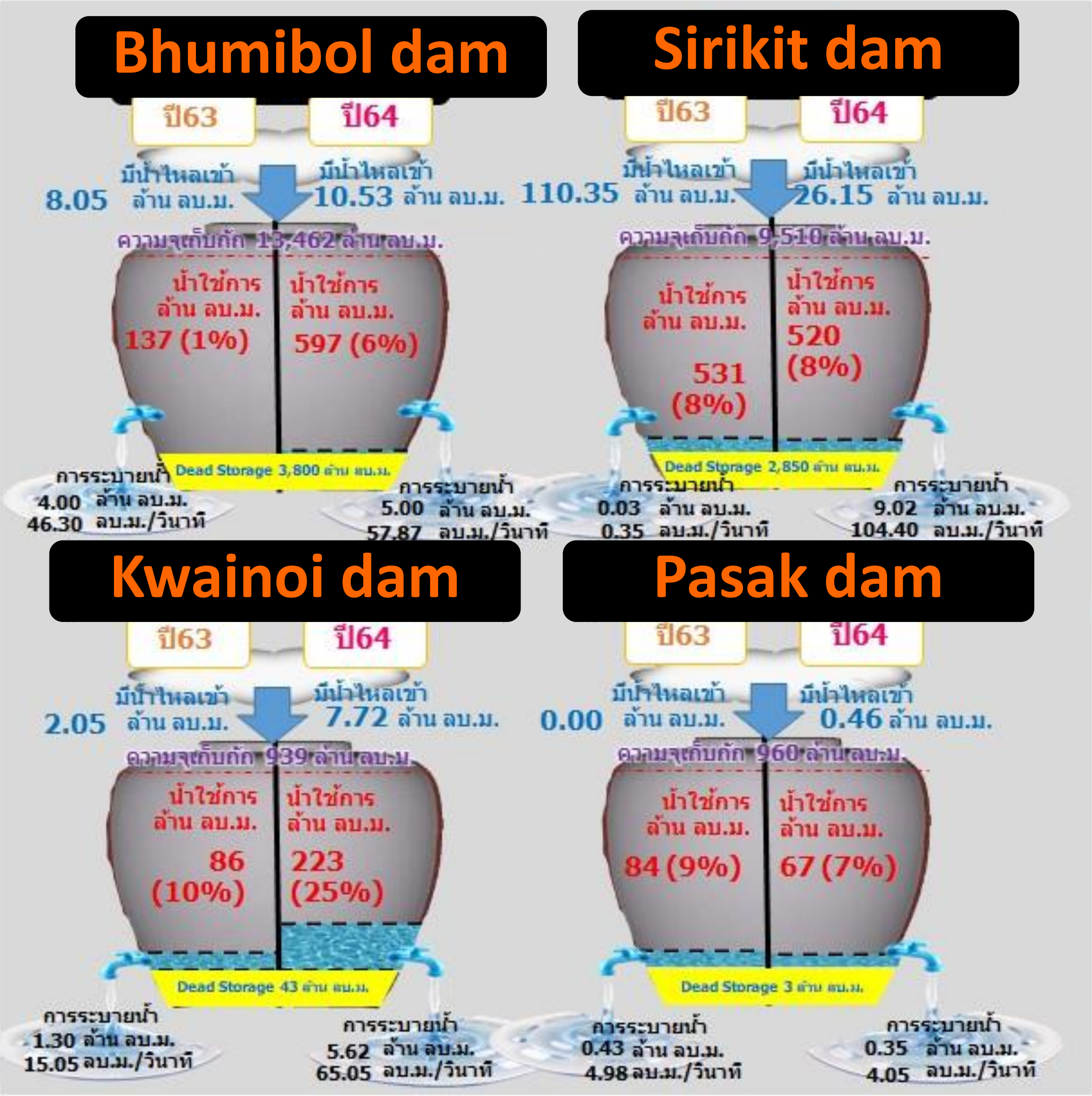
Real time Schematic of Water management in Chaophraya basin



หน่วย : ลบ.ม./วินาที

Active water supply for major dams in Chaophraya basin
4 August 2021

รวม 4 เขื่อน	ปริมาณน้ำทั้งหมด (ล้าน ลบ.ม.)	น้ำใช้การ (ล้าน ลบ.ม.)
4 Aug 2021	8,104 (33%)	1,408 (8%)
4 Aug 2020	7,535 (30%)	839 (5%)



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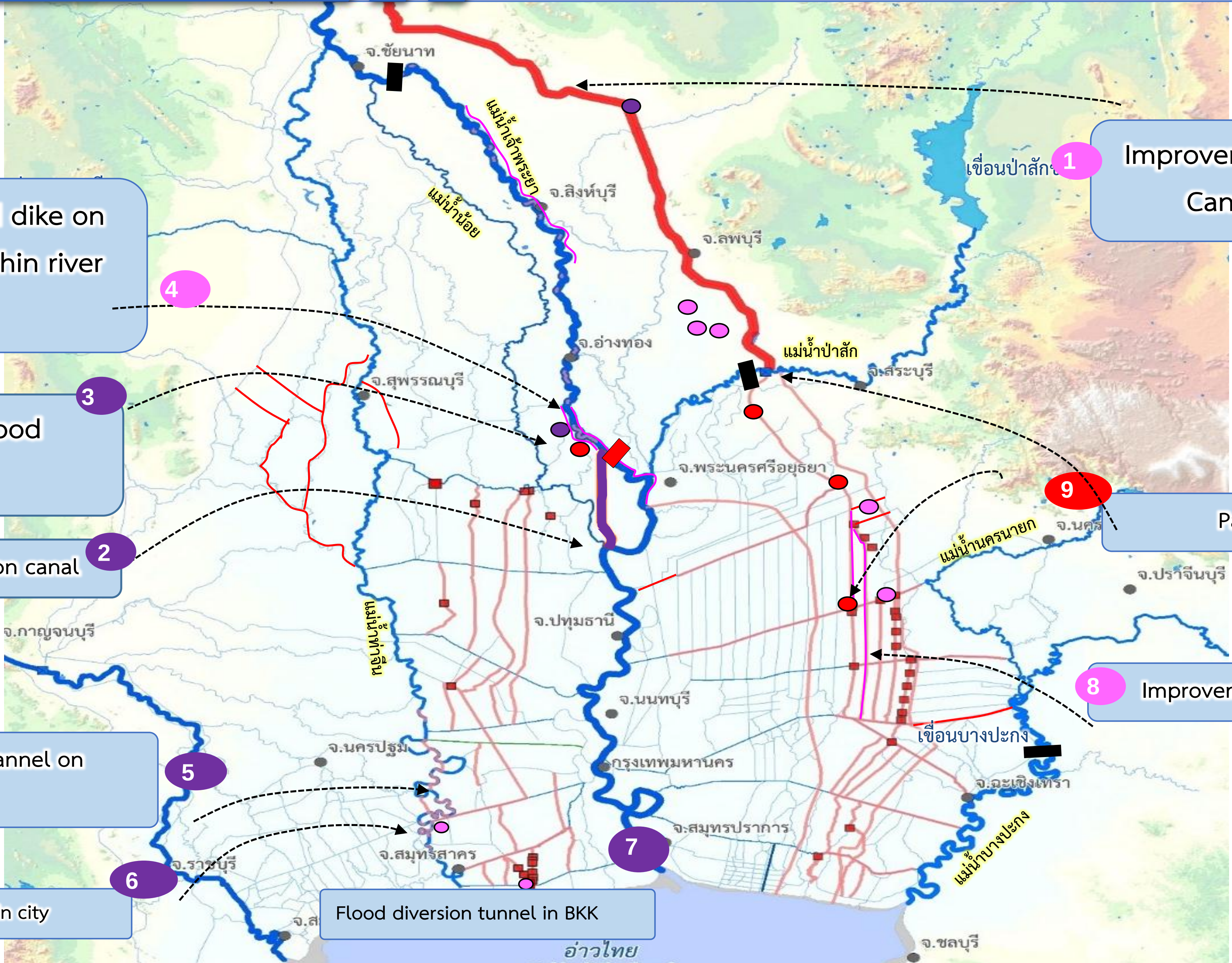
Lower Chaophraya Flood Control



1 Improvement of Chinat-Pasak Canal as main drain

4 Improvement of flood dike on Chaophraya and Thachin river banks

3 Improvement of flood retention area

2 Bangban-Basngsai – Diversion canal

9 Pasak-Aowthai Canal

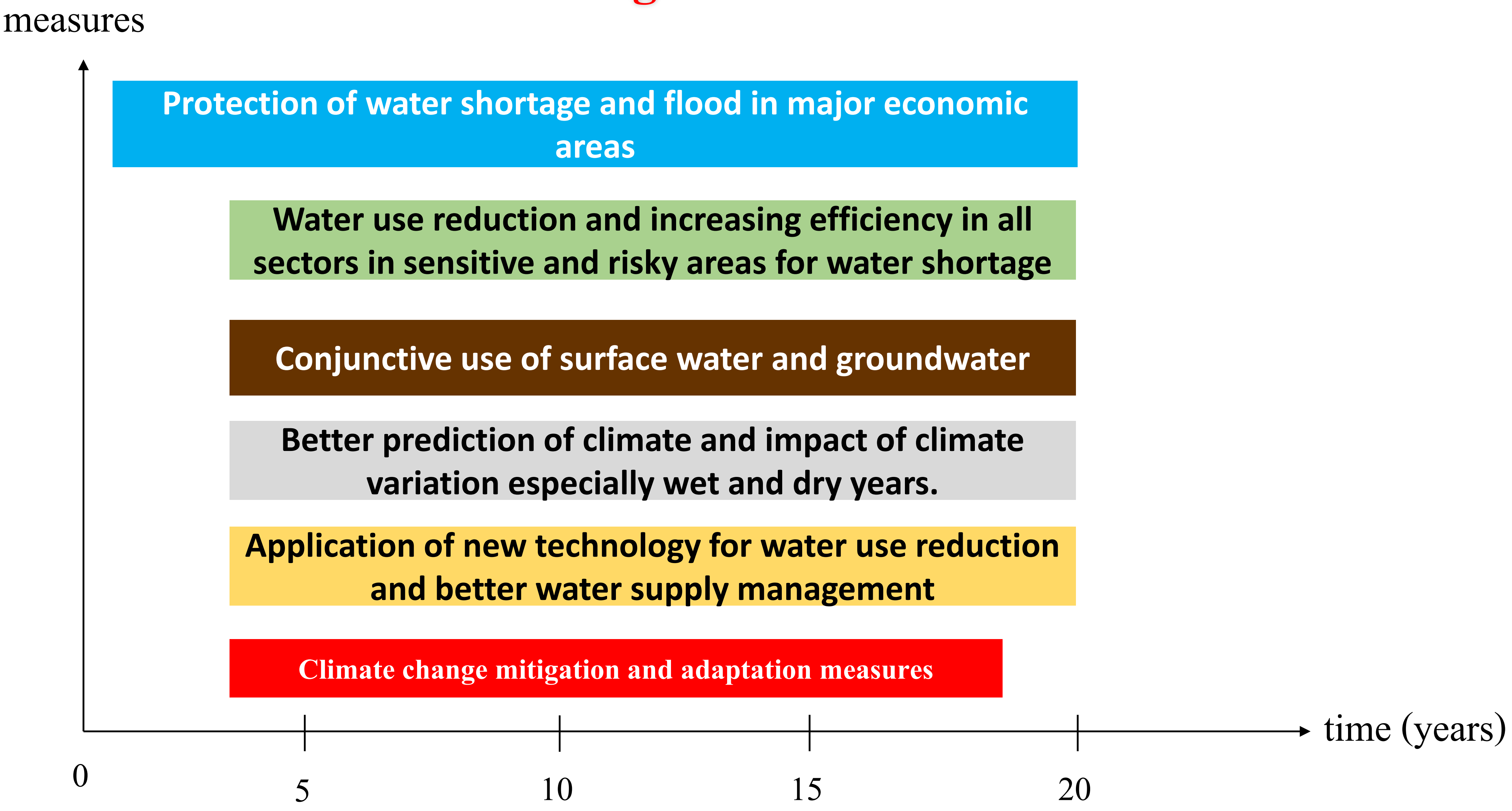
8 Improvement of Rapeepat canal

5 Excavation of river and channel on Thachin and Chaophraya

6 Polder for flood protection on main city

7 Flood diversion tunnel in BKK

Measures for water shortage and flood risk reduction for Thailand



Thank You