

# 7. WATER RESOURCE DEVELOPMENT AND MANAGEMENT IN THAILAND

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## 1. General Information about Thailand

### 1.1 Geographical

Thailand, a tropical land in the center of Indochina Peninsula, is bordered on the north by the Lao People's Democratic Republic (Lao PDR), on the east by the Lao PDR and Cambodia, on the south by the Gulf of Thailand and Malaysia, and on the west by Union of Myanmar and the Andaman Sea. The total land area is about 513,100 km<sup>2</sup> with the present population of about 60 million inhabitants.

Rainfall during the southwest monsoon, i.e. May to October, accounts for 85 to 90 per cent of the annual rainfall and varies significantly over the different parts of the country. The annual rainfall is about 1,200 mm in the northern mountainous region, 1,300 mm in the central plain, below 1,000 mm in the western strip of the north-east plateau and increases to 1,600 mm towards the far east end of the north-east plateau. The east coast peninsula receives additional rainfall from the northeast monsoon during November through January and annual rainfalls of 1,800 mm and 2,500 mm are observed over the eastern and western coasts of the peninsula respectively.

### 1.2 Agricultural Sector

Thailand in fact is today recognised as one of the world's most important and diverse food producers. Year-round sunshine regular rainfall, fertile soil, and mile upon mile of open coastline have given the kingdom a long tradition of agriculture and fishery, while a rich cultural heritage has evolved a highly distinctive cuisine.

Total agricultural area is about 265,200km<sup>2</sup>, where only 49,600 km<sup>2</sup> (18.70%) has been irrigated. The main agricultural products are :- rice, rubber, maize, cassava, sugarcane fruits and vegetables. The utilization of farm holding land of about 51% is paddy land with yield 4.4 tons/ha of rice.

In 1998, Thailand can produce 20 million tons of rice from the whole country

## 2. Water Resources Information

### 2.1 Surface Water Resources

Thailand, with an area of about 513,100 km<sup>2</sup>, can be divided hydrologically into 25 river basins. The average annual rainfall for all over the country is about 1,700 mm. The total volume of water from the rainfall in all river basins in Thailand is estimated at 800,000 million m.<sup>3</sup>, of which 75 per cent or around 600,000 million m.<sup>3</sup>

Region	Total area (km <sup>2</sup> )	Agricultural area (km <sup>2</sup> )	%	Irrigated area (km <sup>2</sup> )	% Agricultural area Irrigated
Northeast	168,850	92,570	54.82	8,182	8.84
North	169,640	46,750	27.56	12,488	26.71
Central	103,900	43,580	41.94	21,625	49.62
South	70,710	29,060	41.10	4,840	16.65
Total	513,100	211,960	41.31	47,135	22.24

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Region	Total area (km <sup>2</sup> )	Population (million)	Average annual runoff (million m <sup>3</sup> )	Runoff/Capita (m <sup>3</sup> /capita/year)	% of total runoff
Northeast	168,850	21.10	50,590	2,398	24.18
North	169,640	11.76	51,065	4,342	24.40
Central	103,900	20.01	42,819	2,140	20.46
South	70,710	7.94	64,776	8,158	30.96
Total	513,100	60.81	209,250	3,441	100

is lost through evaporation, evapotranspiration and infiltration and the remaining 25 per cent of 200,000 million m.<sup>3</sup> constitutes the runoff that flows in rivers and streams. While the population of Thailand is around 60 million. Therefore, the availability of water resources is 3,300 m.<sup>3</sup> per person each year which is statistically considered to be highly adequate. The data on surface water resources in Thailand are as shown below.

## 2.2 Groundwater Resources

Groundwater is an important source of water supply in Thailand. Public water supplies for one - fifth of the nation's 220 towns and cities and for half of the 700 Sanitary Districts are derived from groundwater. It is estimated that 75 per cent of domestic water is obtained from groundwater sources. Groundwater system in Thailand is mainly recharged by rainfall of about 40,000 million m.<sup>3</sup> and seepage from the rivers. It was estimated from previous hydrological balance studies that about 12.5 to 18 per cent of rainfall would infiltrate the soils and about 9 per cent of rainfall would reach the aquifers. However, this estimate is valid only for the basins under favorable geologic conditions such as those in the Northern Highlands, the Upper Central Plain and along the Gulf Coastal Plain. For the other basins such as those in the Lower Central Plain including Bangkok and in the Khorat Plateau, it was estimated that only 5-6 per cent of rainfall reaches the aquifer.

More than 200,000 groundwater well projects were undertaken by both government and private with total capacity of about 7.55 million m.<sup>3</sup>/day. (2,700 million m.<sup>3</sup> /year) It is estimated that 75 per cent of domestic water is obtained from groundwater sources which can be served approximately 35 million of people in villages and urbans area.

## 2.3 Water Provision and Water Demand

The average annual rainfall of the whole country is about 1,700 mm. ranging from 1,200 mm annually in the north and central plain up to 2,000 - 2,700 mm. in the western part of the south and the eastern part of the country. About 29% of the surface runoff, approximately 70,770 mcm. annually, is kept in various sizes of about 650 large and medium scale together with 60,000 small scale water resources development projects all over the kingdom covering about 31 million rai (4.96 million ha.) irrigable area.

Although the water resources development programme has been implemented continuously for more than 80 years, but rapid rural development, industrialization, tourist development and income growth raise the water demand for domestic use, agriculture and other purposes drastically. Inefficient use of water by various sectors and deteriorating water quality due to excessive use of fertilizer and pesticides, urban sewage and industrial wastes also create more serious problems to availability and adequacy of water resources. The present water demand for irrigable areas and other uses for the whole country is estimated to be 68,000 mcm./year and expected to be 86,000 mcm./year in 2006. Hence, the nation is facing serious supply constraints to further growth due to various impacts problems in the water resources development scheme.

## 3. National Water Vision and Policy

### 3.1 National Water Vision

The Office of the National Water Resources Committee (ONWRC) obtained partial financial support from SEATAC of GWP to organize a national consultation meeting for "National Vision on Water for Thailand" during 21 and 22 July 1999 attended by 100 high level officials of the government agencies and representatives from academic institutions, NGO's, the press corps as

well as distinguished individuals.

Through the elaboration of the group, a national vision statement was concluded and read “By the year 2025, Thailand will have sufficient water of good quality for all users through an efficient management, organizational and legal system that would ensure equitable and sustainable utilization of its water resources with due consideration on the quality of life and participation of all stakeholders”.

### 3.2 National Water Policy

- 1) Accelerate the promulgation of the Draft Water Act to be the framework for national water management by reviewing the draft and implementing all necessary steps to have the act effective, including reviewing existing laws and regulations.
- 2) Create water management organizations both at national and river basin levels with supportive laws. The national organization is responsible for formulating national policies. Monitoring and coordinating activities to fulfill the set policies. The river basin organizations are responsible for preparing water management plans through a participatory approach.
- 3) Emphasize suitable and equitable water allocation for all water use sectors, and fulfill basic water requirements in agriculture and domestic uses. This will be accomplished by establishing efficient and sustainable individual river basin water use priorities under clear water allocation criteria, incorporating beneficiaries’ cost sharing based on ability to pay and level services.
- 4) Formulate clear directions for raw water provision and development compatible with the basins’ potentials and demands, and ensuring suitable quality while conserving the natural resources and maintaining the environment.
- 5) Provide and develop raw water resources for farmers extensively and equitably in response to water demand for sustainable agricultural and domestic uses, similar to deliveries of other government basic infrastructure services.
- 6) Include water related topics at all levels

of educational curriculum so as to create awareness for water value, understanding the importance of efficient water utilization, necessity and responsibility in maintaining natural and man made water sources.

- 7) Promote and support participation, including clear identification of its procedures, clear guidelines on right and responsibility of the public, non-government and government organizations in efficient water management. The water management includes water utilization, water source conservation, monitoring and preservation of water quality.
- 8) Accelerate preparation of plans for flood and drought protections, including warning, damage control and rehabilitation efficiently and equitably with proper utilization of land and other natural resources.
- 9) Provide sufficient and sustainable financial support for action programs in line with the national policy, including water related research, public relation, information collection and technology transfer to public.

## 4. Integrated Water Resources Management

Development and conservation of water resources on various scales, comprise of potential, coordinate public and private sector efforts in management and maintenance of existing water resources. According to the guidelines in the 8th National Plan (1996—2001) the development and conservation of both surface and groundwater resources will be a systematic river basin approach with regard to economic and social factors as well as environmental impact.

There re a number of agencies dealing independently with water resources management resulting in work duplications and lack of cooperation among themselves, therefore, in 1996 the Office of the National Water Resources Committee was established in order that it will work as apex body for the management of water resources. In order to have better integrated water resources management in all regions, the river

basin committees are also planned to be established in 25 river basins all over the country in the near future.

Since there is no comprehensive act on water resources and moreover the existing regulations being used by various government agencies are differently, therefore, it is essential practice for all agencies concerned. Presently, the draft on water resources Act has been formulated and is on the proceeding of submission to the cabinet.

The master plan on water resources development, water allocation, water conservation, flood mitigation and water quality will be formulated for all 25 river basins. It is planned to set up the uniform measures and analytical methods to assess data and establish a data network system for possible exchanging and disseminating of the information.

## **5. Establishment of River Basin Organization**

There are many government agencies and private parties involved in the development and exploitation of the Basin's surface and groundwater resources, but cooperation and coordination between them is weak. Even when cooperation between operating agencies leads to plans for equitable allocation of water, they are often challenged by the various interested parties affected. The result is often a compromise that postpones the problem to a later date. In view of the lack of coordination, the government decided to establish a central agency in water resources management in order to formulate plans, coordinate plan implementation and carry out other works concerning management of water resources. The Office of the National Water Resources Committee (NWRC) was established in November 1996. Since its establishment, the NWRC has worked to strengthen the mechanism of integrated water resources management in Thailand. A notable step forward was the drafting of a water resources law that was recently submitted to the Cabinet. In order to implement the law, a river basin organization or commission will be established in each of Thailand's river basins. This recognizes the need for decentralization as an important step in water resources management. According to the draft law, each river

basin commission will consist of qualified persons drawn from public and private sectors. A commission will set policy on water resources planning, development, operation of facilities, and water allocation, and it will oversee all related activities in the river basin including the resolution of water conflicts between various users.

### **5.1 Chao Phraya Basin Organization**

The Chao Phraya Basin with an area of 160,000 sq. km is the largest of Thailand's 25 river basins. The Chao Phraya provides water for the capital city of Bangkok, other large cities, many of the country's main industries, and for irrigation systems covering 1,635,800 ha. Two large reservoirs, Bhumipol on the Ping River and Sirikit on the Nan River, and some smaller reservoirs store the monsoon flows for use in the dry season. As a result of the high degree of regulation provided by these reservoirs almost 75% of the average annual inflow of 36,600 million cubic meters (mcm) is consumed in the Basin. In the dry season, the policy is to give priority to the minimum flows needed to keep salt water from municipal and industrial water supply intakes in the Lower Chao Phraya. But this is in conflict with the demands of farmers who want to grow a dry-season crop. Within the irrigation systems there are also conflicts since the area available for dry-season cropping far exceeds the water available. Such competition and conflicts between users is found in all the sub-basins of the Chao Phraya. Conflicts in quantity are compounded by conflicts in quality, with downstream users suffering the effects of upstream pollution. The Basin also faces a growing problem in the management of groundwater resources. Almost half of Bangkok's supply comes from groundwater exploitation that is not sustainable, and this problem is spreading to other parts of the Basin. Every year the problems and conflicts in the Chao Phraya Basin multiply and, in recent years, abnormally low levels in the reservoirs have sometimes led to situations that came close to closing down the water intakes to Bangkok.

The 1997 report financed by PHRD, the "Chao Phraya Water Resources Management Strategy," found that the establishment of a Chao Phraya Basin Organization is essential to the

effective management of the Basin's water resources. The establishment of such an organization would provide valuable experience for setting up similar organizations in other river basins.

### 5.2 Pilot Case Study of River Basin Committee

The study of establishment of Chao Phraya basin organization should be performed as a pilot case study so that when the water law is enforced, the river basin commission will be immediately set up according to the result of the study.

To study the establishment and operation of Chao Phraya basin organization or commission which will be set up in the future when the water law is enforced, such the commission must compose of appropriate function and composition. Rules and regulations to support its work must be delineated. The study also includes clear determination of its roles and relations to other agencies and its staff office to support its administrative work. This study will also be considered as a case study for establishment of the commissions in other river basins.

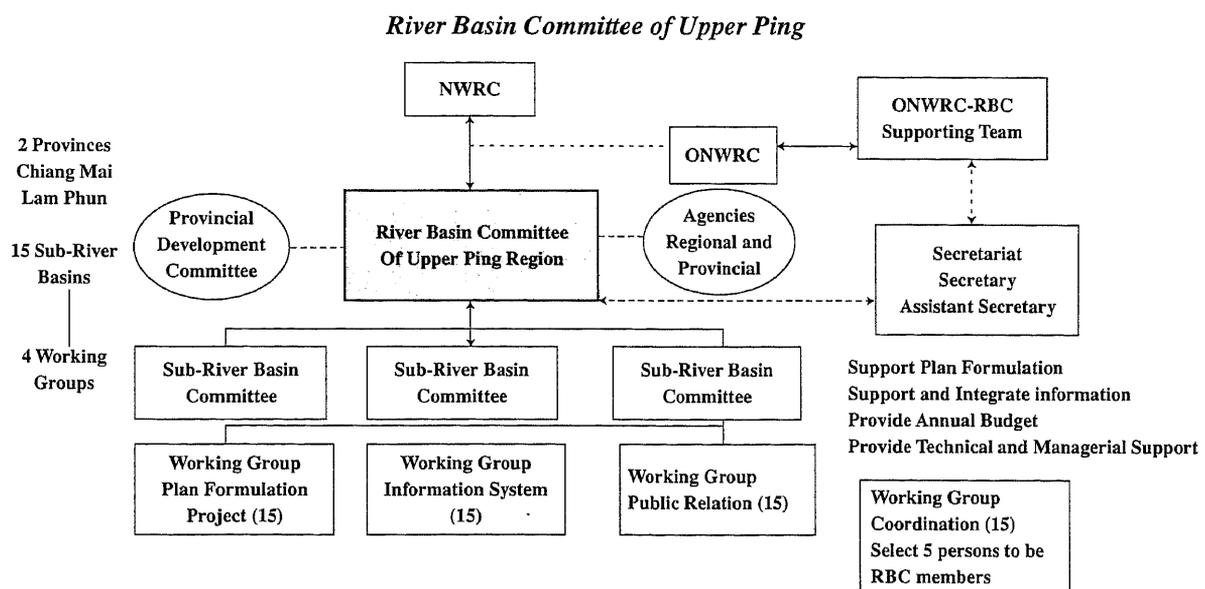
In 1999, ONWRC has been working with major water-related agencies, water users, NGOs, farmers' cooperatives, academics, and local governments to establish three River Basin Committees (RBCs) of Upper Ping, Lower Ping, and Pasak. There is a great concern of ONWRC to keep the initial models and methods quite flex-

ible to allow some appropriate adjustment during the pilot operation. ONWRC also appointed the RBC-support teams to provide managerial and technical support to the establishment.

### 5.3 River Basin Committee Structure

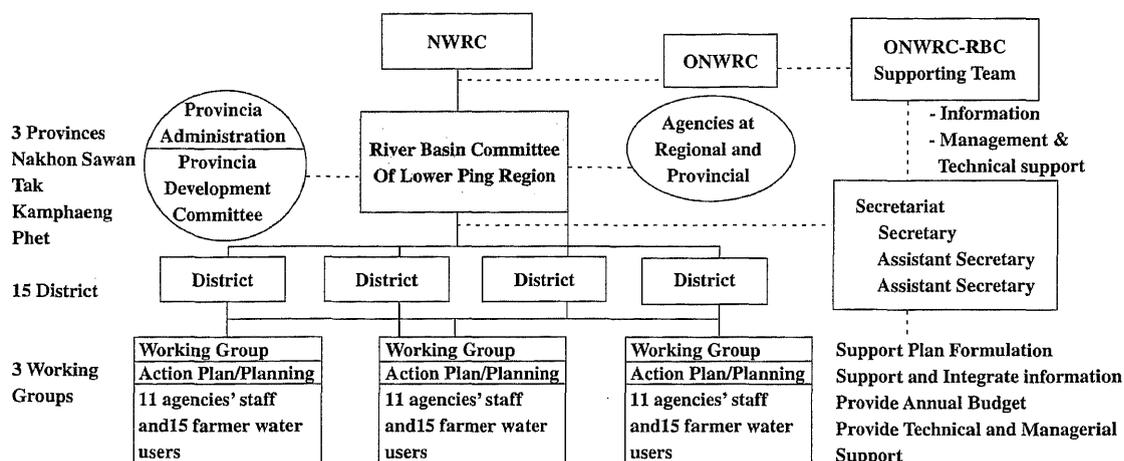
Upper Ping RBC and Lower Ping RBC have been established with two different models. The organization structure is based on administrative area representation (district and sub-district) and sub-watershed. It was a great concern on the proportion of membership, selection process, representation, qualification, and appointment. ONWRC has provided supports in increase the representation of NGOs and local academic/research institutions as well as the selection procedures. With limited time frame, the first round of selection and appointment were mainly depended on the advices of the district office. Then, the initial appointment is required from official regulations to have legal status of RBC before any activities can be organized to use the budget, personnel support, and other resources. Then, this is considered as an interim RBCs which can be flexible to allow some future adjustment in term of scale and composition to increase appropriate representation and accountability. There are some interest and cooperation from local NGOs and academics to take part in the RBCs and activities.

The structure has the secretary team and



Each SRBC select 4 persons to join the working groups to be responsible for producing action plan in three major activities relating to 1) action plan formulation 2) information system 3) public relation and participation.

### River Basin Committee of Lower Ping



Each district select three farmer water users to join the working groups of three major activities: 1) action plan 2) information system 3) public relation and participation

management support as secretariat offices working to link directly with ONWRC for all workshop, meetings, consultation, and selection & appointment. The Provincial Office and RID Regional Office are working to provide the office base for the Secretariat Office of the Lower Ping and Upper Ping.

#### 5.4 River Basin Committee Composition

ONWRC has initiated RBC structure with a combination of both agencies' members and the private stakeholders from all sectors including NGOs and academics. In the Upper Ping, there are two to three members from NGOs and academics joining SRBCs, and three of them in RBC structure. Generally, it was designed that membership of government agencies and local stakeholders / water users would be a ratio of 1 person: 1 person or 50 percent of each group. In practice,

the RBC may have a larger percentage of the non-agency group. While the accountability of membership and selection process require further improvement, the representation is reasonably appropriate at this initial stage of RBC establishment.

#### 5.5 River Basin Committee Responsibilities

Initially, RBCs have been designed to have three major responsibilities including addressing priorities in water resource issues, to promote public education and sustainable water resource management, and to facilitate local public consultations with stakeholders and beneficiaries.

RBC's responsibilities are explained as possible responsibilities in relation to the SRBCs/ Regional Committee, Working Groups, and Secretariat Office. There are six major possible responsibilities of RBC. In addition a new possi-

Compositio	River Basin Committee					
	Proposed Upper Mun	Thatapao	Upper Ping	Lower Ping	Pasak	
1. Agency	14	18	20	22	23	22
2. Water Users and Stakeholder		9	6	4	6	6
3. Local Administration (PAO, TAO)	15	9	11	2	3	3
4. NGO		4	—	1	1	1
5. Academics, researcher, independent scholar	7	5	1	2	2	2
Total	36	45	38	31	35	34

Note: 1. Chairman, Deputy Chairman : Governor, Vice Governor  
 2. Committee : Agencies, Stakeholders, Local Administration, NGO, Academics, Scholars, and Private sector  
 3. Committee & Secretary : RID Regional Office

ble responsibility for RBC which should deal with the conflict resolutions and the problem solving between the sub-river basins and between the related local and regional agencies. The proposed selection process could retain the representative of the sub-river basins in the planning process and to strengthen their representation at RBC level. The working groups should work to prepare the draft action work plan, which would be reviewed by SRBCs / and approved by RBC.

RBC should further expand their key responsibilities to include conflict resolutions, an abstraction license, and revenue collection. These will enable RBCs to grow stronger, and also to develop to be a decentralized decision making body which are semi-independent from ONWRC and RID in the future. RBCs, therefore, have to improve their capacity to carry out their own financial management.

## 6. Development Plan for River Basin Committee Establishment

ONWRC is currently working through five RBC-Support Teams to plan and prepare for the establishment of RBCs in Upper Ping, Lower Ping, Thatapao, Upper Mun, and Pasak. In July 2000, the plan for Upper Mun and Thatapao has been prepared and approved for the action by NWRC. After the initial visits and discussion in Upper Mun, the team is preparing for the first group consultation with key agencies, NGOs, and water users of Korat, Roi-Et, and Surin. The discussion in Thatapao also leads to the planning and preparation in details of the establishment of RBCs. Thatapao and Upper Mun RBC have been finalized with the stakeholder workshop in October and November 2000.

In 2001, ONWRC plan to establish another two river basin committees in Eastern coast and Bang Pakong-Prachinburi river basin in eastern region of Thailand.

## 7. Conclusion and Recommendation

RBCs currently do not work independently, but carry out all designed activities through authorization by NWRC and support of ONWRC and RID. Law provision currently makes ONWRC to function and continue being an

umbrella organization for RBC activities after an approval and appointment by NWRC. Before the new Water Law enactment, it is recommend that RBC and ONWRC should take two major strategies. RBC Program development is suggested to be an important step to allow legal, political, technical, and financial support grow with the strength of each RBC for a preparation to be Independent private body within 5 years, and financially efficient in revenue and abstraction of license in 8 years.

Thus, the recommend two strategies are as follows :

- 1.) Building an institutional and technical support program and further develop to be an RBC Support Division under ONWRC and technical unit attached to RBCs;
- 2.) Establish capacity in information, research, training, and public education and relation for supporting establishment and strengthening RBCs.

## THAILAND: DISCUSSION

**Question:** What about the water balance and ground water balance in your country?

**Answer:** Total amount of rainfall could be categorized into;

1. Evaporation from the soil and water surface
2. Infiltration into the soil surface into the ground water
3. The least would remain in surface storage as run-off

**Question:** How did you determine the amount of water balance for the ecology?

**Answer:** Water for ecology can be estimated basically from the percentage of annual run-off in a particular stream.

**Question:** Is there any conflict between the district boundary and the natural boundary?

**Answer:** We do not have much conflict in Thailand with respect to administrative and hydrological boundaries. Almost all administrative boundaries are based on hydrological boundaries.