

# INSTITUTIONAL REFORM FOR EFFECTIVE WATER RESOURCES MANAGEMENT: THAILAND PERSPECTIVE

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## **Abstract:**

*Appropriate policies and strategies in a coherent institutional system with participation of all stakeholders are needed for effective water resources management. Constraints and challenges, in this regard, faced by the authorities in Thailand are identified. The paper addresses the evolution of the institutional reform initiated by the Royal Thai Government and identifies some hindrances faced in the process.*

## **1 INTRODUCTION**

Water has historically been considered an abundant resource in Thailand. The traditional institution governing the use of water is an “open access” system which basically means that water is allocated on a ‘first-come first-served’ basis. As demand increased over years due to population growth, urbanization, agricultural growth and industrialization, conflicts at all levels have been cropping up- among farmers, among communities, among economic sectors, between the government and the environmentalists, and among government agencies themselves. Furthermore, water quality is declining as a result of increased pollution from domestic, industrial and agricultural activities and seawater intrusion in coastal areas. This certainly necessitates a review of the current water development and management practices in the country.

The approach to water resources development and management has always been on sector basis both with respect to source of water as well the beneficiaries without consideration of any interactions between them. This practice, in the long run, leads to inefficiency in water use and undesirable consequences from development. Coordinated efforts are, therefore, needed to increase the water supply coverage and to allocate sufficient water to various sectors like agriculture, industry, urban and rural areas in coherence with the country’s economic and social development, without adversely affecting water resources for use by the future generations. This challenge can only be met by a combination of measures at national, regional, district and local level that includes the introduction of appropriate policies and strategies for water management and the application of new technologies for an effective planning and efficient use of available water. This calls for a shift towards an integrated or cross-sectorial approach in water management with the understanding and participation of all the stakeholders to avoid fragmented and uncoordinated development of water resources.

With an overview of the available water resources and the water demand by different sectors, the paper identifies the constraints and challenges faced by the authorities for an effective water resources management. In order to address these, a public sector reform process has been initiated by the Royal Thai Government in which all agencies involved in water development sector, formerly under different ministries, are brought under one ministry with the objective of streamlining policy formulation, strategic planning and operational aspect geared towards an effective water resources management. The paper deals with the evolution of this reform and identifies some hindrances faced in the process.

## 2 THAILAND AND ITS WATER SECTOR

Thailand is located within the tropical belt in South East Asia. The country 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 the Union of Myanmar and the Andaman Sea (Figure 1). The total land area is 513,000 km<sup>2</sup>. Thailand is considered as an agriculture-based country with 210,033 km<sup>2</sup> of agricultural land and more than 60 percent of the population is engaged in agriculture. As of 1997, the estimated population was about 60 million with a growth rate of about 1.0 percent. The urban population was estimated at about 11 million with high concentration in the capital and the regional centers. About 80 percent of the urban population is served with the treated piped drinking water supply and it is planned to increase the coverage to 91 percent by the year 2017. For rural population, about 70 percent are served with piped water systems, rainwater jars and tube wells for drinking water. Seventy-one (71) percent of the total water demand is from agricultural sector, while industrial demand accounts for only 2 percent, domestic demand accounts for 5 percent and the remaining 22 percent is for ecological balance.

### 2.1 Surface Water

The climate of Thailand is mainly governed by two monsoons, namely, the southwest monsoon and the northeast monsoon. The long-term average annual rainfall for the country is about 1700 mm ranging from 1200 mm in the northern and central plain up to 2000 to 2700 mm in the western, southern and eastern part of the country. Most rivers have flows highly concentrated during the southwest monsoon period and that contributes to about 80 to 90 percent of the annual flow. The maximum annual flow of major rivers varies from 3 to 8 times the minimum annual flow. As the country is at tropical latitudes, the temperature is uniform throughout the year with small seasonal variation around the mean of 28°C. The average temperature in the hottest month (April) is 32°C while the average temperature during the coldest month (December) is 25°C.

The National Water Resources Committee (NWRC) divided the country area into 25 major river basins (Figure 1). Several studies have been conducted to assess the water availability and water requirements in these basins. On regional basis, a summary on average annual rainfall, amount of rainfall volume and the amount of runoff is provided in Table 1. The total annual volume of water from rainfall is estimated at 800,000 million m<sup>3</sup> (MCM), 75 percent of which or about 600,000 MCM is lost through evaporation, evapo-transpiration and infiltration; the remaining 25 percent or 200,000 MCM constitutes the runoff that flows in rivers and streams.

The most important and largest river basin in Thailand is the Chao Phraya basin. The basin has a total drainage area of 157,925 km<sup>2</sup>, including the major tributary sub-basins of Ping, Wang, Yom, Nan, Pasak, Sakae Krang and Tha Chin. A comprehensive review of available water resources and water demand in the Chao Phraya Basin by Vatchahasinthu and Babel (1999), as reported by Das Gupta (2001), indicated shortage of water in the basin, particularly during the

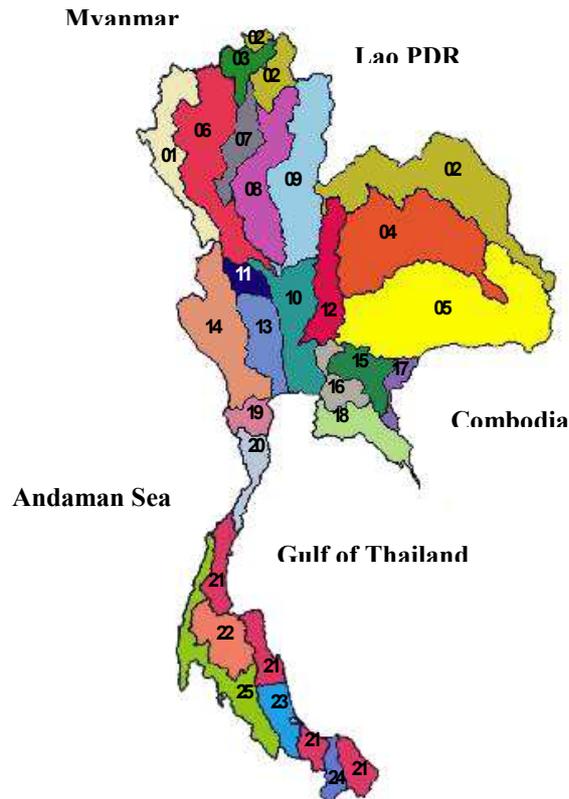


Figure 1. Map of Thailand with Delineation of 25 River Basins

dry season. The annual natural runoff volume of the basin is estimated at about 37,120 MCM, which is the major source of water for various users to support their economic activities. To cope with water shortage problems mainly in the dry season, a number of storage-type water resources development projects have been implemented in the upper sub-basins of the Chao Phraya River. However, growing demand from agricultural and non-agricultural uses over the last decades has surpassed the available resources.

## 2.2 Groundwater

Groundwater has been used to supplement surface water to meet the demand in urban and rural sectors. Public water supply for one-fifth of the nation's 220 towns and cities and for half of the 700 municipalities is derived from groundwater. Both government and private sectors undertook more than 200,000 groundwater well development projects with a total pumping capacity of about 7.55 MCM per day. It is estimated that 75 percent of domestic water is obtained from groundwater resources that can serve approximately 35 million people in villages and urban areas. Systematic groundwater resource quantification is yet to be undertaken to get the estimate of how much groundwater is available for development without any adverse consequence to the environment.

Table 1. Surface Water Resources of Thailand (Sethaputra et al., 2001)

Region	Catchment Area (km <sup>2</sup> )	Average Annual Rainfall (mm/year)	Amount of Rainfall (MCM)	Amount of Runoff (MCM)
Northern	169,640	1,280	217,140	65,140
Central	30,130	1,270	38,270	7,650
North-eastern	168,840	1,460	246,500	36,680
Eastern	34,280	2,140	73,360	22,000
Western	39,840	1,520	60,560	18,170
Southern	70,140	2,340	164,130	49,240
Total	512,870	-	799,960	198,880

Mainly rainfall and some influent seepage streams recharge the groundwater system in Thailand. On the basis of long-term hydrologic water balance studies of different regions, it was estimated that about 12.5 to 18 percent of rainfall would infiltrate the soils and only about 9 percent would reach the aquifers. However, this estimate is valid only for the basins with favorable geologic conditions such as those in the Northern Highlands, the Upper Central Plains and along the Gulf Coastal Plain. For other basins such as those in the Lower Central Plain including Bangkok and in the Korat Plateau, it was estimated that on annual basis only 5 to 6 percent of rainfall reaches the aquifer (Pattanee et al., 2002).

To cope with the rapid increase in water demand for various economic activities, groundwater has been extensively developed in various sectors due to its lower cost of development (development in phase with increase in demand) as well as for its availability near to the place of utilization (independent of distribution system). With years of increasing groundwater pumping, problems related to over-abstraction, like continual decline of the groundwater table associated with other undesirable environmental consequences are being felt in many areas. The authorities concerned have been involved in exploration and development without much effort on the evaluation of the state of the resource geared to groundwater resources management.

### 3 CONSTRAINTS AND CHALLENGES

Traditionally, water policy has been linked to specific problems like water shortages, flooding and water pollution. The construction of water supply and water defence systems and technological developments were mostly related to a few particular interests. Over the years, a shift has been observed from single-purpose water resources development to multi-purpose development objectives. The traditional concept of water resources development with emphasis on exploitation should be oriented towards the concept of water resources management with more emphasis on allocation issues. Furthermore, conservation of water for ecosystem integrity should be emphasized. The following factors contribute to the weakness of the water resources management practices over the years in Thailand.

#### 3.1 Water Management Institutions

A number of government agencies under different ministries are involved in water resources development, use and management. At the national level, there are four major boards and committees, which are responsible for policy, planning and coordination of water resources. The three most dominant ministries in terms of water management are the Ministry of Agriculture and Cooperative (MOAC), the Ministry of Science, Technology and Environment (MOSTE), and the Ministry of Industry (MOI). There are many overlaps and gaps in the responsibilities and duties among different line agencies in managing water.

In order to address these problems at the national scale, a coordinating body was created in 1979 at the Prime Minister Office. Later on the NWRC was established in 1987 with the intention to

serve as an apex body for setting up policies and plans for national water resources development. A permanent secretariat, the Office of National Water Resources Committee (ONWRC) was established in 1996 with the intended task of coordinating the water resources development activities among different agencies. However, the fragmented effort with more than thirty agencies in seven ministries, as indicated in Table 2, working in water resources development has led to over-investment and uncoordinated management.

### **3.2 Water Resources Policies and Budget Allocation**

A number of policies on specific areas have been formulated: namely, water resources development policy, water resources conservation policy, polluted water treatment policy, water resources allocation and utilization policy, and flood mitigation policy. They lack clear guidelines on water resources management. Emphasis has always been placed on the development and provision of water with significantly less spending on increasing efficiency of the existing water use, and a small amount towards management activities. For example, in 2001, the respective percentages for development activities, increasing efficiency of the existing water use and management activities were 64.00, 35.93 and 0.07, and in 2002 they were 70.87, 28.89 and 0.24. The current policy of budget allocation is agency oriented and based on their requests. Such a process is not supportive of regional or basin-wide problem solving and development planning endeavor. This practice usually results in a lack of effectiveness in implementation and improper investment.

## **4 LEGAL FRAMEWORK**

There is a lack of well-conceived legal framework to address various issues like water resources inventory, planning, use, quality and protection and an authoritative power to the administration for implementation. There are several acts covering water resources (Pattanee and Aekaraj, 2002). They fall under the jurisdiction of various agencies and are not directly related to the general concept of water resources management. Moreover, most of the acts were formulated based on conditions that no longer exist. For example, Section 1304 of the Civil and Commercial Code states that water in watercourses is freely available and that the government cannot prohibit anyone from withdrawing this water. The Code does place limits on withdrawal based on reasonable needs of users. However, with increasing competition for sharing of resources, a well-defined legal framework is needed for water allocation.

Table 2. Government Agencies Involved in Water Sector

<b>4.1.1.1.1 Ministry of Agriculture and Cooperatives</b>	
Royal Irrigation Department Land Development Department Bureau of Rain Making Agricultural Land Reform Office	Royal Forestry Department Department of Fisheries Cooperatives Promotion Department
<b>4.1.1.1.1.1 Ministry of Science, Technology and Environment</b>	
Department of Energy Development and Promotion Office of Environmental Policy and Planning Pollution Control Department Department of Environmental Quality Promotion	Office of the National Economic and Social Development Board Office of the Project Implementation Board Electricity Generating Authority of Thailand
<b>4.1.1.1.1.2 Ministry of Interior</b>	
Department of Local Administration Public Works Department Metropolitan Waterworks Department Provincial Waterworks Department Provincial Electricity Authority	Office of the Accelerated Rural Development Community Development Department Board of Small-Scale Water Resources Development Royal Thai Police Department
<b>4.1.1.1.1.3 Ministry of Industry</b>	
Department of Mineral Resources Department of Industrial Works	Industrial Estate Authority of Thailand
<b>4.1.1.1.1.4 Ministry of Health</b>	
Department of Health	
<b>4.1.1.1.1.5 Ministry of Defence</b>	
Naval Hydrographic Department	
<b>4.1.1.1.1.6 Ministry of Transport and Communications</b>	
Harbor Department	Meteorological Department

## **5 PLANNING PROCESS AND STAKEHOLDERS INVOLVEMENT**

Large- and medium-scale water resources development projects are planned and implemented by line agencies in various ministries and the process starts and ends mostly with civil servants involvement. However, in recent past, public hearing sessions are arranged at the end of the project feasibility study to inform the general public of the objective and scope of the project and the benefits envisaged from the implementation of the project. The current planning with top-down approach has proven to be unacceptable as local population and other stakeholders are not involved in the decision-making at different phases of the project. Moreover, in the past several conflicts center around environmental issues, compensations for those affected by the projects and confrontations with interested groups. The top-down approach and lack of stakeholders' participation have impeded the reconciliation between the development groups and the conservation group.

### **5.1 Data and Information**

Data and information are very essential for decision making on development and management aspects as well as on aspects of adopting some control measures against the undesirable implications of development. As a large number of agencies are involved in the implementation of various projects, information on water resources development is scattered. This makes it

difficult to establish plans for efficient water resources development and management. Moreover, such circumstances create difficulties to formulate new projects based on the concept of sustainability.

## **6 CHALLENGES**

A systematic approach to water resources management is therefore needed for effective and efficient utilization of the available water resources within the framework of the Integrated Water Resources Management (IWRM). Apart from the requirement of equitable distribution of water among the stakeholders, governance, economic performance and environmental quality are the crucial challenges facing the water resources management. Water resources management must inevitably involve multi-objective tradeoffs in a multi-disciplinary decision-making process. However, under the traditional institutional framework, several departments/agencies deal with the water resources development according to their own requirements without much integrated effort towards basin wide planning and management. This practice, in the long run, leads to inefficiency in water use and undesirable consequences from development. Furthermore, management of wastewater, its treatment and reuse are other factors to be considered in association with the concept of integrated water resources management, as these practices will impact on the availability of fresh water and water quality. This calls for adequate technical and managerial capability with an effective regulation and control through proper legislation and enforcement mechanism.

## **7 EMERGING INITIATIVES AND INSTITUTIONAL REFORM**

In order to address the constraints to effective water resources management, presented in the previous section, the NWRC has taken initiatives emphasizing on a bottom-up approach involving local communities and the river basin management concept. Several consultations, since 1999, involving stakeholders have been held to develop the National Water Vision, Policy and Development Plans (Pattanee and Aekaraj, 2002). Strategic planning was done and a framework for water resources development and management plan was formulated. Contents of the framework are provided in three categories, namely management, development and increasing of efficiency in water uses. This is also considered as a guideline for the allocation of budget in water sector in a unified manner. A comprehensive national water action plan with the objectives, strategies, the identification of responsible agencies for implementation and the time frames for accomplishment of specific tasks is in place starting 2001.

Also a bottom-up hierarchical system has been instituted for the water development plan with the lowest level being the village and the highest being the federal government, as shown in Figure 2 and this will promote bringing in together efforts of all entities towards development and management in an integrated manner using a river basin approach. The ONWRC took initiative on working with major water-related agencies, water users, NGO's, farmers' users group/cooperatives, academics and local governments to establish River Basin Committees (RBC) with representation of these stakeholders for all the eight sub-basins of the Chao Phraya Basin by the end of year 2002.

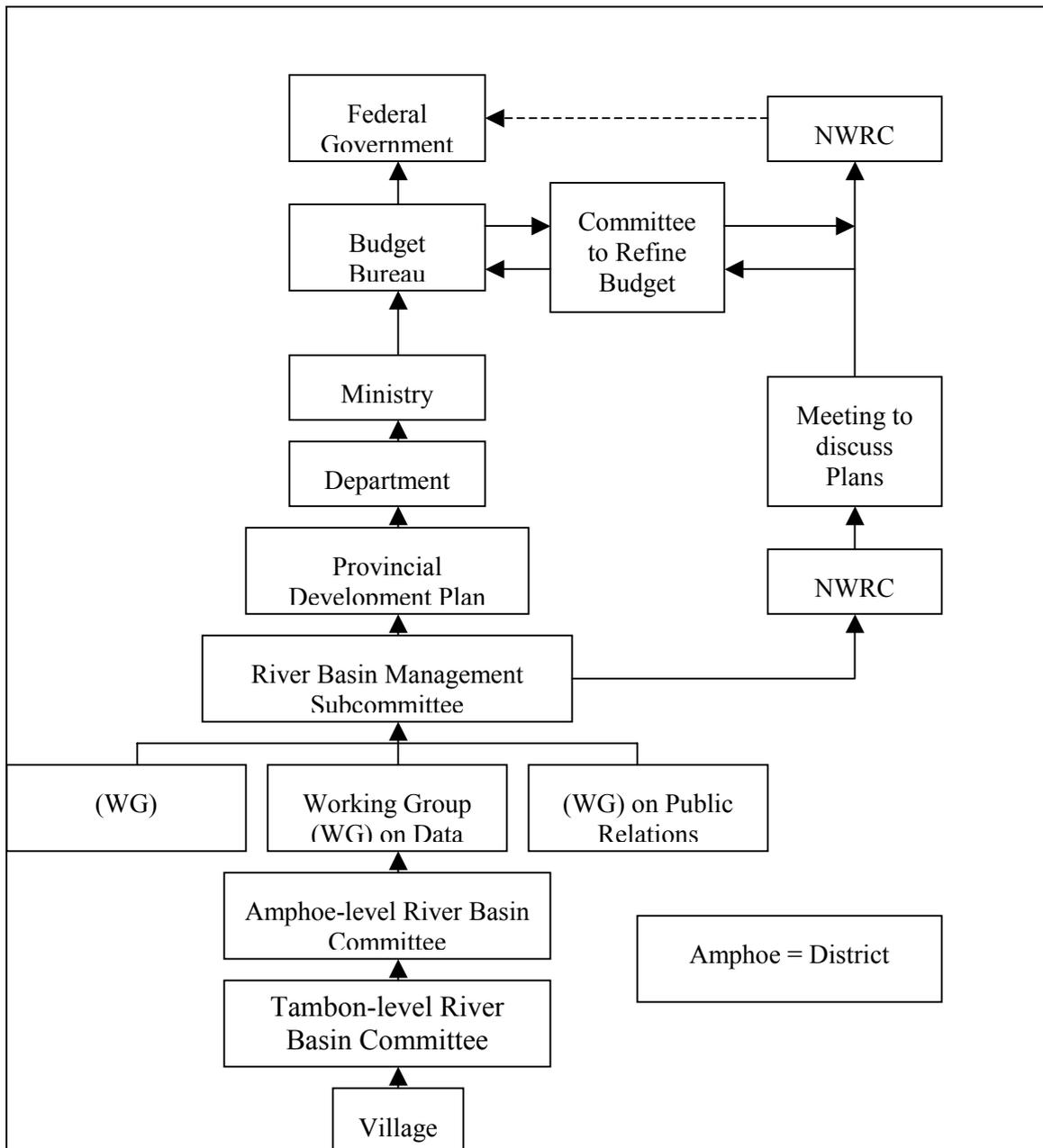


Figure 2. Bottom-up Approach for Water Development Plans and Budget Request

The tambon (sub-district)-level river basin committee develops plans and funding needs based on submission from the villages, the amphoe (district)-level river basin committee subsequently will make its plan based on the tambons' plans and forward the request for funding to the river basin management subcommittee for consideration. With the endorsement of the river basin subcommittee, the respective activities will then be incorporated in the provincial development plan and submitted to the ONWRC for approval for funding in the overall framework of the development thrust at the river basin level. Concurrently requests for funding of activities are placed to the budget bureau through respective departments in respective ministries. Selection of projects for implementation with the refinement of budget allocation, if necessary, is then agreed upon in a committee with representatives from ONWRC and the Budget Bureau. The recommendations of this committee are then passed through ONWRC and the Budget Bureau to the Federal Government for the final approval.

The Thailand bureaucratic system is in the midst of major public sector reform, adjusting the goals and structure of ministries, bureaus and departments, and promoting legal, budgetary and personnel reform. In October 2002, 14 ministries and one department have been restructured into 20 ministries. Under this new system, water resources is solely with the newly formed Ministry of Natural Resources and Environment having all departments dealing with water (except the Royal Irrigation Department) under one organizational structure. The Royal Irrigation Department, which, in the past, used to have water resources development and utilization, flood control and mitigation as main responsibility, will continue to be under the Ministry of Agriculture and Cooperatives with major role in agricultural water use and management.

All other water related departments coming from six ministries are reorganized into eight departments and one office under the new ministry, namely: the Departments of Pollution Control, Environmental Quality Promotion, Marine and Coastal Resources, Mineral Resources, National Parks, Fauna and Flora, Water Resources, Groundwater Resources, and the Office of Natural Resources and Environment Policy and Planning. The Department of Water Resources will be responsible for all water resources planning and management decisions with all agencies formerly involved in the water sector will take the role of implementers. With this adjustment and merging of units that execute similar tasks, it is expected that a comprehensive development, management and control policy can be formulated with clear goals for implementation which will result in efficient and effective use of resources.

## **8 CONCLUDING REMARKS**

An effective performance of the reformed water sector would certainly depend on the institutional and governance thrust of the responsible Department of Water Resources. With so many different organizations having a stake in water resources development and planning, regardless of where the planning and decision making power lies, the challenge is to find a balance in meeting the needs of all in a way that garners the least public resistance and the most financial support from the Federal Government. The approach to manage river basins as a unit of development and/or management has received wider acceptance, however, one needs to critically evaluate the effectiveness of such model under the prevailing physical, social, environmental, economic, legal and institutional conditions.

As the stress on water resources increased, the supply-oriented and government subsidized water management policy of the past is no longer acceptable. The authorities concerned should institute a system of scrutiny on the demand put forth by different stakeholders and implement policies and measures to evolve a sense of “water conservation” among all the water users. In this process demand management should become an acceptable component of water management and be an integral part of planning and design phases. Furthermore, a shift towards an integrated or cross-sectoral approach in water management is needed with the understanding and participation of all stakeholders to avoid fragmented and uncoordinated development of water resources. This implies the formulation and implementation of appropriate policies, strategies, a regulatory framework and a monitoring program.

The other area that needs immediate attention is the institutional aspect of the operation and maintenance of the existing and new water systems. The excellent examples to this effect are the large volumes of unaccounted-for-water in many urban areas and low water use efficiencies in irrigation projects. It is very essential to adapt technically sound, affordable, simple, cost-effective and sustainable technologies in the water supply, sanitation, irrigation and wastewater management sectors. Furthermore, well-trained personnel in all disciplines are needed for effective water resources management. Expertise from outside and support of aid organizations will certainly

assist in addressing key issues at the local and regional level; however, the long-term sustainable river basin development will inevitably depend on the in-country professionals to provide the know-how and expertise. As such education, training, research and development are the key for framing long-term potential and capacity building in pursuing effective efforts in planning, development and management process.

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