Thailand's Water Vision: A Case Study - Sacha Sethaputra, Suwit Thanopanuwat, Ladawan Kumpa & Surapol Pattanee

Sacha Sethaputra
Khon Kaen University, Khon Kaen, Thailand

Suwit Thanopanuwat
Royal Irrigation Department, Bangkok

Ladawan Kumpa
National Economic and Social Development Board, Bangkok

Surapol Pattanee
Office of the National Water Resources Committee, Bangkok

I. INTRODUCTION AND BACKGROUND INFORMATION

1. Background

The World Water Vision process has generated a great deal of enthusiasm towards better management of water resources in the region and elsewhere. In order to build on this global initiative, a programme of cooperation between ESCAP and FAO was recently launched to promote the development of national water visions. In the initial phase of the programme, an overall review of important achievements on the methodology of developing water visions was to be made jointly by ESCAP and FAO in collaboration with the Asian Institute of Technology and other international organizations. In addition, four case studies were to be undertaken in selected pilot countries in the region thanks to financial support from FAO.

As a follow up to the above initiatives, Dr Le Huu Ti of ESCAP and Mr Thierry Facon of FAO contacted the Office of the National Water Resources Committee to prepare a case study for Thailand. ONWRC responded by setting up a working group. This report forms a part of the working group's effort.

2. Objectives

In relation to the formulation of a national water vision, this report aims to:

1. review the national experience (Section II),
2. identify the key components (Section III),
3. review the development process (Section IV) and
4. provide materials for the forthcoming roundtable of national experts (Section V).

3. Approach and report organization

The approach adopted in this study was to build on previous achievements in the formulation of a Thai water vision, a process which was completed in July 1999. The working group responsible for this study has capitalized on the existing national water vision and extended it to cover the strategic action plan required by the terms of reference and to be used by ONWRC as a road map towards achieving the vision statement.

In order to give readers a complete view of how the vision and the strategic action plan were formulated, this report covers the history of Thai water management in Section II. In addition, the section surveys the different water situations as dictated by geography (i.e. river basins) and by the five-year national plans. Section II thus presents the lessons learned from the past and the constraints and opportunities of the current situation. Using these as input, Section III explains why a unified national water vision is needed. The section identifies the strengths and weaknesses of the existing institutional system of water management in Thailand as key components of, or driving forces behind, the formulation of the national water vision. Section IV describes the national water vision statement and associated strategies and how they were evolved. From the contents of the four first sections, guidelines and actions are presented in Section V.

For readers unfamiliar with Thailand, Section I provides background information on the country's current water situation. The information in this section is used in the other sections as well.

4. Background information on Thailand

4.1 General information

Thailand, a tropical land which is part of the Indochina peninsula, is bordered in the north by the Lao People's Democratic Republic (Lao PDR), in the east by Lao PDR and Cambodia, in the south by the Gulf of Thailand and Malaysia, and in the west by the Andaman Sea and the Union of Myanmar. The total land area is about 512 000 km^2. As of 1997, the estimated population was about 60 million, with a growth rate of 1.0 percent per year. The urban population was estimated at about 11 million, with high concentration in the capital and the regional centres.

The country is still agriculture-based, with a total agricultural area of about 265 200 km^2. More than 60 percent of the population engage in agriculture, yet agricultural production accounts for only about 12 percent of GDP.

Due to rapid economic development in the past decade, water demand continues to grow and two of the four regions, namely the Northeast and the Central Plain, experience frequent droughts, and flooding also occurs more frequently due to deforestation. The water resources development budget has been increasing and represents a large portion of the national budget for development. However, current environment constraints may slow down large water resources development projects in the future.

The agricultural sector remains the main user of available water and accounts for 71 percent of total water demand; the industrial sector accounts for two percent, the domestic sector for five percent and the remaining 22 percent are for ecological balance. The trend, however, is for a reduction in the share of agriculture with a corresponding increase in both industrial and domestic water usage.

Currently about 80 percent of the urban population have access to treated pipe drinking water and this is planned to increase to 91 percent by the year 2017. As for the rural population, about 70 percent are served with piped water systems, rainwater jars and tube wells for drinking water, but household consumption still has to rely on other water sources.

4.2 Water resources information

(*a*) *Surface water resources*

For hydrological purposes, Thailand has been divided into 25 river basins. The average annual rainfall countrywide is of about 1700 mm. The total volume of water from rainfall in all the river basins in Thailand is estimated at 800 000 million m^3, 75 percent of which or about 600 000 million m^3 is lost through evaporation, evapotranspiration and infiltration; the remaining 25 percent or 200 000 million m^3 constitutes the runoff that flows in rivers and streams. With a population of about 60 million, the availability of water resources is 3 300 m^3 per person per year, which is considered highly adequate in statistical terms. The data on surface water resources in Thailand are shown in Table 1.

Table 1. Thailand's surface water resources

Region	Catchment area (km^2)	Average annual rainfall (mm/year)	Amount of rainfall (million m^3)	Amount of runoff (million m^3)
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**

(*b*) *Groundwater resources*

Groundwater is an important source of water in Thailand. Public water supply for one fifth of the nation's 220 towns and cities and for half of the 700 sanitary districts is derived from groundwater. It is estimated that 75 percent of domestic water is obtained from groundwater sources. The groundwater system in Thailand is mainly recharged by rainfall of about 40 000 million m^3 and by seepage from the rivers. Hydrological balance studies estimate that about

12.5 to 18 percent of the rainfall would infiltrate the soil and about 9 percent reach the aquifer. However, this is valid only for basins under favourable 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 on the Khorat Plateau, it is estimated that only 5-6 percent of the rainfall reaches the aquifer.

The more than 200 000 groundwater well projects carried out by both the government and the private sector have a total capacity of about 7.55 million m^3 per day (2 700 million m^3 per year). It is estimated that 75 percent of domestic water is obtained from groundwater sources and that they service some 35 million people in villages and in urban areas.

(*c*) *Water provision and water demand*

The average annual rainfall countrywide is about 1 700 mm, ranging from 1 200 mm in the North and in the central plain to 2 000-2 700 mm in the western part of the South and the eastern part of the country. About 29 percent of the surface runoff, i.e. approximately 70 770 million m^3 annually, is kept in some 650 large-scale or medium-sized and 60 000 small-scale water resources development projects all over the kingdom with a total irrigable area of about 31 million *rai* or 4.96 million ha.

Although the water resources development programme has been implemented for more than eighty years, rapid rural development, industrialization, tourism development and income growth have raised water demand for domestic usage, agriculture and other purposes drastically. Inefficient use of water by various sectors and deteriorating water quality due to excessive use of fertilizer and pesticides and to urban sewage and industrial wastes also create increasingly serious problems in the availability and adequacy of water resources. Present water demand for irrigable areas and other uses countrywide is estimated to be 68 000 million m^3 per year and is expected to reach 86 000 million m^3 per year by 2006. Hence, the nation is facing serious supply constraints to further growth due to various impact problems in water resources development schemes. Water provision and water demand in each river basin are as shown in Table 2, overleaf.

(*d*) *Water resources management in Thailand*

Thailand's past three decades of sustained and rapid economic development have stimulated a quantum expansion in the demand for water services for power, irrigation and domestic and industrial usage. The government has devoted significant resources to meet this demand, and an approach towards water resources management has emerged, with emphasis on the expansion of access to services - electricity, irrigation and water supply for domestic purposes.

This approach has been successful in giving millions of Thai people access to potable drinking water, water to produce cheap and abundant food, and to generate hydroelectricity. However, as water has become increasingly scarce, this approach is no longer appropriate.

The government now faces a different and more complex set of challenges, comprising both supply- and demand-side questions:

- Is the resource base, including water and watersheds, being managed in a sustainable manner?
- Are there opportunities for more effective management of existing sources of supply?
- Who will the water be allocated to and how will it be allocated?
- Who will provide and deliver services and who will pay for them?

Table 2. Description of water provision and water demand in the 25 river basins of Thailand

Basin No.	**Name of river basin**	**Catchment area**	**Average runoff (10^6 m^3)**	**Storage capacity (10^6 m^3)**	**Irrigation area (*rai*)**	**Water requirement (10^6 m^3/year)**				
						Domestic consumption	**Tourism industry**	**Ecological balance**	**Irrigation/Agriculture**	**Hydropower**
1	Salawin	17 920	8 571	24.00	188 948.00	11.96	4.46	1 027.81	616.93	-
2	Mekong	57 422	19 362	1 551.00	1 692 333.00	132.57	1.98	1 145.69	4 323.33	-
3	Kok	7 895	5 279	30.00	520 767.00	14.90	0.43	680.00	401.39	-
4	Shi	49 477	8 752	4 246.00	1 863 173.00	195.17	49.62	573.33	3 052.82	2 156.00
5	Mun	69 700	26 655	4 255.00	1 819 785.00	337.88	94.30	956.63	2 628.85	591.30
6	Ping	33 898	7 965	14 107.00	1 942 927.00	75.26	1.00	457.27	2 428.20	3 623.00
7	Wang	10 791	1 104	197.00	472 350.00	20.21	1.00	48.00	487.42	45.00
8	Yom	23 616	3 117	98.00	994 205.00	53.87	0.08	315.36	859.13	-
9	Nan	34 330	9 158	9 619.00	1 780 637.00	66.29	0.32	315.36	2 870.80	2 583.00

10	Chao Phraya	20 125	22 015	33.00	5 731 375.00	1 594.40	646.05	1 250.00	8 768.59	-
11	Sakaekrang	5 191	1 297	162.00	436 410.00	8.62	-	3.35	878.75	-
12	Pasak	16 292	2 820	124.00	661 120.00	72.32	23.28	158.00	927.38	-
13	Tha Chin	13 682	22 300	416.00	2 385 259.00	94.94	310.25	1 000.00	4 292.11	-
14	Mae Klong	30 837	7 973	26 690.00	3 400 000.00	20.34	-	1 577.00	4 323.33	4 670.00
15	Prachinburi	10 481	5 192	57.00	733 862.00	8.08	2.78	377.00	838.32	-
16	Bang Pakong	7 978	3 713	74.00	1 353 263.00	14.18	9.05	946.00	2 243.60	1.94
17	Tonle Sap	4 150	6 266	96.00	123 720.00	12.60	-	9.80	197.00	-
18	Pen. East Coast	13 830	11 115	565.00	427 000.00	129.10	83.50	74.70	578.46	79.00
19	Phetchaburi	5 603	1 400	750.00	562 688.00	14.30	2.90	67.00	1 110.00	693.00
20	Pen. West Coast	6 745	1 420	537.00	327 015.00	18.00	2.97	39.10	1 383.00	-
21	Southeast Coast	26 353	23 270	5.00	1 780 481.00	56.40	8.70	161.70	1 129.10	2 577.00
22	Tapi	12 225	12 513	5 865.00	245 970.00	25.90	10.00	3 085.20	144.60	2 596.00
23	Songkhla Lake	8 495	4 896	28.00	905 550.00	56.45	37.50	312.00	2 994.70	-
24	Pattani	3 858	2 738	1 420.00	337 878.00	31.20	2.44	670.80	441.11	1 152.00
25	Southwest Coast	21 172	25 540	20.00	339 273.00	53.20	18.90	74.80	253.00	-
	TOTAL	**512 066**	**244 431**	**70 769.00**	**31 025 989.00**	**3 118.14**	**1 311.51**	**15 325.90**	**48 171.92**	**20 767.24**

NB: 6.25 *rai* = 1 ha

II. THE NATIONAL EXPERIENCE

This section describes three aspects of the national experience on water management. First, the historical perspective is given in Subsection 1. Second, the various hydrological river basins are presented in Subsection 2. As water management plays an increasingly critical role in the country's development, it is logical to include the perspective of the various national development plans. This is done in Subsection 3.

1. Evolution of water management

Water management in Thailand has evolved with time. Three periods can be distinguished, each with its own focus (TDRI 1990), as follows:

1283 to 1857 - *Managing people to suit water conditions*: Water management was accomplished by moving people closer to or away from water sources as necessary. People were moved to areas with enough water for rice production and away from flood-prone areas. This could be done easily because there was plenty of land and seasonal relocation was compatible with military activity and wars.

1857 to the present - *Supply-side management*: The country was relatively free from war and the stable production of rice for consumption and export was feasible. Early in this period, water was viewed as belonging to the king, who distributed it on an as-needed basis through a government agency - hence the name Royal Irrigation Department. Most of the early water management effort was canal digging (for example, the Rangsit canal network) and water regulation for agriculture and transportation. As the population increased, the later efforts concentrated on building reservoirs and expanding irrigation areas. During this period, water was still so plentiful that wastewater was sufficiently diluted and hence was not perceived as an issue. During this period, irrigation and drainage were the main components of management.

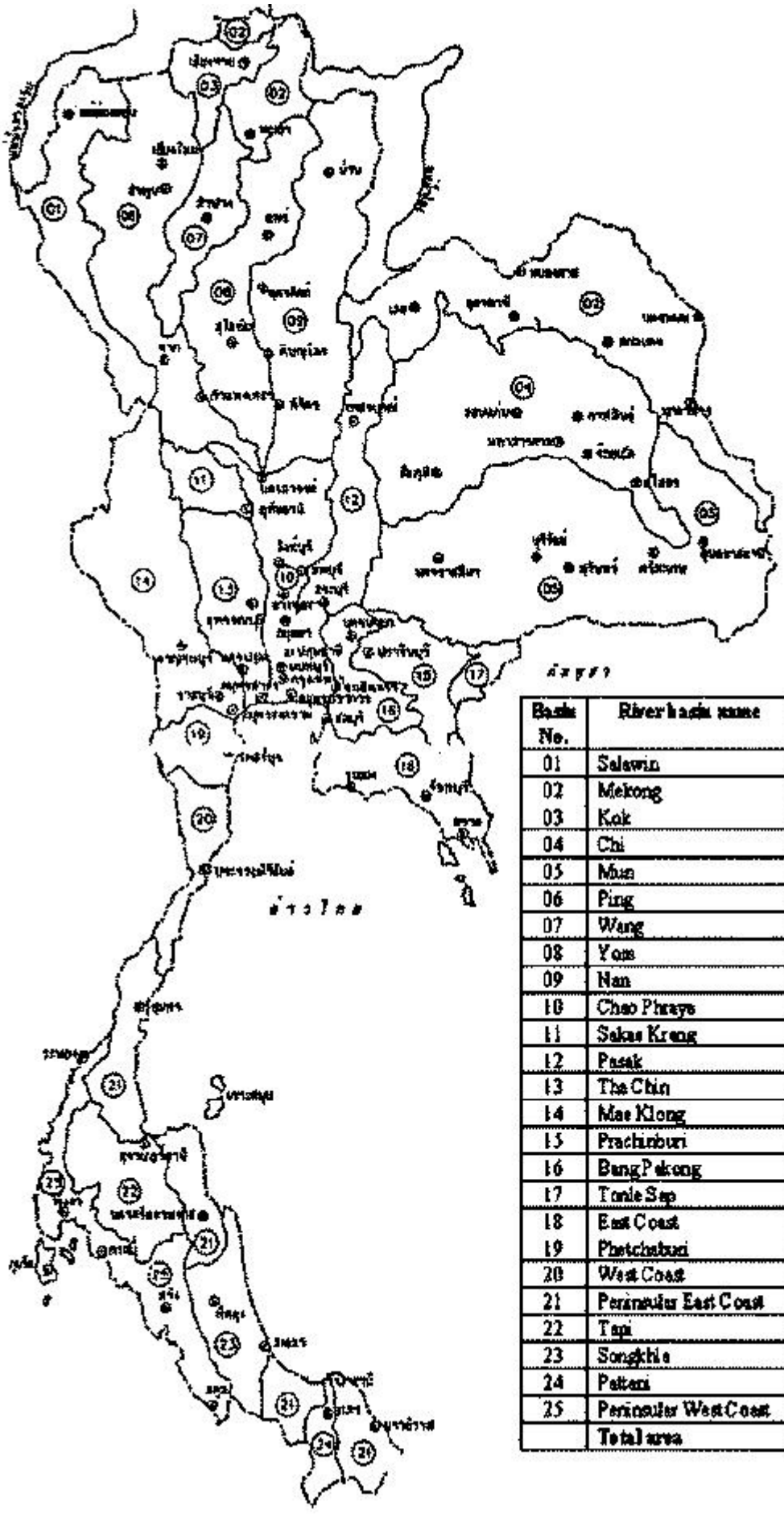
From now to 2025 - *Demand-side management*: At present Thailand is entering a third period, in which population and economic development pressures will dictate the nature of water management. In contrast to the first and second periods, water management will be characterized by transport of water from distant sources to where the people and activities are, by control and regulation of wastewater, and by efforts to conserve water.

In some respects, sophistication in water management will probably reach the current level of control of the mining industry. Mining concessions (for water) must clarify the rights and liabilities of users and are submitted to a sophisticated tax system. As more activities compete for the relatively constant amount of water, water gradually becomes like precious ore; users will have to pay for it as well as for wastewater discharge. Water rights and allocation plans will have to be set up to minimize and mediate conflicts.

2. River basins

The National Committee on Hydrology separates Thailand into 25 distinct hydrological units or river basins, as shown on the facing page. These 25 basins are regrouped into five areas, each with specific characteristics:

Figure 1. The twenty-five river basins of Thailand



Basin No.	River basin name	Catchment area
01	Salawin	17920
02	Mekong	57422
03	Kok	7896
04	Chi	49477
05	Mun	69700
06	Ping	33896
07	Wang	10791
08	Yom	23616
09	Nan	34338
10	Chao Phraya	20125
11	Sakae Krang	6191
12	Pasak	16292
13	Tha Chin	13682
14	Mae Klong	30837
15	Prachinburi	10461
16	Bang Pakong	7976
17	Tonle Sap	4150
18	East Coast	13830
19	Phetchaburi	5603
20	West Coast	6745
21	Peninsular East Coast	26363
22	Tapi	12225
23	Songkhla	8495
24	Pattani	3856
25	Peninsular West Coast	21172
	Total area	**512066**

1. Central area

This is the most important area for Thailand's economy. It is also the most agriculturally productive area without its own large water sources. Demand for water in this area far exceeds locally available supply. The area therefore depends heavily on water from river basins upstream.

2. Northern area

This area in the past was used as a source of raw water for the central area. However, the recent development of the area has increased local water consumption, thus reducing the contribution to the central area. Conflict is looming between this area and its downstream neighbour, the central area.

3. North-eastern area

This is part of the Mekong river basin's catchment area. The area is geographically unsuitable for large-scale water storage, hence cannot respond adequately to local demand. It has to rely on medium-sized and small-scale water storage and on inter-basin transfer.

4. Eastern area

The area is characterized by many short rivers, which are suitable only for medium-sized water storage projects. Due to other favourable conditions, the area is designated in the national development plan as a major industrial zone (the Eastern Seaboard) for the country. Accordingly, water shortage in the area is imminent.

5. Southern area

Many short rivers and high annual rainfall characterize this area. There are a number of large water reservoirs. Water shortage is confined to a few places and is less severe than elsewhere.

3. The national development plans

Thailand is an agriculture-based country and water resources were the main factor supporting the rapid expansion of agricultural activities and increase in productivity in the past. However, rapid population increase and accelerated economic growth, due to a boom in manufacturing and services, have caused a steep increase in water demand. Moreover, in recent years, Thailand has faced serious water problems such as pollution, shortages, droughts and floods. Therefore, water resources development and management has become an increasingly important issue and the emphasis can no longer be put on water management for agriculture alone.

3.1 Past national plans: the supply-side management water strategy

In the past, Thailand's water resources development policy aimed to respond to the demand for water in agricultural and other economic activities by emphasizing supply-side management. During the early stage of development, under the ***First National Economic and Social Development Plan*** (1962-1966), building up infrastructure was viewed as a prerequisite to developing the economy and in particular agriculture and manufacturing. Therefore, about Baht2 000 million of the government budget and another Baht1 000 million in foreign loans went into irrigation construction projects, the most outstanding of which were the Mae Klong and Chao Phraya dam projects. At the same time, the Bhumibol dam was targeted for completion during the First National Plan in order to generate hydropower. At the end of the period, the irrigated area had expanded to about 12 million *rai* or 20 percent of total arable land at the time. The main area targeted for irrigation development was the central region, while in the North, the Northeast and the South a few irrigation projects were begun: the Lum Pao and Lum Phraploeng projects in the Northeast the Sao Tong project in Nakhon Si Thammarat province and the Mae Tang project in Chiang Mai.

In the ***Second National Plan*** (1967-1971), the water resources management strategy was continued to facilitate the rapid increase in water demand in agricultural and industrial production, hydropower and consumption, etc. As the arable area expanded rapidly to fulfil domestic and foreign demand for agricultural produce, investment in irrigation projects grew and some projects were started to expand the irrigated area, such as the Nan, Nam Un, upper Chi and upper Mun projects. The overall target was to expand the irrigated area to 15 million *rai* by the year 1971. The investment budget for irrigation during the second National Plan was of about Baht7 300 million, Baht5 400 million of which came from the national budget, Baht1 950 million from an external loan and about Baht550 million from foreign grants. At the same time, there was an investment of about Baht1 000 million for multipurpose projects such as the Mekong development project and the Sirikit dam project, which were both for electricity generation and irrigation.

Under the ***Third National Plan*** (1972-76), irrigation was further expanded to facilitate the development of agriculture. Water resources were developed through a project approach, with the emphasis on bringing ongoing projects to completion and fully utilizing the existing irrigation system, although new projects had to be considered to answer greatly increased demand in the future. In the irrigation sector, the Upper Chao Phraya project, for instance, was prepared for optimal use of the irrigated area. Budgetary allocations to irrigation development amounted to about Baht8 000 million, about Baht6 500 million of which came from government coffers, Baht800 million from external loans and Baht600 million from foreign grants.

During the ***Fourth National Plan*** (1977-1981), as water resources deterioration had become a pressing consideration, the water resources policy put the emphasis not only on supply management (with a Baht20 000 million budget) but also on rehabilitation. In addition, the necessity for a master plan for water resources development was realized during that period.

The ***Fifth National Plan*** (1982-1986) took into account the problem of water shortage and need for water allocation management and for a more efficient use of water resources. Besides large-scale and medium-sized irrigation projects, small-scale projects were undertaken to supply water for domestic consumption, especially in villages, in order to raise the standard of living of poor rural people. During that period, water resources development was implemented by many agencies - not just the Royal Irrigation Department (RID) and the Electricity Generating Authority of Thailand (EGAT), but also the ministries of the Interior, of Science, of Public Health and others. But there were still no master plan for water resources development.

In the ***Sixth National Plan*** (1987-1991), for the first time, there were policy guidelines for all concerned agencies to prepare a water resources development plan at the basin level. The other guidelines were to spread small-scale water resources development throughout the rural areas, encourage the creation of people's organization, plan a greater role for management, maintain existing water development projects and develop the information system among the relevant agencies. However, the guidelines were not implemented thoroughly, as most agencies still used the project approach and had no coordination system among them.

Therefore, in the ***Seventh National Plan*** (1992-1996), there were strong development guidelines for water resources management in all 25 basins of Thailand. The guidelines for agriculture sought improvement in the efficiency and use of existing irrigation and in agricultural productivity. Farmers' participation was sought, and charging water fees was envisaged. The production of agricultural commodities (e.g. rice and cassava) that did not provide adequate or assured long-term income was not a priority of the plan. However, opportunities were foreseen for the development of high value-added crops: restructuring was proposed to match local market demand and to focus on diversified farming, with an increasing role for livestock, fishery and economic forestry. Specific support was offered to help services promote production and develop marketing systems (e.g. contract farming and farmers' groups) and agro-processing to improve market access and farm-gate prices. Farmers were to be encouraged to increase off-farm income, adapt themselves to changing commodity market conditions and the possibilities of employment in non-agricultural sectors.

During the 1992-1996 period of the plan, there were many investment projects for water resources development, with total investment of Baht122 000 million. The state contribution increased from Baht22 471 million in 1992 to Baht37 996 million in 1995, to which must be added foreign loans of more than US$474 million. The main governmental agencies involved in water resources development were (and still are) RID and EGAT. By 1994, both agencies had implemented 8 005 projects (650 of them large-scale and middle-sized and 7 346 small-scale) with a total water capacity of 48 845 million m^3. In addition, they operated 1 136 water-pumping projects. By 1995, the total irrigated area was of about 28.4 million *rai*, or 21 percent of total arable land.

However, by the end of the seventh plan, water resources management had not changed significantly. In Thailand, water supply and distribution is operated by the public sector as an open-access system whereby water can be consumed free of charge by all economic sectors,

especially agriculture. Farmers use as much water as they like: the idea of cost recovery on irrigation investments has yet to gain currency. Water used in manufacturing and services is charged at unreasonably low rates. If some economic instruments have been used to control water quality, such as the special charge for wastewater from manufacturing and services, they have yet to be applied to control water consumption.

3.2. Main features of the current, Eighth National Plan (1997-2001)

The larger the population, the higher the demand for water, but also the greater the pressure on land, so much so that watershed encroachment has become so prevalent it has led to severe water degradation. The rapid industrialization cum urbanization in and around Bangkok and some provincial towns has worsened the degradation to the point that water there has become a health hazard.

Besides the taxing problems of water quality and availability, management of water resources is hampered by the inefficient enforcement of public regulations, and the top-down, centralized approach results in poor performance. Except for the small-scale projects, which are planned from the local level upward, all medium-sized and large-scale projects are mooted by the central planning authorities based on hydrological and technical information but precious little information on the social side: local needs are investigated only at the project initiation stage. Moreover, there is little coordination among related agencies, which in a few cases results in overlapping project areas. The involvement of the local population is very limited and often causes misunderstandings between line agencies and local groups. These phenomena occur because there is no comprehensive plan of water management of the national river basins.

The first attempt to determine systematically a water resources management plan and guidelines was the study of the potential development of water resources in the 25 river basins of Thailand. The study started in 1993 and was completed in 1994. It covered data collection and preliminary analysis of the potential of each river basin to meet the demand for water for the period 1994 to 2006. However, it concentrated on the potential development of each of the 25 river basins with very little linkage to adjacent upstream and downstream basins.

In order to provide policymakers with a comprehensive river management strategy, the Chao Phraya river basin, which comprises eight sub-basins, was selected as a test case. The entire Chao Phraya river basin is the focus of the country’s growth since it covers about 30 percent of the total land area with 27 million people - half of the total population at the time - and accounts for most of the country’s agricultural production, industrialization and urbanization.

The main objective of the study was to formulate a comprehensive water management strategy for river basins, by integrating the needs of long-term planning and the requirements of short-term real-time operations, basin development and environmental protection, water quality and quantity, and surface- and groundwater development. This meant integrating institutional, policy, legal and technical measures in order to provide a coherent framework of basin planning and management to guide the systematic development, management and

protection of a basin's water resources to meet the demands of socio-economic and population growth in the basin.

The study resulted in a six-pronged strategy, namely:

1) Institutional management, which is the establishment of a Chao Phraya River Basin Organization (CPRBO) to manage all aspects of water usage, using the principle of basin management through the coordination of the activities of existing government agencies in the water sector.

2) Supply management, i.e. to develop new surface resources, attend to catchment conservation, and study and monitor groundwater.

3) Demand management, which puts the emphasis on strengthening the existing system of command and control, as well as applying water charges and improving the information system in the short term. In the longer term, water rights should be formally assigned.

4) Water quality management, by integrating management of water quality, introducing licensing of discharges and enforcing water quality standards.

5) Flood management, which means to establish within CPRBO a unit to provide a strategic flood action plan for the lower basin and strengthen existing development planning control in the lower basin to prevent further encroachment into flood ways.

6) Legal management, i.e. the requirement to support the implementation of the above strategic orientations through, notably, a comprehensive new water law and legislation for the introduction of discharge licenses.

Thus, in the Eighth National Plan, the main strategy was to establish the systematic management of water resources, especially at river basin level, including the provision of clean drinking water and the supervision of water quality, pollution control and drainage. This strategy includes the following guidelines:

1. Organizing supervisory and coordinating mechanisms for the development of water resources at both national and river basin levels in order to ensure consistency and continuity in the work of all related agencies.

2. With the participation of all parties concerned, setting up appropriate systems at various levels for the allocation of water resources between the various types of water consumer, based on the principles of necessity, priority and fairness.

3. Collecting fees for raw water from industrial and agricultural producers and from domestic consumers. The price structure for domestic consumption

and industrial usage will be adjusted to properly reflect the real cost of procurement, production, distribution and wastewater treatment.

4. Improving the transmission and allocation systems for both irrigation and domestic usage in communities, in order to minimize wastage of clean water through leaks.

5. Conducting public information campaigns to promote thrifty and effective use of water, encourage the use of water-saving devices and the re-use of cooling water and treated wastewater in some industrial activities.

3.3. Priority policy issues in the Ninth National Plan (2002-2006)

Halfway through the implementation of the Eighth National Plan, the application of the basin approach to water resources management and the establishment of a river basin authority are in the early stage, while water resources management problems are worsening. Therefore, in the Ninth National Plan, priority will be given to the following issues:

1. Shifting from the supply-side approach to the demand-side strategy. In Thailand, the supply-side approach has dominated the development and management of water resources for more than three decades. With new water-related problems arising, serious consideration should be given to the demand-side approach. Instead of focusing on investment for additional water supplies, the demand management option will concentrate on the organizational and institutional aspects in order to reduce costs while promoting sustainability and environmental conservation.

2. A comprehensive overall basin water management strategy will be substituted to the project-by-project approach. This strategy will be formulated by integrating institutional, policy, legal and technical measures, and will seek to provide guidance for the systematic development, management and protection of a basin's water resources in order to meet the increasing demands of socio-economic and population growth in the basin area.

3. Water should be recognized as a tradable commodity, since it has an economic value in all its competing uses. Therefore, incentives, regulations, permit restrictions, and penalties that will help guide and convince the people to use water efficiently and equitably will be established. Meanwhile, innovations in water-saving technology will also be encouraged.

4. Economic instruments should be considered for the alleviation of protracted water crises. The regulations supporting these economic instruments should be clear and acceptable to all groups of water users. Effective and realistic cost-recovery mechanisms should be adopted and

implemented. This would require considerable public awareness and education. Whether full cost recovery or recovery of operational cost is pursued should depend on water usage and local conditions.

5. The government will try to set up the institutional framework of water administration with users' participation by transforming its strategy and operating style in order to give the opportunity to stakeholders, especially local people, to participate in water resources management, such as:

- announcing to the public all the projects that affect people living in a given area and
- allowing representatives from the operating area to participate in the decisions that affect them.

6. The private sector should be encouraged to play a more important role in water resources management, especially concerning wastewater in urban areas.

3.4. Establishment of a river basin authority for water management

Under the new Constitution, the right of citizens to information and participation in regional and local development programmes is stipulated. The mechanisms of popular participation in the management of water resources must be worked out. All stakeholders should participate in the development and management process. Equally important is their contribution to cost recovery. To ensure the use and conservation of water resources in an economical and environmentally sound manner, a river basin authority has been proven effective in a number of countries. Such an authority must have a clear mandate as to its role and responsibilities, together with administrative guidelines to operate effectively. The river basin and sub-basin authorities are well defined in the draft water law now awaiting approval. The role of these authorities is to participate in the identification of water-related problems in the basin and in the formulation of solutions as well as of projects or programmes for agencies and government to consider and act upon. The government and line agencies will address the issues and proposals of the river basin authority to implement projects and set development priorities. However, as the idea is new and has never been put into practice in the country, some policy changes and preparatory work need to be carried out before the establishment of such authorities.

- Commission a study to look into the institutional framework and administrative procedure, and define clearly the role and responsibilities of a river basin authority.
- Establish a pilot river basin authority to serve as a learning laboratory for gradual expansion to cover all 25 basins.
- Encourage the participation of local people through the introduction of a bottom-up process for medium-sized and large-scale projects.
- Transfer some activities to user groups, such as maintenance of the distribution system, water distribution scheduling and control, etc.

III. THE KEY COMPONENTS

This section explains why a single national water vision is needed for Thailand. Briefly, the vision is needed because of the diversity in demands for water, in responses to those demands and in the limitations and opportunities of the different areas of the country. This diversity is driving water management into many different (and sometime conflicting) directions, causing inefficient use of resources, hence compromising the nation's ability to compete.

1. Increasing demand

More water is demanded from all sectors. Since water is an important resource for many economic activities, many people are involved in water resources management. The demand for water is increasing due to various reasons such as population growth and expansion of industry and services. In recent years, many areas have faced water shortages in some economic activities, especially agriculture, and domestic consumption during the dry season. New water development projects now have to address environmental issues, and many are unable to do so, seemingly for failure of considering them at the planning stage.

The demand for water has increased rapidly in every economic sector, as each wants to achieve its development target. In the case of agriculture, which consumes about 80 percent of the water supply, the demand for irrigation, which was of 58 171 million m^3 in 1993, is estimated to reach 61 746 million m^3 by 2006, an increase of about 6 percent. During that period, the irrigated area will have increased by 45 percent, from 30.2 million *rai* to 43.9 million *rai*. The share of irrigation water in the total water supply will have declined from 74 percent in 1993 to 68 percent in 2006. This declining trend reflects the competition for water from other sectors and points to more serious water shortages in agriculture. The Lower Chao Phraya project is a good example of misjudgement of future development: it has resulted in water shortages preventing cultivation of the irrigated areas during the dry season.

Total demand for domestic water, which was of 3 118 million m^3 in 1993, should increase to 6 593 million m^3 by the year 2006 - a more than 100-percent increase, much greater than the growth of population over the same period. Per capita water demand, which was of 153 litres per day in 1993, is projected at 262 litres per day in 2006. Water consumption by industry and tourism is estimated to increase by 64 percent over the period. Electricity generation is expected to increase only slightly, as EGAT has stopped implementing new large hydropower development projects and only some mini hydropower projects are implemented by the Department of Energy Development and Promotion.

Rapid economic growth has led to conflicts between people in various sectors, especially during the dry season. At the same time, the adverse impact of large dam projects on the environment is widely acknowledged in the country these days, putting a damper on new, large water development projects. All the more reason, then, for people from all sectors coming together to draw the national water vision in order to avoid conflicts of water usage in the future.

2. Differences in area requirements

All river basins in Thailand are different in terms of potential, water supply limitations, and types of water demand. The 25 main river basins of the country have a total runoff of about 214 128 million m^3. The national NESDB study of these river basins, carried out in the early 1990s, shows the difference in water supply and demand in each and points out that they all have water shortage problems during the dry season.

The Chao Phraya river basin, which is the largest and the most important basin of the country, has faced the most serious water shortage problem. The high density of population and intense economic activity in the basin result in high water demand. The 1996 NESDB study on a strategy for water resources management in the Chao Phraya river basin confirms the problem. The water shortage of the Lower Chao Phraya depends very much on the combined available water stored by the Bhumibol and Sirikit dams and on total rainfall in the Northern region. The shortage of water will worsen in future, since water demand continues to increase both upstream and downstream while the total water supply remains the same or even decreases due to deforestation. During the 1999 dry season, paddy plantation was reduced because of the water shortage. Moreover, the study points out that there is no more potential for large dam construction in the basin or in the adjacent Tha Chin river basin.

In the Northern region, all river basins suffer from water shortage, especially the Salawin basin and, to a minor extent, those of the Kok, Ping and Wang rivers. In the Northeast, the Mun river basin is the most seriously affected, followed by the Chi and Mekong river basins. The soil structure in the Northeast has low potential for water storage.

In the Eastern and the Southern areas, water shortage problems are less serious than in the other regions, with the exception of the Eastern coastal basins of the Tonle Sap and Tapi rivers.

The different state of water supply and demand and different potential from one basin to the next imply different objectives and targets in water resources management to fulfil people's needs. However, at present, there is no master plan for such management in any basin. Therefore, the preparation of the national water vision had to include and reflect people's needs in every water basin.

3. Institutions

There are two major obstacles to effective water management in Thailand: the lack of clear policies and the lack of coordination among organizations. Water resources are administered and managed by eight ministries with different priorities and programmes that sometimes overlap or are in conflict. The irrigation projects of all sizes that are handled by the Royal Irrigation Department sometimes lack proper management of water delivery and this makes a change of priority in irrigation development difficult. Most of the irrigation system is designed to serve the needs of rice farmers in the central region. Large-scale and medium-sized irrigation systems do not adequately meet the current requirements of

competitive mixed farming and contract farming linked to agro-industries and to competitive global export markets in all regions. At the same time, the differences in soil and hydrology conditions in the various regions have resulted in inefficient water delivery for irrigation. The irrigated areas are not fully utilized, especially in the dry season. It is estimated that the cropping intensity of irrigation projects is 70 percent in the wet season and 30 percent in the dry season.

Besides the Royal Irrigation Department, there are many agencies implementing small-scale water development projects. The Department of Energy Development and Promotion manages the pumping schemes and the Department of Mineral Resources manages and controls the use of groundwater. Other agencies take part in small-scale project implementation; they usually have their own work plans and do not coordinate their activities with other concerned agencies.

Most irrigation projects are formulated mainly to solve specific problems, often with little regard for the concept of basin or sub-basin. At the same time, the problem of unrealistic water allocation exists, especially in the dry season when the water supply is limited. Besides, with the exception of small-scale projects in which local people are involved at the inception, the current process of water resources development through projects has proven unacceptable to local people and other stakeholders, as they need more information and more participation in decision-making. The implementing agencies need to be responsive, but they have to follow their own procedures, evolved to facilitate operations, as well as important regulations such as the Groundwater Act of 1977, the Dykes and Ditches Act of 1982, the State Irrigation Act of 1992 or the Private Irrigation Act of 1939. To improve efficiency and increase stakeholder participation in water resources development projects, these acts need to be amended. Moreover, the national water law, which will be the framework for overall water resources management, needs to be approved and promulgated.

Currently there is no long-term national water resources management plan, and no targets and objectives have been set for the various agencies to follow. Despite the vast authority given it under a Prime Minister's Office regulation of 1989, the National Water Resources Committee (NWRC) functions like an ad-hoc committee tackling immediate and short-term problems. Actually, NWRC lacks full authority and an operating mechanism to oversee the implementation of the resolutions adopted by the Cabinet. The Office of the NWRC (ONWRC), which was established in 1996 with 80 officials, still lacks the capacity to support NRWC effectively, because of limited budget and quality staff.

Although NWRC has come up with directives, measures and programmes for water resources development and management, they were not based on any coherent blueprint and hardly any targets for achievement were set. As for the various agencies, they usually carry their operations over from year to year with little or no change and their plans are subjected to intense political lobbying. The 25 basin preliminary plans have not been of much use and there has been no follow-up study to formulate a long-term plan and targets of development. It is also apparent that there is no coordination in carrying out studies or in preparing a master plan, as in the case of the World Bank-funded NESDB study of the Chao Phraya river basin

and the Chao Phraya river basin management study of the Royal Irrigation Department, which had more or less the same objective. With better coordination, some budget could be saved.

However, NWRC with the support of ONWRC and NESDB has started to implement water resources management through the basin approach. The subcommittee for the establishment of a Chao Phraya river basin authority was set up in 1998. Since then, the pilot implementation of a sub-basin authority has started in three priority sub-basins of the Chao Phraya basin, namely the upper Ping, lower Ping and Pasak. The corresponding sub-basin committees were established by NWRC at the request of the Cabinet. Each committee consists of all involved parties, such as representatives of the local government, local community, local people's organizations, etc. Its duties are information collection, local project formulation and approval before submission to NWRC, and resolution of local conflicts about water issues.

However, some problems have been found from the start in water resources management at the river basin level. First is the issue of management mechanism at basin level. The unclear policy, legal and institutional framework governing basin areas makes it difficult to effectively implement basin management. Inadequate and sometimes conflicting legislation is also a problem. There are numerous agencies involved in basin management, and none has clear responsibility for basin management and development. Second is the problem of participation of stakeholders. The current process of project identification and formulation of line agencies has proven unacceptable to the local population and other stakeholders, who demand more information from line agencies and greater participation in the decision-making process. Many large-scale projects do not go through this public process and cannot proceed. There are a few issues that line agencies need to consider to reshape their approach. Third is the issue of involvement of stakeholders in the development process. All public water projects are intended to serve and benefit the users, though they may have adverse effect on some other groups or resources. It is therefore important to seek the opinion of all concerned parties or stakeholders, to get them involved from the early stage of project formulation and to keep consulting them throughout the development process. This is certainly a big change for line agencies. On the other hand, the stakeholders have to adopt a more cooperative and objective stance and be keen to compromise, instead of letting outside influence overshadow their real interests, as has occasionally been the case. Fourth is the issue of conflict management. With the more democratic practice of public involvement in water resources development, many conflicts happen during public hearings or consultations. The conflicts centre on environmental issues, compensation for those affected by the projects and demands from interest groups. At present, there is a lack of mechanism for conflict management, in the form of either institution, legislation or procedure. As competition for water will no doubt increase in the near future, conflicts will multiply; thus, conflict management is a necessity. Finally is the issue of sense of ownership and sharing of responsibility. As long as water is freely accessible and the government provides all water resources projects free of charge, the users or beneficiaries do not appreciate the projects and have little sense of ownership. The general feeling is that if it's a government project, it belongs to the government, so let the government take care of it: people do not feel responsible for the upkeep of the project.

The above legal and institutional framework shows that water resources management concerns many parties and requires much legal adjustment. All conflicts and problems need to be solved as soon as possible to achieve better management and it is necessary that all parties join in the process of improvement, development and formulation of the national water vision to come up with a common objective.

IV. THE NATIONAL WATER VISION

This section states the national water vision and how it was formulated, why it is needed and what has been done to translate it into reality.

1. The vision statement

The vision statement for Thailand is shown below. Explanation for its derivation is in the next subsection.

> "*By the year 2025, Thailand will have sufficient water of good quality for all users through efficient management and an organizational and legal system that will ensure equitable and sustainable use of water resources, with due consideration for the quality of life and the participation of all stakeholders.*"

2. Development of the vision statement

A series of brainstorming sessions were held to arrive at the vision statement. Table 3 summarizes these meetings.

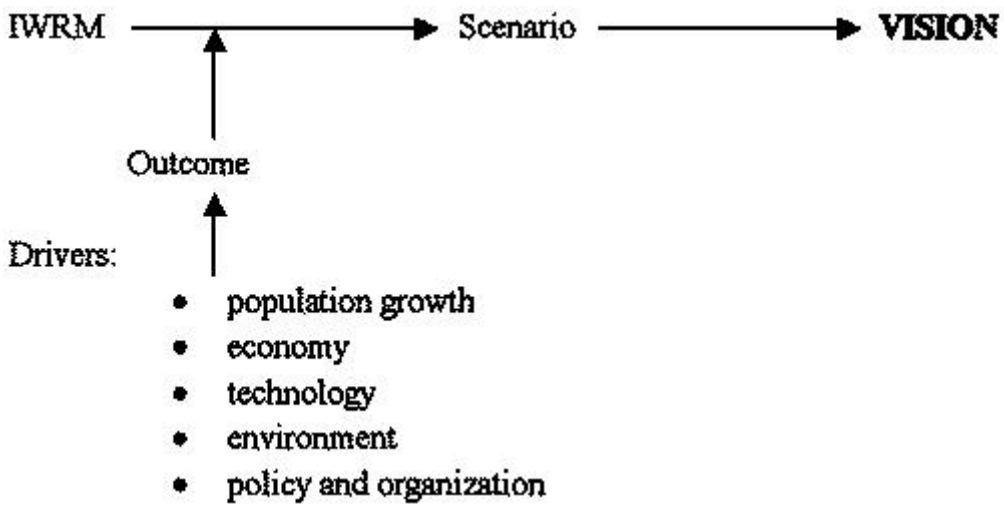
Table 3. Meetings leading to the formulation of the vision statement

Date/Venue	Title of the meeting
1) 5 September 1997/Public Relations Department's Meeting Hall, Bangkok	Directions for the management of water resources and preparation of the water resources management master plan for major river basins
2) 8-9 January 1998/Rama Garden Hotel, Bangkok	Policy and strategy for national water resources development beyond the year 2000
3) 21-22 July 1999/The Peninsula Hotel, Bangkok	National water vision

Formulation of the vision statement occurred in the last meeting of July 1999. How was the statement derived is explained below.

Conceptual framework

Conceptual framework used to guide the meeting is shown in the diagram below.



(IWRM = Integrated water resources management)

Methodology

Based on the above concept, participants were divided into four groups. Each group was assigned the following tasks: 1) select three targets it wishes to see reached in the next 25 years, 2) arrange the targets into several keywords and 3) form the group's vision from the keywords. The four visions were then discussed in a plenary session and arranged into a single statement for the National Vision on Water for Thailand.

V. POLICIES, STRATEGY AND ACTIONS

This section examines the steps taken to ensure that vision definition leads to action. A brainstorming workshop* entitled 'From vision to strategic plan and national policy' was organized on 3 March 2000. In this workshop, national policies, corresponding strategic guidelines and actions were formulated (Subsection 1). These and the national water vision as defined in Section IV were presented to the roundtable meeting held on 19-20 June 2000 (Subsection 2; the programme of the meeting is attached as Appendix 2). To legitimize and implement these policies, they were presented to NWRC, which adopted them with minor modifications in its 20 July 2000 meeting. Details of the endorsed policies are in Subsection 3.

* Held at the Miracle Grand Convention Hotel, Bangkok. Organized by the Office of National Water Resources Committee. Sponsored by the Global Water Partnership, the Thailand Research Fund, and the Eastern Water Resources Development and Management Public Company Ltd.

1. Proposed policies

Results of the brainstorming workshop are summarized and presented in Appendix 1.

2. The roundtable meeting

Accepting the proposed vision, strategy, policies and actions, the roundtable meeting focused on what was required to start fulfilling the vision and on the details of some important water subsectors. The outcome of the meeting came under the five following headings:

1. Implementation of the national water vision
2. Water for the people: water supply, sanitation and health
3. Water vision for agriculture and rural development
4. Water management in the Chao Phraya river basin
5. Thrust of water management in the Ninth National Plan

The first four were formulated in corresponding working group discussions, the fifth during the final session of the meeting.

2.1 Implementation of the national water vision

Implementation was considered to consist of five components:

1. **Acceptance** of the vision: ONWRC is responsible for
   a) Cabinet or ministerial endorsement and acceptance;
   b) Campaign through the mass media;
   c) Organization of an NGO forum; and
   d) Incorporation of the vision into the Ninth National Plan.
2. **Monitoring** of the progress towards the vision: ONWRC is to do the monitoring on behalf of NWRC through the river basin committees and the concerned line agencies. To achieve this will require:
   a) Capacity building for ONWRC and river basin committees.
   b) An effective water law.
3. **Implementation** of the action plans: ONWRC is to coordinate as much as possible the activities of line agencies, river basin committees and private organizations according to the plan.

4. Development and application of **indicators** for monitoring: ONWRC is responsible for:

   a) identifying suitable indicators and methodologies to measure the degree of fulfilment of the vision and

   b) making sure that these indicators are used in the monitoring of the Ninth National Plan or the action plans.

5. **Reporting** of monitoring results: ONWRC is responsible for reporting once a year to:

a) the Cabinet,
b) a national assembly to be organized by ONWRC and
c) the public, through publication and dissemination.

2.2 Water for people: water supply, sanitation and health

As a continuation of the process of the national water vision, the inter-sectoral workshop entitled 'Water for life and health vision' was held in Bangkok on 15 March 2000. The participants adopted the following vision statement:

> *"By the year 2010, all Thais will have clean and adequate water supplies for good health, with the participation of all stakeholders in an efficient and sustainable manner."*

Measurable goals were agreed as follows:

1.Clean and adequate domestic water consumption

- Urban: 90 percent of households.
- Rural: water supply systems in all target villages

2. Proper and efficient pollution control systems in all localities to prevent contamination of domestic water reservoirs.

3. Public awareness of domestic water consumption, effective usage, and pollution impact.

4. National leading agency for the management of water for life and health.

5. Participation of the local administration and all stakeholders in the effective management of water for life and health.

6. Water and water-related legislation to support water for life and health.

7. A modern and integrated information system for policy, planning and management decisions.

8. Promotion of research and development for a clean and adequate water supply to all.

9. Maintenance and promotion of local traditional wisdom in water for life and health management.

2.3 Water vision for agriculture and rural development

Agriculture is the most important sector in Thailand to support food security, create rural employment and stabilize the economy. Thai governments have emphasized agriculture and rural development continuously by launching a rural development programme followed by an agriculture-restructuring programme.

For more than fifty years, many irrigated agricultural development projects have been implemented in parallel with the development of irrigation. However, irrigation intensity is still low. Compared with the 132 million *rai* of total farmland, only 30 million *rai* are under irrigation. Historically, most of large-scale water resources development projects in the country were constructed from the 1950s to the 1970s and the areas served under the projects were only one fifth of the total cultivated area. A large number of farmers still do not enjoy the benefits of irrigation water.

The government therefore started a small-scale development programme in the 1980s with the aims of improving the living conditions of the people in poor rural areas and of reducing income disparity, and water resources development was part of the programme.

In conclusion, water resources development for agriculture and rural development should be considered of strategic importance, first for economic growth, by efficiently using the existing irrigated area and developing new areas wherever possible, and second for rural development in rain-fed agricultural areas, by promoting more small-scale projects and appropriate technology such as rainwater harvesting, including the royally initiated 'New Theory' projects.

2.4 Water management in the Chao Phraya river basin

In 1997, a Chao Phraya Basin Water Management Strategy was prepared with technical assistance from the World Bank. NESDB supervised the work in collaboration with major water agencies.

The recommendations of this strategy were as follows:

1. Establishing the Chao Phraya River Basin Organization
2. Water supply management
3. Demand management
4. Water quality management
5. Flood management
6. Improvement of the legal aspect

Follow-up projects are further developed in the Chao Phraya river basin:

(a) A pilot project for trial of organizing river basin committees in the Chao Phraya sub-basins. There are three river basin committees, for the upper Ping, lower Ping and Pasak sub-basins.

(b) A study on the establishment of the Chao Phraya Basin Organization, supported by AUSAID through the World Bank. The study takes into consideration comments from many workshops and from the people concerned. The suggestion for establishing such an organization comes with the recommendation to improve the capacity of the water sector.

(c) A study on rights-based allocation of water, funded by the World Bank. The purpose of this project is to address some aspects of this approach, for instance, what kind of implementation would be required and what would a pilot programme for it be like.

(d) A study of management in the Ping river basin, funded by ADB. The study tries to formulate a river basin management system in three areas, the Ping river basin in the North, the Mun river basin in the Northeast and Thatapao canal in the South. The activities include reviewing available information and data for water resources management and watershed protection.

(e) The Thailand Integrated Water Resources Management System. The project will carry out research work in the Chao Phraya river basin.

(f) Modernization of the irrigation system:

- Study on conjunctive use of surface and groundwater
- Study on cost recovery in irrigation projects
- Promoting people's irrigation management
- Privatization of irrigation

2.5 Direction of water management in the Ninth National Plan

1. Preparation of the Ninth National Plan is based on the collection of opinions among the public. This is done in two steps:

- Organizing meetings at sub-regional level for nine sub-regions.
- Organizing meetings at the national level.

2. The steps in preparation of the plan are:

- Drafting the vision and development framework to be proposed to the Cabinet
- Drafting the Ninth National Plan to be proposed to the national conference and the consultative council
- Proposing the draft plan to the Cabinet
- Clarifying the plan's implementation
- Announcing the start of the Ninth National Economic and Social Development Plan on 1 October 2001

3. Provision of raw water will be made with careful consideration of its impacts on the environment.

4. Support the establishment of river basin organizations, eventually to cover all 25 river basins, with the participation of all concerned parties.

5. Increase people's participation to water quality management, especially regarding wastewater.

2.6 Significant issues in water resources development

1. Accelerate water resources management in river basins, notably by improving rules and regulations and strengthening the concerned agencies.

2. Emphasize demand-side management

- Encourage effective water usage and equitable water allocation
- Adapt economic mechanisms, such as fees and licenses, for the promotion of effective water usage.

3. Endorsed policies

The policies mentioned in Subsection 1 were refined and endorsed by NWRC in its 20 July 2000 meeting. The endorsed policies are shown below.

1. Accelerate the promulgation of the draft water act to serve as framework for national water management by reviewing the draft, and implement all necessary steps to have the act effective, including reviewing existing laws and regulations.

2. Create water management organizations both at national and at river basin levels with supportive laws. The national organization is responsible for formulating national policies, monitoring and coordinating activities to carry out the set policies. The river basin organizations are responsible for preparing participatory water management plans.

3. Emphasize suitable and equitable water allocation for all water-using sectors to fulfil basic water requirements in agriculture and for domestic purposes. This is to be done by establishing efficient and sustainable water usage priorities for each river basin under clear water allocation criteria, incorporating beneficiaries' cost sharing based on ability to pay and level of services.

4. Identify clear directions for provision and development of raw water of suitable quality, compatible with the potential and demands of each river basin, while conserving the natural resources and maintaining the environment.

5. Provide and develop raw water sources for farmers extensively and equitably to respond to water demand in sustainable agriculture and for

domestic consumption, similar to deliveries of other basic infrastructure services provided by the State.

6. Include in the curriculum at all levels of formal education water-related topics, to create awareness of the value of water and understanding of the importance of efficient water usage and of the need to maintain natural and man-made water sources.

7. Provide sufficient and sustainable financial support for water-related research, public relations, information collection and technology transfer to the public.

8. Promote and support the participation, with clear identification of its format, of non-government and government organizations in efficient water management. Water management includes water usage, water source conservation and monitoring of water quality.

9. Accelerate the preparation of plans for flood and drought protection, including damage control and rehabilitation efficiently and equitably with proper use of land and other natural resources.

4. Endorsement by the Cabinet

In its weekly meeting of 25 July 2000, the Cabinet endorsed the national water vision, its policies and related directives.

VI. CONCLUSIONS AND RECOMMENDATIONS

1. Conclusions

1. A well-planned process for the formulation of the national water vision and its downstream actions (strategic actions) has been in place since 1997. The process consists of a series of brainstorming meetings among more than a hundred national experts - government officials, NGO representatives, academics and consultants.

2. At the time of this report preparation, both NWRC and the Cabinet have endorsed the national water vision, along with its policies and blueprint for action.

2. Recommendations

It is fortunate that the formulation of the national water vision and actions leading to its realization are occurring at a time when the new (1997) Constitution is beginning to shape the country’s future. The Constitution calls for public participation and partnership in all national

development endeavours, including those of the water sector. In this spirit, the following recommendations are presented:

1. Demand attention from the political sector.

2. Clarify water rights and water allocation practices. Formulate a clear division of responsibilities between ONWRC (as the topmost national water management body) and local authorities (the river basin committees).

3. Promote and support the river basin committees to exercise local authority in river basin water management.

4. Lobby for inclusion of the output of the national water vision in the forthcoming Ninth National Plan.

REFERENCES

1. **TDRI.** 'Water shortages: managing demand to expand supply' *in* The 1990 TDRI Year-End Conference, *Industrialization in Thailand and its impact on the environment*, 8-9 December 1990, Bangkok

2. Office of the National Economic and Social Development Board (NESDB). *The First National Economic Development Plan* (*1961-1966*)

3. **Office of the NESDB.** *The Second National Economic Development Plan* (*1967-1971*)

4. **Office of the NESDB.** *The Third National Economic Development Plan* (*1972-1976*)

5. **Office of the NESDB.** *The Fourth National Economic Development Plan* (*1977-1981*)

6. **Office of the NESDB.** *The Fifth National Economic Development Plan* (*1982-1986*)

7. **Office of the NESDB.** *The Sixth National Economic Development Plan* (*1987-1991*)

8. **Office of the NESDB.** *The Seventh National Economic Development Plan* (*1992-1996*)

9. **Office of the NESDB.** *The Eighth National Economic Development Plan* (*1997-2001*)

10. **Office of the NESDB.** *Evaluation of the Second National Economic Development Plan* (*1967-1971*)

11. **Office of the NESDB.** *Evaluation of the Third National Economic Development Plan* (*1972-1976*)

12. **Office of the NESDB.** *Evaluation of the Fourth National Economic and Social Development Plan* (*1977-1981*)

13. **Office of the NESDB.** *Evaluation of the Fifth National Economic and Social Development Plan* (*1982-1986*)

14. **Office of the NESDB.** *Evaluation of the Sixth National Economic and Social Development Plan* (*1987-1991*)

15. **Office of the NESDB.** *Evaluation of the Seventh National Economic and Social Development plan* (*1992-1996*)

16. **Office of the NESDB.** *Evaluation of the Eighth National Economic Development plan* (*1997-2001*)

17. **Snoh Unakul.** *Monetary and Fiscal Policy and Economic Development Planning of Thailand.* 1971. Ramin Publisher

18. **Binnie & Partners (Overseas) Ltd**. October 1997. *Chao Phraya Basin Water Management Strategy, Final report*. Prepared for the Office of the NESDB, Bangkok

APPENDIX 1. PREPARATION OF A NATIONAL ACTION PLAN

Under each policy, objectives, strategic guidelines and action plans were set, the responsible agencies were identified and a timeframe specified for each action. The whole forms the national action plan.

POLICY: National water resources will be managed within a sound legal framework

Objective	Strategy	Action	Responsible agency	Time frame
To have a water law to serve as principal legislation for the efficient management of national water resources	Draft the water law and revise existing laws and regulations concerning water resources management	1. Set up a working group to revise the draft water law	ONWRC	Dec 2000
		2. Organize seminars and workshops to obtain feedback from all stakeholders	ONWRC	March 2001
		3. Submit the draft water law to the government for consideration	ONWRC	June 2001

POLICY: Water sector coordination will be ensured by a national body for policy formulation and regulation and by the river basin committees

Objective	Strategy	Action	Responsible agency	Time frame
1. To have legally established organizations manage water resources at both national and basin levels	Draft laws to establish a policy and a regulatory body for national water management, and to establish basin organizations with emphasis on public participation in basin water allocation and management	1. Study and design a suitable organization structure of the national and basin organizations for the drafting of supporting laws	ONWRC and concerned agencies	Dec 2000
		2. Establish basin organizations to prepare basin development plans	ONWRC	2001-2005
2. To expand drinking water supply service to cover all communities and villages in the country	Increase construction of drinking water supply projects for communities and villages	1. Short-term: Construct and provide water supply to cover 70% of communities and villages	TAO, DOH, PWA and private sector	2001-2003
		2. Long-term: Construct and provide drinking water supply to cover 95% of communities and villages	TAO, DOH, PWA and private sector	2004-2006
3. To have users share responsibility for services received	Use economic and financial measures for water allocation, fee collection, water market, compensation, and duty for wastewater treatment and other services through which the public participate in setting fees	1. Study and set appropriate pricing for various uses of water	ONWRC and concerned agencies	2002
		2. Study feasibility and set guidelines for the private sector to provide services	ONWRC and concerned agencies	2002
		3. Public awareness campaign for users to understand investment and other costs needed to be borne collectively	ONWRC and concerned agencies	Begin 2001
		4. Creation of a water fund for water management	ONWRC and concerned agencies	Begin 2001
4. To have appropriate water allocations for all	1. Infrastructure rehabilitation 2. Management system improvement	1. Rehabilitation of water distribution and control structures to	Concerned agencies	Begin 2001

users at both national and basin levels		reduce losses		
		2. Modernize water delivery and control methods	Concerned agencies	Begin 2001
		3. Organize restructuring and human resources development in water management	Concerned agencies	Begin 2001
	3. Introduce reuse systems	1. Study and develop water reuse models 2. Provide incentives for water reuse	Concerned agencies	Begin 2001

POLICY: Water resources management will be carried out with clear guidelines and targets, supported by firm commitment, with due consideration given to the conservation of the environment

Objective	**Strategy**	**Action**	**Responsible agency**	**Time frame**
1. To have clear direction and firm commitment for water management	To make decision-makers aware of the importance of and associated problems in water management	1. Provide information and propose solution to decision-makers.	ONWRC	Begin 2001
		2. Adopt the IWRM approach for all concerned agencies to follow	ONWRC and concerned agencies	Begin 2001
2. To develop water resources in adequate quantity and of suitable quality for various uses with due consideration for environmental conservation	To prepare a master plan based on integrated basin water management and development	1. Prepare an integrated surface water and groundwater development, conservation and rehabilitation plan	ONWRC and concerned agencies	2001-2006
		2. Prepare a master plan for sanitary programmes and waste water treatment	OEPP, PCD, PWD, DOH and TAO	2004-2006
		3. Develop and establish a database on water, land, forestry and the environment	ONWRC and concerned agencies	2006

POLICY: Public awareness of water resources management will be increased by incorporating knowledge about water into the curriculum at all levels of formal education

Objective	Strategy	Action	Responsible agency	Time frame
To make all citizens aware of the importance of water and use water efficiently	Include curriculum on water at all levels of study	Prepare curriculum to cover water-related matters for all levels of study	ONWRC, MOE and MOUA	2003

POLICY: Sustainable water resources management requires investment in research, public relations and the collection and dissemination of information about water

Objective	Strategy	Action	Responsible agency	Time frame
1. PR programme to publicize government agencies' plans and projects among the public for understanding and support	To provide budget for public relations, create awareness and distribute information to agencies responsible for project implementation	1. Study and develop public relation models and media methods for concerned agencies to follow	ONWRC and concerned agencies	Begin 2001
		2. Training and recruitment of public relation personnel for the agencies	ONWRC and concerned agencies	Begin 2001
2. Development of qualified personnel in water management	To promote research and technology transfer for the personnel involved in water management	1. Prepare a master plan for research on water management	ONWRC and academic institutes	Begin 2002
		2. Conduct research, training and transfer of technology	ONWRC and academic institutes	Begin 2002

POLICY: Water resources planning, development, management and conservation require the participation of government agencies, private organizations and the public, based on procedures that clearly define the rights and responsibilities of stakeholders

Objective	Strategy	Action	Responsible agency	Time frame
To let the public/stakeholders participate in the planning, development and management of water, and to make them	1. To promote public participation in all steps of water management	Study and define procedures as well as the scope for public participation	ONWRC and concerned agencies	Begin 2001

understand their rights and responsibilities in the use, preservation and conservation of water and the environment	2. To launch a campaign to make the public aware of their right to water and of their responsibility to take care of, and conserve, water and the environment	Study and define the rights and responsibilities of stakeholders, and provide materials for public information	ONWRC and concerned agencies	Begin 2001

APPENDIX 2. PROGRAMME OF THE ROUNDTABLE MEETING ON 'WATER RESOURCES MANAGEMENT IN THAILAND: FROM VISION TO ACTION'

Bangkok, 19-20 June 2000

19 June 2000 - DAY 1

8:00-8:45	**REGISTRATION**	
8:45-9:00	Opening session: Welcoming address	Director of ONWRC
9:00-10:00	**Session 1**	Chaired by
	- From water vision to action: visioning process versus strategic planning	Dr Le Huu Ti, ESCAP
	- Overview of the water vision for food, agriculture and rural development: strategic choices for countries	Mr Thierry Facon, FAO
10:00-10:15	Open forum: discussion	
10:15-10:30	*Coffee break*	
10:30-11:15	**Session 2**	Chaired by
	- Thailand's water vision - a case study	Dr Apichart Anukularmphai
	- Experiences in strategic planning for water resources management	Dr Sacha Sethaputra, ONWRC
11:15-11:30	Open forum: discussion	Dr Le Huu Ti, ESCAP
11:30-12:30	**Session 3**	Chaired by
	- Water resources management for socio-economic development in the past and in the 9th Five-year Plan	Dr Apichart Anukularmphai
	- Water supply, sanitation and health	NESDB representative
	- Water for food and rural development	PWWA representative
	- Water resources management in the Chao Phraya river basin	RID representative ONWRC representative
12:30-13:30	*Lunch*	
13:30-16:30	**Session 4: Working groups**	

- Implementation of the national water vision
- Water for the people: water supply, sanitation and environment
- Water for food and rural development
- Water management in the Chao Phraya river basin

20 June 2000 - DAY 2

9:00-10:30	**Session 5** Findings and recommendations of the four groups	Moderator: Dr Sacha Sethaputra Respective chairpersons
10:30-11:00	*Coffee break*	Organizing Committee
	Preparation of a consolidated list of priority actions	
11:00-12:00	**Final session**	Chaired by
	- Open forum on the recommended list of priority actions	Mr Surapol Pattanee
	- Conclusions and closing remarks	
12:00-13:30	*Lunch*	

Held at the Royal River Hotel, Bongkot-rat Room. Organized by the Office of the National Water Resources Committee in cooperation with ESCAP and FAO